Purpose: The outcome after reverse shoulder arthroplasty (RSA) depends on the condition of the deltoid muscle, which we assessed with novel ultrasound modalities and electromyography (EMG). Contrast-enhanced ultrasound (CEUS) and acoustic radiation force impulse (ARFI) were applied to compare perfusion and elasticity of the deltoid muscle to the clinical and functional outcome. Material and methods: 64 patients (mean age 72.9 years) treated with RSA between 2004 and 2013 were recruited. The deltoid muscle was examined with EMG and ultrasound; functional scores such as Constant (CS) and ASES were assessed. Among other CEUS parameters, Wash-in Perfusion Index (WiPI), Time To Peak (TTP) and Rise Time (RT) were compared between the operated and contralateral shoulders as well as between patients with above- and below-average outcome. The stiffness of the deltoid muscle was analyzed with ARFI. Results: After RSA, both the deltoid perfusion (WiPI, Δ=−12 ±22%, p=0.0001) and shoulder function (CS, Δ=−14±24, p<0.0001) were inferior compared to the contralateral side. This perfusion deficit was associated with a limited range of motion (TTP and anteverision: r =−0.290, p=0.022). Deltoid perfusion was higher in patients with above-average outcome (RT, Δ=33 ±13%, p=0.038). The operated deltoid muscles showed higher stiffness than contralateral (ARFI, Δ=0.2±0.9 m/s, p=0.0545). EMG excluded functionally relevant axillary nerve injuries in the study population. Conclusion: CEUS revealed reduced mean perfusion of the deltoid muscle after RSA. Reduced perfusion was associated with limited range of motion and below-average outcome. Functional shoulder impairment after RSA might be predicted by non-invasive CEUS as surrogate parameter for the integrity of the deltoid muscle.
**SL1-3**

**Contrast enhanced ultrasound as a first line imaging method in the evaluation of FLL in daily practice. A large monocentric experience.**

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**Background:** Contrast enhanced ultrasound (CEUS) has become the first line imaging method in our center, used for the characterization of focal liver lesions (FLL) after it proved to be a cost-efficient method (1). We present you a monocentric experience in the evaluation of focal liver lesions by CEUS in daily practice routine in our center.

**Materials and methods:** The retrospective study performed between September 2009-December 2015, included 2037 patients, in whom CEUS was performed. We evaluated 2427 FLL: 72.7% (95% CI: 43.4–94.7%) of cases, CEUS was inconclusive, other methods being required (CT, MRI or biopsy) for the final diagnosis. From the total of 2427 lesions evaluated by CEUS, we were able to provide the correct classification in 1931 (79.6%) of cases. From all the FLLs evaluated by CEUS, 442 (22.9%) were hepatocellular carcinomas; 490 (25.4%) were liver metastases; 373 (19.2%) hemangiomas; 257 (13.4%) focal fatty liver alterations; 75 (3.9%) FNH; 1.2% (22) Adenomas, 82 (4.2%) hepatic cysts; 48 (2.5%) liver abscesses; 80 (4.1%) regenerative nodules; 0.5% (10) Cholangiocarcinoma; 0.1% (2) other malignant lesions; 2.5% (48) other benign lesions. **Conclusion:** CEUS demonstrated its efficiency as a good first-line imaging method for the characterization of focal liver lesions detected by ultrasound, with a positive diagnosis in 79.6% cases and differentiation between malignant and benign lesions in 88.1% cases.

**SL1-4**

**Diagnostic accuracy and interobserver agreement of contrast-enhanced ultrasound in the evaluation of residual lesions after treatment for malignant lymphoma and testicular cancer.**

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**Purpose:** To calculate the diagnostic accuracy and interobserver agreement of contrast-enhanced ultrasound (CEUS) in the evaluation of residual lesions after treatment for malignant lymphoma and metastatic testicular cancer. **Materials and methods:** Between May 2004 and October 2010 an experienced sonographer performed CEUS in 52 patients with residual lesions after treatment for malignant lymphomas and metastatic testicular cancer. Final judgement on presence or absence of active disease was based on histological findings and/or clinical follow-up. To quantify the diagnostic accuracy of the CEUS we calculated sensitivity, specificity, likelihood ratios and predictive values. A second, equally well experienced sonographer reassessed the results of the CEUS in every patient. To quantify the interobserver agreement we calculated the proportion of agreement and the Kappa statistic. **Results:** Sensitivity was 72.7% (95% CI: 43.4–90.3%), specificity was 87.8% (95% CI: 74.3–94.7%), positive likelihood ratio was 5.96 (95% CI: 2.43–14.63) and negative likelihood ratio was 0.31 (95% CI: 0.12–0.82). The observers agreed in 84.6% (95% CI: 71, 1–92.7%) of cases, Kappa statistic was 0.76 (95% CI: 0.60–0.91). **Conclusion:** Our preliminary study indicates that contrast-enhanced ultrasound might be helpful in the evaluation of residual lesions after chemotherapy for malignant lymphoma and metastatic testicular cancer. Based on the results we provide required sample sizes for an adequately powered phase 3 diagnostic accuracy study.

**SL1-5**

**Dynamic contrast-enhanced ultrasound (CEUS) after open and minimally invasive locked plating of proximal humerus fractures.**

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**Purpose:** Closed reduction and locked plate fixation of proximal humerus fractures with the minimally invasive deltoit-splitting approach intends to minimize soft tissue damage although axillary nerve injury has been reported. The aim of this study was to assess the deltoid muscle perfusion with dynamic contrast-enhanced ultrasound (CEUS) as novel technique and evaluate its relation to the functional and neurologic outcome after open (ORIF) and minimally invasive (MIPO) fracture fixation.

**Materials and methods:** 50 patients, 30 with deltoiod-splitting MIPO approach were examined 6–49 months after surgery. Only patients with a healthy, contralateral shoulder were selected. Shoulder function, satisfaction as well as psychosocial outcome were assessed with established scores (Constant, DASH, Simple Shoulder Test, ASES, SF-12). Electromyography (EMG) of the deltoid muscle was performed to determine nerve damage. Ultrasound of both shoulders included CEUS and Power Doppler after deltoid muscle activation via active abduction for two minutes. **Results:** None of the examinations and scores showed significant differences between ORIF and MIPO patients, the psychosocial outcome was similar. The fracture types were equally distributed in both groups. The normalized Constant Score was 76.3±18.6 in the ORIF and 81.0±16.1 in the MIPO group (p=0.373). Deltoid muscle perfusion in CEUS and Power Doppler revealed no differences between both approaches. EMG excluded functionally relevant axillary nerve injuries. Compared with the contralateral shoulder, Constant- and ASES-Scores (p=0.001 for both ORIF and MIPO) as well as the deltoid muscle perfusion (ORIF p=0.035; MIPO p=0.030) were significantly worse for both approaches. **Conclusions:** Convincing consensus of functional, ultrasonographic and neurologic examinations demonstrated comparable outcomes after deltoiodplate and deltoiod-splitting approach. The quantification of the deltoid muscle perfusion with CEUS indicates that the proclaimed benefits of the MIPO approach on soft tissue might not be as great as expected.

**SL1-6**

**Liver function assessment using sonazoid, correlation analysis with conventional biochemical marker ICG R15.**

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**DOI:** 10.1055/s-0036-1587716

**Purpose:** We analyzed the pattern of time-intensity curves (TICs) of the liver parenchyma on contrast-enhanced ultrasonography (CEUS), using Kupffer cell specific contrast agent; Sonazoid. The aim of the present study is to assess the diagnostic accuracy of the parameters of the time-intensity curves (TICs) for assessment of liver function. **Materials and methods:** Between June 2013 and October 2014, total 52 patients (44 men, 8 women) who underwent contrast enhanced ultrasonography and indocyanine green (ICG) tests due to focal liver lesion requiring surgical or ablational treatment were enrolled. We evaluated the hemodynamic-related parameters of TICs such as rise time (s), time to peak (s), peak intensity (dB), time from peak to one half (s), area under curve (dB*s), mean transit time (s). And compared these parameters with the conventional serologic test, indocyanine green retention rate at 15 minutes (ICG R15). **Results:** There were no significant relationship between rise time (s), time to peak (s), peak intensity (dB), area under curve (dB*s), and mean transit time (s). And compared these parameters with the conventional serologic test, indocyanine green retention rate at 15 minutes (ICG R15). **Conclusion:** Time from peak to one half was relatively proportional to ICG R15. The cutoff value of 149 seconds was determined for the time from peak to one half for abnormal ICG R15 (>14). And sensitivity and specificity were 85.7% and 92.3% for detecting abnormal ICG R15. **Conclusion:** Time from peak to one half is a useful parameter of TICs using CEUS to predict post-operative liver function.

ARFI imaging© in the parotid gland – is it useful in different disease?  
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Purpose: To evaluate ARFI imaging© in the parotid gland and different parotid gland diseases. Material and methods: 143 patients with parotid gland tumours, 50 patients with primary Sjögren’s syndrome (pSS), and 78 patients with healthy parotid glands. ARFI values were measured in 27 patients of the 64 PA (42.2%), in 50 patients of the 79 WT (63.3%), and in all patients with pSS (100%) and healthy parotid tissue (100%). ARFI values in healthy parotid tissue (1.9 ± 0.62 m/s) were significantly lower than in PA (2.4 ± 0.6 m/s, p < 0.05), WT (2.32 ± 0.69 m/s, p < 0.05), or pSS (3.0 ± 0.97 m/s, p < 0.0001). Conclusion: ARFI imaging© is feasible in healthy parotid tissue and the diffuse disease of the parotid tissue like pSS, while it is not regularly reproducible in neoplastic lesions of the parotid gland.

Special US pattern of thyroid lesions: “nodule within the nodule”  
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Purpose: The technical improvement of modern ultrasound (US) equipment allows a better evaluation of the sonographic structure of the thyroid and of the thyroid nodules (TN). The aim of this prospective study is an evaluation and presentation of a new US-pattern of the thyroid lesions denominated “nodule within the nodule”. Methods: Thyroid US with 18 MHz transducer in 540 patients. In case of solid TN, the presence of additional circumscribed thyroid lesions within the nodule was studied. The uptake of such TN at thyroid scan with 99 m-Tc-Pertechnetate and/or the histology after surgery was evaluated. Results: 1920 TN with diverse US pattern were detected. 24 lesions were slightly hypoechogenic till isoechoic nodules (diameter between 15 – 35 mm) with hypoechocal halo and peripheral vascularization, which showed additional small nodules (diameter between 5 – 10 mm) within the TN, mainly hypoechogenic nodules with microcysts and a peripheral perfusion of diverse degree. These 24 TN showed at the thyroid scan a normal uptake compared to the paranodular tissue or a hyperaccretion. Conclusion: The special US pattern of thyroid lesions called “nodule within the nodule” is seldom, but it should be known and be taken into consideration in every thyroid US in order to avoid erroneous reports or false US descriptions. The pattern “nodule within the nodule” corresponds to scintigraphic lesions with normal uptake or toxic thyroid adenomas.
Clinical implication of texture analysis as a prognostic factor of papillary thyroid microcarcinoma

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Purpose: We investigated the value of texture analysis as a prognostic factor for pathologic extrathyroidal extension, lymph node metastasis, and high TNM stage. Methods: This retrospective study was approved by the Institutional Review Board, and the requirement to obtain informed consent was waived. 363 patients (mean age, 43.8 ± 11.3 years; range, 16 – 72 years) who underwent staging US and subsequent thyroidectomy for conventional PTMC ≤ 10 mm between May and July 2013 were included. Each PTMC was manually segmented and its histogram parameters (Mean, Standard deviation, Skewness, Kurtosis, and Entropy) were extracted with Matlab software. Multivariate logistic regression analysis was performed to evaluate factors associated with pathologic extrathyroidal extension, lymph node metastasis, and high TNM stage. Results: Kurtosis > 6.364 (Odds ratio, 2.496; 95% confidence interval (CI), 1.292 – 4.821, P = 0.006) and extrathyroidal extension on US (Odds ratio, 2.501; 95% CI, 1.508 – 4.147, P < 0.001) were independently associated with pathologic extrathyroidal extension. Younger age (Odds ratio, 0.963; 95% CI, 0.941 – 0.985, P < 0.001) and lymph node metastasis on US (Odds ratio, 7.362; 95% CI, 3.572 – 15.175, P < 0.001) were independently associated with pathologic lymph node metastasis. Mean ≤ 102.642 (Odds ratio, 2.271; 95% CI, 1.019 – 5.062, P = 0.045) and older age (Odds ratio, 1.144; 95% CI, 1.105 – 1.184, P < 0.001) were independently associated with high TNM stage. Conclusion: Texture analysis can be used to predict pathologic extrathyroidal extension and high TNM stage in patients with PTMC.

Pediatric Ultrasound I – Clinical Investigations

SL3-1

Pediatric musculoskeletal ultrasound – age- and sex-related normal B-mode findings of the knee

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Purpose: Musculoskeletal ultrasound (MSUS) is an important tool for evaluating disease activity, therapeutic progress, and remission status of rheumatic diseases in children. Knowledge of age-related normal findings is essential when interpreting pathological findings such as those seen in juvenile idiopathic arthritis. The most commonly affected joint in childhood arthritis is the knee. Materials and methods: To evaluate normal findings of the knee joint, we age-related stages of musculoskeletal development in the knee in 440 healthy children between 1 and 18 years of age using high-resolution B-mode MSUS. We determined approximate age- and sex-related norms for suprapatellar recess size, ossified patella size, and distal femoral intercondylar cartilage thickness. Results: In almost all age groups, over 64% of children had visible fluid accumulation in the suprapatellar recess. Significant correlations were found between chronological age and the size of the suprapatellar recess and the length of the ossified patella (p < 0.05). An age-dependent decrease in intercondylar cartilage thickness of the distal femoral epiphysis was found in children between 10 and 18 years of age. Conclusion: High-resolution B-mode MSUS is an excellent tool for assessing joint and skeletal development in children. Our reference data can be used to discriminate better between normal physiological findings and pathological abnormalities.

SL3-2

4-year follow-up of ultrasound-based diagnosis and non-surgical treatment of developmental dysplasia of the hip in mongolia: a prospective cohort study

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Purpose: Avascular necrosis of the femoral head and residual dysplasia can occur after non-surgical treatment of developmental dysplasia of the hip (DDH). Both are indications for surgical procedures and cause pain and early osteoarthritis despite interventions. We therefore aimed to determine their prevalence in a prospective cohort study of Mongolian newborns. Materials and methods: Hips of all children born within one year in the largest pediatric hospital of Mongolia (n = 8356) were examined by ultrasound at a median age of one day. If DDH was present, the patient was treated with a Tubinger splint (n = 107). All treated children could be discharged with healthy type 1 hips after monthly checks by ultrasound. A representative sample of 51/107 children treated was followed up at the age of 3 – 4 years with conventional radiography. We determined 1) the formation of the femoral head (condensed) and joint space (narrowed) as signs of avascular necrosis; and 2) the acetabular angle (≥ 28 degrees in ≤ 3-year-old participants or ≥ 25 degrees in > 3
years) as sign for residual dysplasia. Furthermore, we asked the parents about the use of swaddling. **Results:** No child showed signs of avascular necrosis. One child had a sign of residual dysplasia (acetabular angle 25.8 degrees on the left hip at age 3.5 years). Angles in all other children were below thresholds and highly variable, ranging from 11.1 to 26.2 degrees. They were slightly higher in girls than boys, and on the left compared to the right. Swaddling behavior did not affect the results. **Conclusion:** Ultrasonographic diagnosis of DDH and treatment with Tubinger splint within the first few weeks of life is safe and efficient in preventing surgical interventions.

### SL3-3

**Adaptation of the Graf hip ultrasound system for a newborn DDH screening program in the humanitarian Swiss Mongolian Pediatric Project (SMOPP)**

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**DIO:** 10.1055/s-0036-1587725

**Purpose:** In Mongolia, a developing country in Central Asia, SMOPP has introduced a strategy for early detection and treatment of developmental dysplasia of the hip (DDH). A big screening study with 8356 newborns showed a high incidence of DDH (2%) and a remarkable treatment success with a simple and safe reusable abduction device. In the study, we had employed the gold standard in DDH classification of Graf differing 10 types. Yet, for daily use in our program, it proved to be rather complicated and extensive. Furthermore, different types of dysplasia did not lead to different treatment strategies. In order to simplify the instructions of the screeners and their evaluations, SMOPP developed an adaptation of the Graf method. **Method:** We adapted the Graf system for use in a DDH screening program in newborns to 4 different types according to the therapeutic consequences: A – none; B – control; C – conservative; D – surgical. **Results:** The simplification of the Graf method could quickly be implemented and found high acceptance amongst the performing doctors. It helped to compensate the huge turnover of users in governmental hospitals and it will facilitate the implementation of a nationwide screening program. The selected age group (first days of life) allows a narrowing of treatment strategies, so the adaption does not result in an increase of individual risks. All screening doctors are supervised by experts with profound knowledge of the original Graf method. **Conclusion:** The SMOPP adaption of the Graf method is instructed to screeners and shows good acceptance. It will be used in the national newborn DDH screening program in Mongolia.

### SL3-4

**Paediatric musculoskeletal ultrasound – Examination of the joint capsule shape in healthy children and adolescents**

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**DIO:** 10.1055/s-0036-1587726

**Purpose:** In rheumatic diseases a convex shape of the joint capsule is valid as a sign of joint effusion. Up to now there are no studies about the capsule shape in a healthy childhood population. **Material and methods:** In an age- and sex-related multicentre study, we examined the formation of the capsules of shoulder, elbow, hip and ankle joints. The evaluation was performed in a longitudinal scan in healthy children and adolescents between 2 and 18 years of age. The shape of the capsule was classified into concave, straight or convex in relation to the bone surface located dorsally of the capsule. **Results:** We evaluated 447 study participants, 245 of them being girls. They were classified into six age groups, which constitute three age ranges. For the shoulder and ankle joints, we found a predominantly concave form in all age groups. Regarding the elbow joint, particularly the younger age groups showed both a concave and a straight capsule formation with a concavity increasing with age. In external rotation, the hip joint capsule showed a predominately concave or straight form, whereas the capsule had a rather convex or straight shape in the neutral position of the joint. **Conclusion:** A convex joint capsule shape can also be found in healthy children and adolescents. It, therefore, cannot be interpreted separately as a sonographic sign for a joint effusion or a synovia inflammation.

### SL3-5

**Standardized joint-ultrasound for individualization of prophylaxis in hemophiliacs: Easy-to-learn-ultrasonography (HEAD-US) of joints and correlation with function and clinics**

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**DIO:** 10.1055/s-0036-1587727

**Purpose:** In Haemophilic Arthropathy the extent of synovitis is detected as a sign of the activity, osteochondral defects are quantifiable as a sign of progression by ultrasound. In 2013 an easy-to-use standardized ultrasound protocol (HEAD-US) for examination of early joint changes in Haemophilic Arthropathy was published by C. Martinoli. The results of the first clinical trial to correlate clinics, functional and structural changes in Haemophilic Arthropathy are shown here. Material and methods: In 2012 – 2015 we have included more than 200 young german patients with hemophilia A or B or vWD from different German haemophilia treatment centers in the HaemarthroSonoPilot trial (DRKSS00004483, informed consent, ethical approved by the LÄK Baden-Württemberg). Standardized Ultrasound of the elbow, knee and ankle joints was performed and rated with the HEAD-US scale in each patient. Simultaneously an orthopedic clinical examination with clinical scoring and 3D motion analysis of the lower limbs for detecting early function defects (rolling vs. gliding in motion) were performed with an ultrasonometric toposcope. **Results:** The investigations in the presented pilot study showed correlation of the sonographic diagnostics with the measurement of a clinical orthopedic examination in haemophilic arthropathy depending on age. Through the joint sonography changes were even partially already seen before that stood out in the clinical investigation. **Conclusions:** It may be useful if haemophilia treaters in future apply an easy to learn standardized ultrasonography (HEAD-US) to individualize the therapy under close control and evaluation of joint changes.

### SL3-6

**The use of abdominal ultrasound as a screening method in the neonatal and infant period – is it useful?**

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**DIO:** 10.1055/s-0036-1587728

**Introduction:** Over the last few years abdominal ultrasound has become a very useful and accessible method for exploring the pediatric gastrointestinal pathology. **Study objective:** Assessing the need to perform an abdominal ultrasound in the newborn and infant period as a screening procedure, in order to find evidence of malformative or tumoral pathology. **Methods:** Abdominal ultrasounds were performed on 769 patients hos-
pipalized in our clinic during July 2013 – March 2015. The patients were aged between 0–1 years, with an average of 3±2.5 months. Of these, 450 patients (58.51%) received a routine abdominal ultrasound without any clinical evidence to justify this investigation. Results: The most common pathology was that of the reno-urinary tract: renal malformations – 1 case (cystic renal dysplasia), list and ilid degree hydronephrosis – 75 cases (16.67%), ilid and IVth degree hydronephrosis – 18 cases (4%); other findings: congenital splenic cyst – 1 case, ovarian cysts – 18 cases (4%), vascular portal malformations – 5 cases (1.1%), digestive malformations (midgut cyst) – 2 cases (0.4%), tural pathology – 10 cases (2.2%), congenital splenic cyst – 1 case. Discussions: The relatively high prevalence of ab- dominal pathology (75 cases, 28%) detected accidentally by performing routine abdominal echography in these patients has not changed the therapeutic approach in 92% of cases. 6 cases were subject to surgical referrals. 2 cases required immediate surgery (neuroblastoma and neo- phroblastoma), while other 2 cases would undergo surgery at a later stage. Conclusions: Abdominal ultrasound during the neonatal period and infancy is important in order to establish a complete diagnosis and subsequent monitoring of these cases.

### Neurological/Nephrology/Musculoskeletal Ultrasound

#### SL4-1

**Comparison of freehand B-mode and power-mode 3D ultrasound for visualisation and grading of internal carotid artery stenosis**

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**Purpose:** Currently, colour-coded duplex sonography (2D-CDS) is clinical standard for detection and grading of internal carotid artery stenosis (ICAS). However, unlike angiographic imaging modalities, 2D-CDS asessees ICAS by its haemodynamic effects rather than luminal changes. Aim of this study was to evaluate freehand 3D ultrasound (3DUS) for direct visualisation and quantification of ICAS.

**Materials and methods:** Thirty-seven patients with 43 ICAS were examined with 2D-CDS as reference standard and with freehand B-mode respectively power-mode 3DUS. Patients were 20 patients with ICAS (ICCA: distal CSA reduction). Ultrasound examination of ICAS was assessed by calculating distal diameter respectively distal cross-sectional area (CSA) reduction percentage and interrater as well as intermethod agreement were calculated.

**Results:** Interrater agreement was good for power-mode 3DUS and assessment of stenotic value as distal CSA reduction percentage (intraclass correlation coefficient) was moderate for the proximal (ICC, distal CSA reduction: Ex1 0.85, Ex2 0.88; ICC, distal diameter reduction: ICC 0.81, Ex1 0.85, ICC 0.85; ICC, distal diameter reduction: ICC 0.81). Interrater reliability was poor for B-mode 3DUS (ICC, distal CSA reduction 0.36; distal diameter reduction 0.51). In comparison to 2D-CDS intermethod reliability was good and clearly better for power-mode 3DUS (ICC, distal diameter reduction: Ex1 0.85, Ex2 0.78; ICC, distal CSA reduction: Ex1 0.63, Ex2 0.57) than for B-mode 3DUS. For power-mode 3DUS and assessment of stenotic value of ICAS as distal diameter reduction percentage, positive predictive value for differentiation between moderate and high-grade ICAS was 0.81 (Ex1) and 0.76 (Ex2) while negative predictive value was 0.92 (Ex1) and 0.91 (Ex2).

**Conclusions:** Non-invasive power-mode 3DUS is superior to B-mode 3DUS for imaging and quantification of ICAS and might ideally complement 2D-CDS as initial vascular diagnostic in stroke patients. Thereby, more invasive and time-consuming imaging modalities like computed tomography angiography might be restricted to those cases of ICAS where a clear discrepancy for stenotic value is found between 2D-CDS and power-mode 3DUS.

#### SL4-2

**Reference values for the cross-sectional area of the vagus nerve in healthy subjects – preliminary results of a high-resolution ultrasound study**

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**Purpose:** To assess age-related reference values for the vagus nerve (VN) and to examine interrater reliability. Herewith, we report preliminary results.

**Materials and methods:** Both VN’s of 26 healthy subjects (18 female, mean age 31 ± 7 years) were examined with high-resolution ultrasound using a 15 MHz ultrasound transducer (Esaote MyLab Five, probe LA435). Cross-sectional area (CSA) of each VN was assessed at 2 points: at level of the distal common carotid artery before beginning of the bulb (proximal measuring point) and at level of the thyroid gland (distal measuring point). Each subject was examined by 2 sonographers experienced in peripheral nerve ultrasound. Results: Median CSA of the VN at the proximal level was significantly larger on the right (examiner 1/examiner 2: 2.9 ± 0.7 mm² [mean ± SD]/2.6 ± 0.5 mm²) in comparison to the left side (2.2 ± 0.6 mm²/2.3 ± 0.5 mm²; both p < 0.001; Wilcoxon signed-rank test). At the distal level, median CSA of the right was also significantly larger (2.8 ± 0.9 mm²/2.7 ± 0.5 mm²; both p < 0.001; Wilcoxon signed-rank test). Interrater agreement (intraclass correlation coefficient) was moderate for the proximal (0.63, 95% confidence interval: 0.43 – 0.77) as well as for the distal (0.69, 95% confidence interval: 0.51 – 0.81) measuring point. Conclusion: With restrictions due to the preliminary character of our data, we found a significant difference in CSA between the right and left VN, which further emphasises the need for side-specific reference values. However, because of special anatomical characteristics like the pulsating common carotid artery and the internal jugular vein in direct vicinity, even experienced sonographers of a faculty might consider a training to obtain a good interrater reliability.

#### SL4-3

**Accuracy of high-resolution ultrasound in carpal tunnel syndrome**

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**Purpose:** The aim of this study was to evaluate the diagnostic efficiency of high-resolution ultrasound in diagnosis of carpal tunnel syndrome compared to electromyography exam (EMG). **Materials and methods:** 36 wrists of 20 patients with clinical suspicion of carpal tunnel syndrome were prospectively evaluated using high resolution ultrasound. 14 patients were female and 6 male. Control group consisted of 17 asymptomatic volunteers (34 wrists). Ultrasound exam was performed the same day right after the EMG, by a radiologist experienced in MSK ultrasound. High resolution linear transducer was used. The radiologist was blinded to EMG results. Ultrasound diagnostic criterion for carpal tunnel syndrome was cross section area of median nerve of 10 mm² or more measured at proximal carpal tunnel (at the level of pisiform bone). Sensitivity, specificity and accuracy of the method were evaluated. **Results:** Majority of the patients, 80% had bilateral carpal tunnel syndrome. Ultrasound showed true positive finding in 31 of 36 cases of carpal tunnel identified by EMG. Sensitivity was 86.1%. Specificity was also high, 88.2%. The exam was correctly recognized as normal by ultrasound. Positive predictive value was 88.6%, and negative predictive value was 85.7%. Accuracy of the method was high, 87.1%. **Conclusion:** Ultrasound in comparison to EMG shows high sensitivity, specificity and accuracy in diagnosis of carpal tunnel syndrome. Due to its availability, easiness of use and cost of the exam it can be used as a reliable method of choice for quick and accurate evaluation of carpal tunnel syndrome.

#### SL4-4

**Is 2D shear wave elastography (2D-SWE) useful in the assessment of chronic kidney disease? – A 2 center pilot study**

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**Purpose:** The results published so far regarding elastography of the kidney (mainly point shear wave speed measurements) are not always consistent. The present study aims to evaluate another elastographic method (2D-SWE, Aixplorer, Supersonic Imagine), performed independently in two centers. **Material and methods:** The study was performed in two Nephrology Clinics from Croatia and Romania on a total of 58 subjects


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Dynamics of arthrosonographic pattern of gouty arthritis influenced by medication therapy

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Methods: General clinical examination, ultrasound examination of the affected joints. Results: There have been examined 84 patients with gouty arthritis. The monitoring group consisted of 20 healthy volunteers of appropriate age and gender. All patients were divided into two independent centers. 1 group (40 people) received a daily dose of 400 mg of allopurinol, 2 group (44 people) – allopurinol of 400 mg and atorvastatin of 20 mg for 8 weeks. Before treatment patients of group 1 had been diagnosed with: micro calcification sand dual circuit of cartilage in 95%, joint effusion in 83%, subchondral bone erosions in 82.5%, tophus in 32.5%. After 8 weeks micro calcification sand dual circuit were visualized in 70% (p < 0.05), effusion in 29.5%, erosions in 82.5%, tophus in 32.5%. Patients of group 2 before treatment had been detected with: micro calcifications and dual circuit of cartilage in 95%, joint effusion in 80%, subchondral bone erosions in 82.5%, tophus in 32.5%. After 8 weeks micro calcifications and dual circuit were visualized in 52.5% (p < 0.01), effusion in 82.5% (p < 0.05), erosion in 52.5% (p < 0.005), tophus in 15% (p < 0.05). Conclusions: Arthrosonographic changes in patients with gouty arthritis are presented by micro calcifications and dual circuit of cartilage, effusion in the joints, erosions and tophus. Medication therapy by allopurinol improves ultrasound picture in 8 weeks of treatment (frequency of detection of micro calcifications and effusion has been significantly reduced). Additional receiving of atorvastatin allows to reliably reduce the frequency of detection of erosion and tophus. Therefore rthrosenographic is recommended to be used in the dynamic monitoring of the effectiveness of medication treatment of gouty arthritis.

Assessment of elasticity by ARFI sonography of ruptured achilles tendons – long-term results

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Purpose: Rupture of the Achilles tendon is a common injury. Only a few studies have investigated the biomechanical properties of injured tendons compared to healthy tendons in the long-term results. Our objective was to compare the elasticity of injured tendons vs. non-traumatized tendons by ultrasound elastography in the long-term outcome. Our secondary objective was to investigate differences of operatively vs. non-operatively treated tendons. Methods: Acoustic-radiation-force-impulse-elastography (ARFI) was performed on Achilles tendons of patients who had ruptured their Achilles tendon and received operative (O) or non-operative (N) treatment. We included patients who were injured 2 – 10 two to ten years prior to the examination (exclusion criteria: bi-lateral injury in their history). Both Achilles tendons (injured and healthy) of each patient were scanned in the distal, middle and proximal portion using ARFI sonography (Siemens Acuson 2000, 6 – 9 MHz probe). Statistical analysis was performed by using one-way ANOVA with Bonferroni’s post-hoc testing and subgroup analysis by using paired t-test. Furthermore, healthy tendons of the patients were compared to tendons of healthy individuals (n = 36) without any Achilles tendon rupture in their history (control). Results: 56 patients were included in the study [23 (N), 33 (O)]. Mean follow-up-time after injury was 67 ± 26 months [Mean ± SD]. No statistical significant differences (p > 0.05) were found between non-operatively and operatively treated ruptures (Fig. 1). Compared to the control group all injured tendons had significantly lower elasticity in ARFI measurements. No significant differences were found between the healthy tendon of the patients and the control group.

Safety/Technology/Physics

Fig. 1: ARFI results of all subgroups (A) and pooled injured subgroups (B) compared using One-way ANOVA with Bonferroni’s multiple comparison test (black). Subgroups separately compared using paired t-test (grey). P-values: * ≤ 0.05; ** ≤ 0.005; *** ≤ 0.0001

Conclusion: Evaluating our patients, we found that previously ruptured tendons still showed deficiencies in elasticity as evaluated by ARFI-sonography after a long period of healing. No significant differences were found between non-operatively and operatively treated tendons. Further investigations need to be performed in order to correlate ultrasound findings with clinical scores, biomechanical, and histological parameters.

Purpose: A pilot study has been performed during Sept.-Nov 2015 in 3 selected ambulances of our hospital to collect data about image quality parameters and about the actual condition of the involved ultrasound systems in general. The results lead support for selecting needed additional technical quality assurance checks regarding image quality deterioration and for assigning check intervals. Material and methods: An advanced test protocol has been prepared based on methods published in EFSUMB TQA Guideline 2012 by using different test devices and software for image/data evaluation. The focus has been on testing the status of the installed transducers and monitor quantitively, while the overall functional status of the system e.g. working of important main console settings, has been done visually. In total 30 different ultrasound units with 89 transducers were involved checking 22 different TQA protocol items. Results: 72% of the tested devices were fully operational but around 20% (n = 17/89) of the transducers and 7% (n = 2/30) of the monitors were classified as working suboptimal and needed maintenance immediately; the users partly do not register these malperformances in use: e.g. loss of several elements or sensitivity decrease, air inclusions, cracks in cables. The total protocol were worked off in 30 min
per unit sometimes including 3 – 4 transducers (checking time 5 min each only). Conclusion: These results are in accordance with published literature data and show that these kind of tests must be introduced mandatorily to guarantee optimal image quality. In general the testing intervals should depend on the system's operating-hours and carried out for 24/7 machines/transducers optimally monthly for others at least once a year. Reference: EFSUMB Technical Quality Assurance Group, Guideline for Technical Quality Assurance of Ultrasound devices (B-Mode) – Version 1.0, 2012. Ultraschall in Med 2012; 33: 544 – 549.

Conclusions:

Reduction of defective transducers by implementing regular technical quality assurance tests

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Purpose: Transducers are the most common error source for diagnostic ultrasound devices. Therefore regular technical quality assurance is intrinsic to be able to detect such faults at an early stage. With the implementation of a regular technical quality assurance concept for diagnostic ultrasound devices in the Austrian Mammography Screening Program the amount of defective transducers has been reduced. Material and methods: Within two years 198 radiology departments including 237 ultrasound devices and 255 linear transducers were evaluated. Analysis of DICOM images from extensive initial tests, additional tests and monthly consistency checks was performed using in-house software in terms of transducer defects such as weak/dead elements, cyst resolution and penetration depth. Results: Initially detected transducer defects revealed a total of 23.5% at screening start. Two years later the amount of defective transducers could be reduced significantly to 13.5%. Additional analysis of initial test data in terms of cyst resolution and penetration depth showed large divergences as a result of suboptimal preset settings. Conclusion: It could be shown that technical quality assurance is intrinsic to overcome high numbers of transducer defects. Most of these defects can be detected at a much earlier stage by performing regular quality checks as implemented in the screening program. With such checks a high quality of ultrasound devices and equipment can be ensured, improving quality of diagnoses for physicians as well as patients.

A blood mimicking fluid for clot-detection experiments with ultrasound

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Purpose: Monitoring of coagulation tendencies is important during many therapies, e.g. during dialysis or heart surgery with extracorporeal blood circulation. The monitoring could be done with ultrasound which can help physicians to make informed decisions on treatments. To ensure safety and to get administrative approval of the ultrasound measurement lots of experiments are necessary. Therefore a fluid that mimics rheological as well as acoustical properties of blood as closely as possible is necessary. Material & methods: We want to model the early stages of coagulation and therefore adapted a recipe of a blood mimicking fluid (BMF). The constituents of the BMF are polyamide particles with diameters 5 μm as erythrocyte and 20 μm to 60 μm as small clot mimics. Surfactant is added to suspend the particles. Water, glycerin, and dextran mimic the blood plasma. Their amount was adjusted to represent rheological and acoustical properties of blood as closely as possible. Experiments were performed to examine the fluid's properties. Among experiments, viscosity was measured with a rheometer, speed of sound and the absorption coefficient in pulse-echo-mode, and density with a pycnometer. Results: The haematocrit of the BMF is up to 30 Vol% (polyamide particles). Viscosity and density strongly agree with that of blood, speed of sound is somewhat higher (1600 m/s), and the attenuation coefficient is much stronger than that in blood. The latter is due to different impedances of polyamide particles and erythrocytes. Conclusions: It is essential to find a blood mimicking fluid that closely reproduces rheological, acoustical and to some extent mechanical blood properties in larger vessels and during coagulation. Our BMF overcomes difficulties as susceptibility at higher haematocrit concentrations or air bubbles in the solution. Concerning all aspects, this recipe is an adequate mimic for research to be used at higher haematocrit values.

Combined optoacoustic and ultrasound tomography for investigation of inflamed finger joints

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Arthritic diseases, including rheumatoid arthritis, psoriatic arthritis and osteoarthritis, have a prevalence between 2 and 3% and lead to joint destruction and deformation resulting in a loss of function. Current diagnostic methods rely on B-scan and Doppler ultrasound, x-ray or MRI, which have the drawbacks of low sensitivity and high user-dependency, involvement of ionizing radiation and high costs, respectively. We propose a new approach based on a combination of ultrasound and optoacoustic tomography for high sensitivity imaging of inflammation induced hypervascularization on finger joints. Optoacoustic signals are generated upon absorption of pulsed light in tissue according to the local absorption coefficient. The optical energy is converted into broadband acoustic waves by means of the optoacoustic effect. Pressure signals can be detected using different kinds of transducers. In our system, a tomographic setup consisting of 4 arc-shapes transducer arrays based on high-bandwidth cMUTs (capacitive micromachined ultrasound transducers), which can independently be moved, allows imaging of all 3 finger joints (full tomographic view of DIP and PIP, top/bottom view of MCP). Signals are generated with a wavelength-tunable pulsed OPO (optical parametrical oscillator) laser system and acquired with the latest version of IBMT’s ultrafast ultrasound platform DiPHAS. The system has been evaluated using different phantom structures. The resolution of the combined US/OA imaging system was characterized to be less than 200 μm. Vessel mimicking phantoms embedded in optically scattering media (gel phantoms) were imaged as well. The system has shown to be able to perform combined high-resolution acoustic and optoacoustic imaging in different studies. The platform has furthermore been tested according to different safety standards (acoustic, optical, electrical, EMC). Currently, hardware optimization steps with respect to a further improvement of the sensitivity are performed and a pilot patient study will be initiated soon to demonstrate the clinical potential of the technique.
**Possibilities of contrast-enhanced ultrasound (CEUS) for evaluation of the success of percutaneous treatments of malignant liver lesions using special perfusion software**

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**Aim:** Using new perfusion software for evaluation of the success of percutaneous treatments of malignant liver tumors with CEUS. **Material and methods:** Retrospective analysis of 79 patients (66 male, 13 female; 30–84 years) with 140 malignant liver lesions (size 9 mm–10 cm). The lesions were metastases in 45 cases and HCC lesions in 95 cases. The success of percutaneous interventional treatments (IRE n = 40; RFA n = 33; MWA n = 36; TACE n = 31) was evaluated by CEUS with perfusion imaging using special perfusion software. CEUS was performed after bolus injection of 1–2.4 ml of sulfur hexafluoride microbubbles. Regions of interest (ROI) were manually placed in the centre, and the margins of the lesions as well as in the surrounding tissue. Using perfusion software Time to Peak (TTP), mean Transit Time (mTT). Rise-Time, and wash-in rate were calculated in the ROIs. **Results:** There were significant differences in all cases between the centre compared to the surrounding liver tissue for the main perfusion parameters (Peak, Rise Time, wash-in) (p < 0.001). There were also significant perfusion differences for Peak and wash-in when comparing defect and margins (p < 0.001), and in Peak, Rise Time, and Wash-in when comparing liver tissue to the defect and the defect in comparison to the margins for completely treated sections. **Conclusion:** Combination of CEUS with perfusion imaging using special perfusion software enables a very critical analysis of successful treatment by percutaneous interventional procedures of malignant liver lesion. **Clinical relevance statement:** A combination of CEUS with perfusion imaging is a radiation-free possibility of controlling the success of percutaneous ablation therapies in malignant liver lesion. There are no contra-indication for ultrasound contrast-media so far.

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**The “Pumping Probe Technique” and complete sealing stent – a new simple method for the detection and treatment of ureteral fistulae**

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**Purpose:** Ureteric fistulae after gynecological surgery are a typical postoperative (PO) complication. In the past, fistula detection was performed by X-Ray or CT. The aim of this study is to show that ultrasound using the novel “Pumping Probe Technique” (PPT) is an alternative method of detecting fistulae. The use of a new intermural complete sealing ureteric stent prevents leakage, covers the tissue and allows the tissue to heal without further measures. The stent will then be removedatraumatically after wound healing is complete. **Methods:** In 19 cases between June 2012 to April 2016 we used the new PPT in both endoluminal sonography and elastography to visualize ureteric fistulae. The technique involves the forward and backward movement of an ultrasound probe to generate pressure in the fistula, thus leading to a movement of the fluid within so that it can be detected. We found 15 ureterico-vaginal fistulae, three ureteric-enteric fistulae and 1 arterio-ureteric fistula using this method. Each patient was then treated with the implantation of a 120 mm, 30Fr self-expanding covered stent (Allium/North Medical (TM)) under radiological control. **Results:** A fistula was detected by elastography in only 12 of the cases, however using ultrasound 17 of 19 were visualized, both imaging modalities were performed with the new PPT. X-Ray and CT were then used to confirm the diagnosis. In 17 of the 19 cases the fistula was successfully closed and the stent could be removed 8 weeks later. **Conclusions:** Endoluminal sonography and elastography using the novel PPT detected approximately 90% of the fistula cases. The subsequent management of ureteric fistulae with stents can be performed gently, safely and quickly. The cure rate was high at 90%. This minimally invasive technique as well as the comfort of the implanted stent leads to high levels of patient satisfaction.

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**Performance of Fetal Intelligent Navigation Echocardiography (FINE, 5DHeart©) in congenital heart defects – experiences from a retrospective single center study**

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**Purpose:** Congenital heart defects (CHD) are among the most common malformations as well as the main cause of malformation related childhood mortality. Although ultrasound is nowadays available almost everywhere, the majority of congenital heart defects are diagnosed postnatally. Fetal intelligent navigation echocardiography (FINE, 5D Heart©) was developed to assist physicians in the extraction of examinations planes in accordance to national and international guidelines from a STIC (spatio-temporal image correlation) volume data set. **Material and methods:** In our retrospective study STIC volumes of patients with a fetus affected by congenital heart disease (n = 35) were examined. After seven predefined anatomical structures were labeled, a sort of “map” of the fetal heart was automatically constructed by the algorithm and nine examination planes in accordance with the guidelines of the German Society for Ultrasound in Medicine (DEGUM), International Society of Ultrasound in Obstetrics and Gynecology (ISUOG) and the American Institute of Ultrasound in Medicine (AIUM) were extracted. The examined heart defects include tetralogy of Fallot, atrioventricular septal defects (AVSD), double outlet right ventricle (DORV), Hypoplastic left heart syndrome and other major structural heart defects. The volume data sets of the affected fetuses were analyzed with the FINE algorithm and the resulting planes have been examined. **Results:** The results whether the heart defect is detectable will be demonstrated. **Conclusions:** Preliminary results confirm and expand previously published data that the algorithm in combination with the standard 2D ultrasound could be a valuable tool to identify CHD and moreover to improve prenatal counseling and multidisciplinary management of the delivery.
Elastography and Ultrasound I – Clinical Investigations

**SL7-1**

Results of the DEGUM-multicenter study evaluating strain elastography for differentiation of thyroid nodules

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**Purpose:** Many patients with thyroid nodules are presently referred to surgery not only for therapeutic but also for diagnostic purposes. Strain elastography (SE) enables the ultrasound-based determination of tissue elasticity. The aim of the present study was to evaluate the value of SE for differentiation of thyroid nodules in a prospective multicenter study.

**Material and methods:** The study was registered at clinicaltrials.gov and was approved by the local ethical committees of all participating centers. All patients received an ultrasound (US) of the thyroid including Colour Doppler US. In addition all nodules were evaluated by SE (Hitachi Medical Systems) using qualitative image interpretation of colour distribution (SE-ES), strain value and strain ratio. **Results:** Overall, 602 patients with 657 thyroid nodules (567 benign, 90 malignant) from 7 centers were included in the final analysis. Sensitivity, specificity, NPV, PPV, +LR were 21.1%, 73.5%, 88.3%, 11.8%, 0.9 for colour Doppler US; 60.7%, 93.7%, 94.5%, 30.2%, 2.9 for SE-ES; 58.1%, 92.3%, 92.2%, 12.2% for SE-strain value; 58.7%, 78%, 92.3%, 30%, 2.6 for SE- strain ratio, respectively. Diagnostic accuracy was 71% for both strain value and strain ratio of nodules. **Conclusions:** SE as an additional ultrasound tool improves the value of ultrasound for the work-up of thyroid nodules. It might reduce diagnostic surgery of thyroid nodules in the future.

**SL7-2**

Rapid and sustained improvements of liver stiffness values in HCV-infected patients treated with direct-acting antiviral drugs

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**Background:** The use of interferon-free antiviral therapy in patients with chronic HCV infection is associated with high rate of sustained virological response (SVR). The aim of this study was to evaluate changes of liver stiffness (LS) using Acoustic Radiation Force Impulse Imaging (ARFI) elastography and transient elastography (TE) during antiviral treatment and to evaluate its role in relation to SVR.

**Patients and methods:** In total 337 chronic HCV-infected patients (mean age 59 years, 42% females) were included in this prospective single center study. Genotype 1 accounted for 75%, 244 patients (72%) had liver cirrhosis at baseline. Patients received direct-acting antiviral drugs (DAADs), 254 patients (75%) reached follow up 24 (FU24) and were considered for statistical analyses. Duration of treatment varied between 8 and 24 weeks. All patients received LS measurement by ARFI during treatment and at FU24 and FU48. TE was performed at baseline and at FU24. **Results:** SVR was observed in 219/254 patients (86%). Mean ARFI values decreased significantly from baseline to FU48 (p = 0.042), with a gradually decrease from baseline to W4 (p = 0.001), from W4 to W12 (p = 0.006), from W12 to FU48 to (p = 0.031). Median TE showed an overall decrease from baseline to FU24 (p < 0.001). ARFI values decreased on the LSM scale at W48 from F4 to F3 in 17%, to F2 in 7% and to F2 < 26%. Baseline values of ARFI, TE and AST showed higher values in relapers than in patients with SVR (p < 0.001, p < 0.001, p = 0.029, respectively). In the multivariate analysis, ARFI was the only predictor of liver stiffness regression (p < 0.001). **Conclusion:** LSM by ARFI and TE decreased in almost all HCV-treated patients during the course of treatment, irrespective of HCV response. Base-

**SL7-3**

Evaluation of 2D shear-wave elastography for characterisation of focal liver lesions running title: 2D-SWE and liver lesions

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**Purpose:** The aim of this prospective study was to evaluate 2D shear-wave-elastography (2D-SWE) for characterisation and differentiation of benign and malignant focal liver lesions (FLLs). **Material and methods:** Patients referred to our ultrasound unit for surveillance of chronic liver disease or work-up of incidentally detected FLLs were prospectively included. B-mode ultrasound and 2D-SWE (Aixplorer® France) was performed for one FLL in each patient. Liver histology obtained by biopsy and/or contrast-enhanced imaging was used as reference method. The Mann-Whitney test was used to assess the stiffness difference between the groups. **Results:** 140 patients with FLL were included. SWE acquisitions failed in 34 FLLs (24%). Therefore, 106 patients with FLL could be analysed, 42/106 (40%) with benign and 64/106 (60%) with malignant FLLs. 58/106 (55%) FLLs were localized in the right liver lobe. The median stiffness for benign FLLs was 16.4 (2.1–71.9) kPa (in detail: 16.55 kPa for 18 focal nodular hyperplasia (FNH), 16.35 kPa for 18 hemangioma, 9.8 kPa for 3 focal fatty sparrings (FSP), 8.9 kPa for 1 adenoma, 20 kPa for one regenerative node and 29 kPa for one cholangiofibroma) and for the malignant FLLs 36 (4.1–142.9) kPa (in detail: 44.8 kPa for 16 hepatocellular carcinoma (HCC), 70.7 kPa for 7 cholangiocarcinoma (CCC) and 29.5 kPa for the 41 metastasis) (p < 0.001). Malignant FLLs were significantly stiffer than benign FLLs (p < 0.001). CCGs were the stiffest malignant FLLs with significantly higher values as compared to HCCs and metastases (p = 0.033 and p = 0.0079). No significant difference in stiffness could be observed between the different benign FLL entities. No significant difference was observed whether 2D-SWE included the whole FLL, only the periphery or only the hardest area of the FLL. **Conclusions:** 2D-SWE provides further characterising information for interpretation of FLLs and may be useful at least in differentiation of CCCs and HCCs.

**SL7-4**

Reliability and validity of elastography in circumscribed objects: Acoustic-Radiation-Force-Impulse-quantification with fixed Region-of-Interest versus Shear-Wave-Elastography with variable Region-of-Interest – Phantom study

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**Purpose:** Elastic properties of circumscribed tissue e.g. tendons, lymph nodes, myometrium are in focus of clinical interest. Current elastography systems employ several measurement techniques regarding the application of radiation force, measurement and imaging. The purpose of the study is the comparison of reliability and validity of Acoustic-Radiation-Force-Impulse (ARFI)-quantification versus Shear-Wave-Elastography (SWE) and the assessment of precision of SWE with variable Region-Of-Interest (vROI) in elasticity phantoms. **Material and methods:** The ultrasound (US) elastography phantom Model 049 (CRS USA) was used. Targets of varying stiffnesses (8, 14, 45, 80kPa) and diameters (20/10 mm) were examined. Three US-Systems and four probes were applied (Sie-
Ultrasound based elastographic methods for the prediction of esophageal varices in liver cirrhosis

**Purpese:** Ultrasound based elastographic methods are non-invasive techniques for the evaluation of liver stiffness (LS) that might be also useful in the assessment of portal hypertension. The aim of this study was to evaluate the performance of 4 ultrasound based elastographic methods for predicting the presence of esophageal varices (EV) in patients known with liver cirrhosis.

**Material and method:** The study included 109 consecutive subjects diagnosed with liver cirrhosis (with clinical, biological, ultrasound, endoscopic or histological signs of liver cirrhosis), in whom LS was evaluated in the same session by means of 4 elastographic methods: transient elastography (TE) (M and XL probes), ARFI (VTQ), 2D-SWE and 2D-SWE.GE. Reliable LS measurements were defined as: for TE, VTQ and 2D-SWE.GE-the median value of 10 measurements and for 2D-SWE the median value of 3 measurements acquired in a homogenous area. In 60 patients out of 109 all 4 elastographic methods had valid measurements and were included in the final analysis. 

**Results:** 20/60 patients from the study group had EV while 40/60 had not. The mean LS values for patients without EV were lower as compared to those of patients with EV: TE: 21.1 kPa, Se-94.4%, Sp-57.1%, NPV-48.6%, PPV-96%, AUROC = 0.76, p < 0.0001; ARFI (VTQ): >2.01 m/s, Se-88.9%, Sp-45.6%, NPV-48.6%, PPV-96%, AUROC 0.56, p = 0.002; 2D-SWE: >13.7 kPa, Se-100%, Sp-84.6%, PPV-37.5%, AUROC = 0.61, p = 0.05; 2D-SWE.GE: >13.48 kPa, Se-77.8%, Sp-64.3%, NPV-63.0%, PPV-48.3%, AUROC = 0.69, p = 0.01. 

**Conclusion:** LS values assessed by any ultrasound based elastographic method are higher in patients with EV as compared to those without EV, but TE seems to be the most predictive for the presence of EV.

Ultrasound shear wave elastography and multifrequency magnetic resonance elastography for detection of chronic renal allograft dysfunction

**Purpose:** Kidney transplant dysfunction is associated with viscoelastic tissue changes. The purpose of this study is to noninvasively assess renal stiffness in kidney transplant recipients using ultrasound shear wave elastography (SWE) and to correlate shear wave velocity (SWV) with renal allograft function and shear modulus values obtained by magnetic resonance elastography (MRE).

**Materials and methods:** This prospective study investigated 25 transplant kidneys (functional renal allograft, ft, n=14; renal allograft insufficiency, dys, n=11) in 20 kidney transplant recipients (mean age, 43 ± 14 years). SWE was performed using a high-end ultrasound device (Aplio500, Toshiba) with a 14-MHz broadband linear transducer. In the same group multifrequency MRE (1.5 T scanner, Siemens) was performed with 7 slices at 4 mechanical frequencies from 40 to 70 Hz. Stiffness maps were computed by multifrequency reconstruction of the magnitude shear modulus (G’). SWE and MRE of larger tissue portions including pyramids and renal cortex were compared. SWE was correlated with clinical markers of renal allograft function and MRE. 

**Results:** Functional allografts had higher SWV than dysfunctional allografts in both cortex and pyramids and showed increased G’ as well (cortex: 3.75 ± 0.82 m/s vs. 2.79 ± 0.73 m/s, P=0.0002; pyramid: 2.89 ± 0.46 m/s vs. 2.39 ± 0.34 m/s, P=0.004; G’: 7.92 ± 2.18 kPa vs. 6.13 ± 1.20 kPa, P<0.0001). Cutoff values of 3.27 m/s for cortex, 2.54 m/s for pyramids and 7.24 kPa for G’ provided sensitivities of 72.7%/77.8%/90.9% and specificities of 71.4%/78.6%/85.7% for detecting renal allograft dysfunction with AUROC values of 0.831/0.841/0.945 (95% Cl, 0.67 – 0.79/ 1.02 – 0.86/1.03). SWV correlated positively with glomerular filtration rate (r=0.741, P=0.0004) and agreed with MRE-measured shear modulus values (r=0.564, P=0.003).

**Conclusion:** SWE is sensitive to renal allograft dysfunction, which is characterized by reduced SWV values, but has higher image resolution than MRE, while MRE slightly better diagnostic accuracy.
Teaching ultrasound: do you credit for participation or test knowledge? 
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Background: The vast majority of ultrasound courses for non-radiologists are giving credit for participation without testing for the actual knowledge and practical skills that were achieved by the participant. We present a structured training concept for ultrasound teaching for internal medicine physicians in Israel, including observed bedside practice and formal knowledge testing.

Intervention and methods: A basic ultrasound training program for internal medicine physicians, with a total duration of 3–4 months is continuously being offered to hospitals owned by Clalit Health Services (the largest HMO in Israel). The course includes four steps: (1) A 6 hour, bedside course of basic ultrasound skills for fluid identification (pericardium, pleura, peritoneum, and bladder); (2) Four hour personal training on a computerized ultrasound simulator; (3) Bedside practice with a trained sonographer, according to a pre-specified list of skills (3–6 weeks); (4) Final exam (1.5 hours). The final exam tests for 4 skills: (i) Spatial orientation: the participant is required to precisely re-capture ultrasound images/videos using a phantom; (ii) Pattern recognition: the participant is required to explain anatomic and pathologic findings on a given image/video; (iii) Real-time sonography on a simulator, with focused questions (i.e., “is there pericardial effusion?”), and (iv) Operational skills (“knobology”).

Results: Ninety-three physicians from 28 internal medicine wards in 8 general hospitals of Clalit Health Services across Israel, started the ultrasound training program. Forty-nine doctors (52%) were examined up to date (March 2016). Within the examined participants, 2 physicians (4%) needed additional practice in order to pass the exam. Conclusion: Even at basic ultrasound level, such as the point of care ultrasound training for internal medicine physicians presented here, one cannot assume that participation equals knowledge or skills. Knowledge and skills evaluation should become a standard for ultrasound teaching, for both patient safety and clinical quality assurance.

Gynaecological Ultrasound I – Clinical Investigations

SL9-1

Carotid intima-media-thickness precedes the clinical onset of preeclampsia and persists postpartum: A longitudinal study
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Purpose: Carotid intima media thickness (cIMT) is an established marker for endothelial dysfunction and cardiovascular risk. This prospective study aimed to assess differences in cIMT before the onset of preeclampsia and postpartum. Material and methods: We longitudinally measured cIMT in 417 pregnant women (31 ± 5 years), in the first (T1: 11.4 ± 1.9 wks), second (T2: 21.5 ± 2.3 wks) and third trimester (T3: 32.5 ± 2.9 wks) and postpartum (21.6 ± 23.6 wks), using high-resolution ultrasound and an automated reading program. Comparisons were made with univariate ANOVA, data are expressed as mean (SD). Results: 56 women (32 ± 5 years) who later developed preeclampsia had a higher cIMT [T1: 0.47 ± 0.16/T2: 0.45 ± 0.14/T3: 0.43 ± 0.12 (p < 0.001)] throughout pregnancy compared with 618 women who did not develop preeclampsia (NP) [T1: 0.32 ± 0.09/T2: 0.33 ± 0.10/T3: 0.33 ± 0.09], adjusted for age, body mass index, mean arterial pressure and family history of cardiovascular disease. This difference in cIMT persisted postpartum [PE: 0.55 ± 0.11/ NP: 0.36 ± 0.10 (p < 0.01)]. Conclusion: This study documents increased carotid arterial remodeling, by measuring intima media thickness, in women who later developed preeclampsia. This difference preceded the clinical signs of preeclampsia and persisted postpartum.

SL9-2

Prediction of preeclampsia by maternal carotid intima-media-thickness, blood pressure, flow-mediated dilatation and uterine artery Doppler
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Purpose: To evaluate the performance of a 1st, 2nd and 3rd trimester (T) prediction model for preeclampsia (PMPE) by a combination of carotid intima media thickness (cIMT), flow-mediated dilatation (FMD), retinal arterio-venular ratio (AVR), mean arterial pressure (MAP), and uterine artery (UtA) Doppler. Methods: We performed the combined screening in 761 pregnant women, of whom 292 were analyzed in the 1st, 475 in the 2nd and 407 in the 3rd trimester. cIMT and FMD were assessed using high-resolution ultrasound and an automated reading program and AVR was calculated using a specific retinal vessel analyser. All women underwent UtA Doppler ultrasonography and pulsatility index (PI) was used. The area under (AUC) the receiver operating curves (ROC), detection (DR) and false-positive rates (FPR) for the different PMPEs were calculated: 1st T: cIMT, AVR, MAP, 2nd and 3rd T: cIMT, FMD, UtA-PI, MAP and a PMPE for daily use (PMPEedu): cIMT, MAP and UtA-PI. Results: The mean maternal age was 31 ± 5 years. 96 women (32 ± 5 years) later developed PE, including 39 early onset, 57 late onset, 10 superimposed early onset and 18 superimposed late onset PE cases. The 3rd T PMPE yielded the best DR for preeclampsia (90.6%, FPR: 20.3%, AUC: 0.92), followed by the 2nd T PMPE (DR: 76.8%, FPR: 20.3%, AUC: 0.85) and 1st T PMPE (DR: 69%, FPR: 17.1%, AUC: 0.84). The DRs of the PMPEedu were slightly different [1st T (DR: 73.7%, FPR: 16.2, AUC: 0.83), 2nd T (DR: 73.2%, FPR: 19.3%, AUC: 0.85), 3rd T (DR: 86.8%, FPR 18.9%, AUC: 0.91)]. Conclusion: The different combinations of cIMT, FMD, UtA-PI, MAP and AVR were better 1st, 2nd and 3rd trimester predictors of preeclampsia than any individual marker. Since the combination of cIMT, MAP and
**Sonographic weight estimation in small for gestational age fetuses**

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**Purpose:** To determine the accuracy of sonographic weight estimation (WE) for small for gestational age (SGA) fetuses, and to further differentiate the evaluation between fetuses being symmetric and asymmetric SGA.

**Material and methods:** The accuracy of WE in SGA fetuses (n = 898) was evaluated using 14 sonographic models and was further differentiated between symmetric (n = 750) and asymmetric (n = 148) SGA fetuses. SGA fetuses were considered to be asymmetric with a head circumference to abdominal circumference ratio above the 95th percentile. The accuracy of the different formulas was compared using means of percentage errors (MPE), medians of absolute percentage errors (MAPE), and proportions of estimates within 10% of actual birth weight. **Results:** Results for the subgroup of asymmetric SGA fetuses differed significantly from the subgroup of symmetric SGA fetuses. MPE values were closer to zero with most of the formulas in the asymmetric SGA group. Apart from the Siemer, Shepard, Merz and Warsed equations, all formulas showed an underestimated weight of fetal symmetric SGA fetuses. In contrast, in the symmetric SGA group, all of the formulas commonly used for fetuses in a normal weight range showed a systematic overestimation of fetal weight. Overall the best accuracy was achieved by using the Sabbagha equation (MPE 1.7%; SD 9.0%; MAPE: 6.0)

**Conclusions:** An accurate WE in SGA fetuses is feasible using the Sabbagha formula. However, one has to be aware of the significant differences in WE between symmetric and asymmetric SGA fetuses.

**SL9-4 Update reference charts: Fetal biometry between the 15th and 20th week of gestation**

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**Purpose:** Reference charts for biometric parameters are a substantial implement of prenatal ultrasound screening. Inaccurate reference charts lead to fault clinical decisions. In our daily practice we observed an over- and underestimation of biometric parameters. The aim of this study was to derive reference charts between the 15th and 20th week of gestation for biparietal diameter (BPD), occipito-frontal diameter (OFD), head circumference (HC), abdominal circumference (AC), femur length (FL), compare to commonly used curves and evaluating the impact of maternal BMI, ultrasound equipment, fetal gender, and nicotine abuse. **Material & Methods:** In a cross-sectional study of 4,265 low-risk pregnancies, biometric data were obtained between the 15th and 20th weeks of gestation. The statistical analysis included descriptive data, fitting regression curves for the 5th, 50th, 95th quantile and multivariate quantile regression analyses. **Results:** Reference curves for BPD, OFD, HC, AC, FL showed a linear increase between the 15th and 20th week of gestation. New equations and reference charts are presented in this study. In a comparison of influence factors sexes, BMI and ultrasound systems have an impact. **Conclusion:** As a result of the study, we determined current growth curves for BPD, OFD, HC, AC, and FL for both sexes as well as for males and females separately. The updated growth curves for all biometric parameters differ from the curves used commonly in the last two decades.

**SL9-5 Vascular biopsy of the placenta using VOCAL2 ultrasound software in the prediction of IUGR**

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**Purpose:** Firstly, to investigate the potential value of placental vascular biopsy using VOCAL2 software at second and third trimester to define the pregnancies at risk with intrauterine growth restriction (IUGR). Secondly, to prove an effective and novel method to use the software, enabling significant, efficient and easily reproducible results during the scan. **Materials and methods:** Placental vascular image biopsy was taken using VOCAL2 software, prospectively, during the scan, using a practical approach by optimised machine settings (21 cases with IUGR, 233 controls). This enabled the examiner to take the image in 5 seconds. The 3D power Doppler measurements such as placental vascularisation index (VI), flow index (FI) and vascularisation flow index (VFI) were calculated using the machine software. To compare the placental function with the new measurements, the Doppler measurements of the uterine arteries, umbilical artery and middle cerebral artery were performed. The 5. percentile in birth weight was taken as cut-off to define the IUGR. Linear regression analysis was used to estimate the difference of each placental vascular index between IUGR and control pregnancies after adjusting for gestational age. **Results:** Placental VI, FI and VFI were significantly lower in IUGR pregnancies than in controls (p = 0.03, p = 0.014, p < 0.001). Mean uterine artery and umbilical artery PI were higher in IUGR foetuses at the time of the measurements. After adjusting both FI and VFI for gestational age, they remained lower in the IUGR group than in controls (p = 0.011 and p < 0.001). **Conclusion:** Placental vascular biopsy is easy to perform at second and third trimesters of pregnancy to assess the placental function.

**SL9-6 MRI-fusion sonography for the evaluation of Trans Vaginal Colposuspension treatment success**

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**Purpose:** Trans Vaginal Colposuspension (TVC) is a novel, minimally invasive technique for the treatment of stress urinary incontinence (SUI). To reconstruct the pubourethral or pubovesicular ligaments we use an...
MRI visible sutureable mini sling (SlimSling) which allows for the preservation of normal anatomy without any mesh material under the urethra. To follow up the success of this procedure we use MRI fusion sonography along with a clinical evaluation of outcomes. By using MRI fusion sonography we are able to see the fixation points and the mesh position angle which in not possible with traditional imaging. The aim of this study is to show that MRI fusion sonography is a superior tool for evaluating the treatment success of TVC. **Methods:** Between August 2013 and April 2016 116 patients underwent a TVC procedure. Peri and postoperative complications were recorded. Patients were followed up at six weeks, three and six months and objective and subjective outcomes were evaluated. All patients underwent magnetic resonance imaging (MRI) and then MRI fusion sonography to evaluate the position of the mesh sling following the procedure. **Results:** We found that with ultrasound alone the correct angle of the sling was not able to be measured accurately but with the addition of MRI fusion the outcome of the procedure is easily measurable. Visualization of the 3 mm prolene mesh sling is easier using MRI fusion and a larger field of view is obtained. The paraurethral fixating points of the mesh are seen in only 68% of cases but with MRI fusion nearly 96% are seen. The imaging shows that the traction angle of the sling is the same as the normal anatomy. **Conclusion:** MRI fusion sonography allows for measurable follow up of TVC performance and also proves that it is a good alternative to traditional colposuspension or midurethral slings.

**Fig. 1: MRI-US-Fusion TVC**

**Ultrasound in Emergency**

**Comparison of Ultrasound-guided interscalene block vs. analgesodation for shoulder reduction in a Swiss University Emergency Department**

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**Purpose:** Patients presenting with traumatic shoulder dislocation in the Emergency Department (ED), often get procedural sedation for shoulder reduction. Recent studies report the possibility of Ultrasound-guided interscalene block (US-ISB) in the ED, done by Emergency physicians (EP), to facilitate reduction without analgosedation. The aim of this study was to compare US-ISB vs. procedural sedation for shoulder reduction especially considering patient safety and length of stay in the ED. **Material and methods:** We included adult out-patients with traumatic shoulder dislocation, two part fracture-dislocation (greater tuberosity), or dislocated shoulder prosthesis. Exclusion criteria for US-ISB were refusal by the patient, associated brachial plexus or axillary nerve palsy, infection at the injection site, or allergies to local anesthetics (LA). Ultrasound-guided single-shot LA was placed below the epineural sheath of the three trunks of the brachial plexus. US-ISB were performed by two EP and one emergency fellow resident who are trained in the technique. In the US-ISB group no further analgesics or sedatives were given. Reduction maneuvers were done by emergency fellow residents. The time of ED-entry and post-reduction radiography has been taken as start- and endpoint. **Results:** From January 2014 to March 2016 we included 145 out-patients (34 females, 111 males), median age 36.2 years (min. 17.0, max. 94.8). Underlying pathologies: dislocations 126 (86.9%), fracture-dislocations 17 (11.8%), and two dislocated shoulder prosthesis (1.4%). Depending on the availability of the three trained interventionists, US-ISB (30) or procedural sedation (115) has been used. The time between ED-entry and post-reduction X-ray was significant shorter in the US-ISB-group (mv 94 min) vs. sedation-group (mv 106 min), using the independent samples t-test. Complications (intravascular injections, neural lesions, later infections) were not seen in the US-ISB-group. **Conclusion:** US-ISB for shoulder reduction in the ED is a safe and effective method. Teaching priority for EP’s should therefore focus on this technique.

**Emergency ultrasound in German emergency departments. Results from a national survey**

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**Purpose:** Evaluation of the current state of ultrasound use in German emergency departments (ED). **Methods:** Online-Survey by SurveyMonkey® for 3 months. Members of DGfNA and DEGUM were asked to complete the questionnaire. Responses were collected and anonymized. **Results:** 135 valid answers from different hospitals were received. 85% of the hospitals have 2 or more ultrasound machines in the ED. 1/3 of the examinations are done by residents without supervision from an expert sonographer. Among the most frequent US-examinations are eFAST exams, little is known about the location or size of these missed PTXs. **Conclusion:** Our study demonstrates that missed PTXs are smaller and in atypical locations than those detected in eFAST. Missed PTXs less often need treatment with thoracic drainage. Preclinical suspicion of PTX is strongly associated with the detection of PTX in eFAST and deserves special attention.

**SL10-3 Dectection of pneumothoraces in patients with multiple blunt trauma: use and limits of eFAST**

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**Background:** Trauma patients are commonly evaluated in the trauma room by extended focused assessment with sonography for trauma (eFAST). Little is known about the location or size of these missed PTXs. **Methods:** This cross-sectional study includes all patients with multiple blunt trauma and PTX who were admitted to the emergency department of a level 1 trauma centre in Bern, Switzerland between June 1, 2012 and September 30, 2014 (n = 109). Demographic data, imaging modalities, medical data on admission and preclinical suspicion of pneumothorax were compared in patient groups with and without PTXs detected in eFAST. Compared with CT, using the Mann-Whitney U or Pearson’s chi-square tests. Univariate binary logistic regression models were used to identify predictors for detection of PTXs. **Results:** The group of missed PTXs contained significantly fewer ventral PTXs (30 (47.6%) vs. 4 (9.3%), p < 0.001), but more apical and basal PTXs (7 (11.1%) vs. 15 (34.9%), p = 0.003; 11 (17.5%) vs. 18 (41.9%), p = 0.008, respectively). The PTXs missed in the eFAST examination were smaller on both sides (left side: 30.7 ± 17.4 vs. 12.1 ± 13.9 mm; right side: 30.2 ± 10.1 vs. 6.9 ± 10.2 mm, both p < 0.001). In univariate analysis, we found that the preclinical suspicion of PTX was associated with the detection of PTXs in eFAST in all PTXs (p < 0.001, OR 7.002 (2.801; 17.507)) as well as in the subgroup analysis of patients who needed thoracic drainage (p = 0.004, OR 10.487 (2.117; 51.944)). **Conclusion:** Our study demonstrates that missed PTXs are smaller and in atypical locations than those detected in eFAST. Missed PTXs less often need treatment with thoracic drainage. Preclinical suspicion of PTX is strongly associated with the detection of PTX in eFAST and deserves special attention.
Atrial Fibrillation (AF) is one of the main risk factors for cardio-embolic stroke. The aim of the present study was to define morphological and functional parameters of the left atrium (LA) and the LAA to get a better risk stratification regarding the stroke risk estimation in the low risk group according to the CHA2DS2-VASc-Score. In 331 patients (pts) transesophageal and transthoracic echocardiography was performed to characterize LA and LAA morphology and function. The following parameters were determined: left ventricular ejection fraction (LVEF), left ventricular end-diastolic pressure (E/e'), biplane LA-volume, LAA morphology (3D-TEE), LAA filling and emptying velocities in the proximal and distal LAA. In pts with SR (n = 242) mean LVEF was 61±10, mean LA volume 57 ml ± 25, mean E/e' ratio 13 ± 7, proximal mean LAA flow 82 cm/s ± 30, distal mean LAA flow 64 cm/s ± 24. In pts with SR 18pts (7%) showed a reduced LAA flow < 30 cm/s. The LAA morphology could be described by the chicken wing-LAA (37%), the windsock-LAA (56%), the cauliflower-LAA (6%) and the cactus-LAA (1%). A significant statistical correlation of the LAA morphology to the development of neurological events could not be observed in the present cohort. In pts with AF (n = 89; 27% of all pts) mean LVEF was 53±13, mean LA volume was 82 ml ± 32, mean E/e'-ratio 16±8, proximal mean LAA flow 51 cm/s ± 35, distal mean LAA flow 41 cm/s ± 33. In pts with history of neurological event a higher coincidence of reduced LVEF, increased LA volume, increased E/e', and reduced proximal and distal mean LAA flow were observed. In patients with SR and without cardiovascular risk factors, e.g. hypertension and diabetes mellitus, increased LA volumes and reduced LAA flow velocities seem to be major risk factors for the development of cerebral ischemia despite of normal LVEF. Currently, these pts are not considered as risk pts by the CHA2DS2VASc-Score.

Interventional Ultrasound and Miscellaneous

Percutaneous ultrasound-guided cyst sclerotherapy in patients with polycystic liver disease

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Purpose: Polycystic liver disease (PCLD) is a genetic disease causing hepatomegaly and local cystic complications. To date, there is no established medical therapy for PCLD. We present our results of percutaneous cyst sclerotherapy in patients with PCLD. Material and methods: 301 pat. with PCLD were followed by our centre between 2001 – 2008 and retrospectively analysed. The age was 50±11 years with 19% male. Additional polycystic kidney disease was found in 63%. All patients received ultrasound-guided cyst sclerotherapy via drainage thereafter. In infected or sangui- administered into the cyst in form of 1% ethoxysclerol. In cysts with a period. A total of 31 pat. died during follow-up. Cyst sclerotherapy was additionally polycystic kidney disease was found in 63%. All patients received ultrasound-guided cyst sclerotherapy via drainage thereafter. In infected or sangui-administered into the cyst in form of 1% ethoxysclerol. In cysts with a period. A total of 31 pat. died during follow-up. Cyst sclerotherapy was

The study of feasibility of predicting the microwave ablation energy of uterine leiomyomas by three-dimensional power Doppler

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Purpose: To evaluate the feasibility of predicting the microwave ablation (MWA) energy of uterine leiomyomas by three-dimensional power Doppler (3D-PD). Methods and materials: 42 uterus leiomyomas in 41 patients who underwent ultrasound-guided Percutaneous Microwave Ablation (PMA) for treatment of uterus leiomyomas were studied from March 2014 to March 2015. Before PMA treatment, the uterus of patients was scanned by 3D-PD ultrasonography. Vascularization flow index (VFI) of 3D-PD of leiomyomas was calculated by virtual organ computer aided analysis (VOCAL) program. The average of three measurement was used for evaluating the richness of blood flow in the leiomyomas and the leiomyomas which mean diameter were more than 5 cm were treated with quantitative ablation energy of 50 w*300 s and single antenna with 11 mm tip was used. Immediately after ablation the contrast-enhanced ultrasound (CEUS) was performed. The non-perfused volume (NPV) was measured as the volume of quantitative ablation. Relationship between VFI value of 3D-PD and microwave energy required per unit volume (EPV) was analyzed statistically. Results: 42 leiomyomas (41 patients) were analyzed. Average VFI was 1.96±1.63 and average ablation volume was (39.49±22.68)cm³. Average EPV was 589.47±399.36 (Jcm⁻³). EPV was positively correlated with VFI value (r=0.61, p<0.001). When unit volume of leiomyoma was ablated, the leiomyoma with large VFI values needed higher microwave energy than that with small VFI values. Conclusions: The richer the blood vessel in the leiomyomas the more microwave energy was need for ablation unit volume. The value of VFI of uterus leiomyomas can be used to predict the PMA energy before ablation.

Manual versus automatic image fusion of real-time ultrasonography and MR/CT images for radiofrequency ablation of hepatic tumors:

A preliminary report of a randomized prospective trial

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DOI: 10.1055/s-0036-1587763

Purpose: To compare the registration error, time required for image fusion and technical success rate of manual and automatic image fusion of ultrasonography (US) and MR/CT images for radiofrequency ablation (RFA) of hepatic tumors. Materials and methods: 26 consecutive patients with hepatocellular carcinomas (HCC) or colorectal liver metastases (CRLM) were prospectively enrolled in this study. Patients are randomly assigned to a) manual image fusion group, or b) automatic image fusion group. Two interventional radiologists performed RFA for hepatic tumors with manual or automatic image fusion of real-time US and MR/CT. Time for image registration (s), number of point locks, registration error (cm) and technical success rate were compared between manual group and automatic group. Mann Whitney U-test and Fisher’s exact test was performed for statistical analyses and p-values less than 0.05 were considered as statistically significant. Results: 15 HCCs and one CRLM were treated using manual image fusion and 13 HCCs and one CRLM were treated using automatic image fusion. Mean sizes of hepatic tumors were 1.67 cm for manual fusion and 1.54 cm for automatic fusion (p=0.623). Averages of time for image registration, number of point locks and registration error were 156.5, 3.1 and 0.76 mm for manual group, and 201.3, 3.0 and 0.88 mm for automatic group, respectively, and there were no significant difference (p-value = 0.5582, 0.8218 and 0.8058). Technical success rate was 100% (16/16) for manual group and 92.9% (15/16) for automatic group and there was no significant difference between each other (p=0.4667). Conclusion: Technical performance of manual and automatic image fusion is comparable for RFA of hepatic tumors.
Success of an ultrasound guided liver mass biopsy is determined by needle size and liver lesion depth

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DOI: 10.1055/s-0036-1587764

Purpose: Ultrasound guided puncture is the preferred method for histological sampling of liver lesions. Nevertheless, data evaluating factors influencing the outcome of this procedure are scarce. Therefore we aimed to evaluate predictors of a successful ultrasound guided liver mass puncture. Material and methods: Retrospective analysis of all liver mass punctures performed in 2012 – 2013 in a university hospital was performed. Patient, lesion (depth and size) and technical characteristics of the biopsy as well as final diagnosis and complications were recorded. Successful biopsy was defined by histological accordance of clinical and sonographical preemptive diagnosis. Clinically relevant complications defined by hypovolaemic shock, need for operation or transfusion were recorded. Variables are expressed as proportions, means (SD) or medians (range) as appropriate. Univariate analysis and multivariate logistic regression analysis was performed to evaluate predictors of success. Multivariate analysis included only the variables which were a priori available.

Results: 195 patients were included, in 154 (79%) cases the lesion was accurately punctured, although a final diagnosis resulting from histological examination of material gained was only made in 144 (74%) cases. 173 patients were biopsied for the first time, 22 patients were repeat biopsies. No patients had clinically relevant complications. Univariate analysis and multivariate logistic regression analysis was performed to evaluate predictors of success. Multivariate analysis included only the variables which were a priori available.

Conclusions: Needle size and the distance of the lesion to the liver surface are independent predictors of a successful liver mass biopsy.

<table>
<thead>
<tr>
<th>Tab. 1: Univariate Analysis</th>
<th>Successful biopsy no</th>
<th>Successful biopsy yes</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeat biopsy</td>
<td></td>
<td></td>
<td>0.039</td>
</tr>
<tr>
<td>No</td>
<td>41/173 (24%)</td>
<td>132/173 (76%)</td>
<td></td>
</tr>
<tr>
<td>yes</td>
<td>10/22 (45%)</td>
<td>12/22 (55%)</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>28.3 (25.7–30.5)</td>
<td>25.2 (22.3–28.3)</td>
<td>0.002</td>
</tr>
<tr>
<td>Age</td>
<td>66 (46–71)</td>
<td>65 (55–73)</td>
<td>0.031</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td>0.417</td>
</tr>
<tr>
<td>Male</td>
<td>24/102 (22%)</td>
<td>78/102 (76%)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>27/93 (29%)</td>
<td>66/93 (71%)</td>
<td></td>
</tr>
<tr>
<td>Size of lesion</td>
<td>35 (12–35)</td>
<td>32 (20–50)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Depth of lesion from liver surface (mm)</td>
<td>30 (21–47)</td>
<td>14 (10–24)</td>
<td>0.001</td>
</tr>
<tr>
<td>Liver cirrhosis</td>
<td></td>
<td></td>
<td>0.043</td>
</tr>
<tr>
<td>yes</td>
<td>16/40 (40%)</td>
<td>24/40 (60%)</td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>35/153 (23%)</td>
<td>118/153 (77%)</td>
<td></td>
</tr>
<tr>
<td>Asutes prior to puncture</td>
<td></td>
<td></td>
<td>0.006</td>
</tr>
<tr>
<td>yes</td>
<td>2/30 (73%)</td>
<td>28/30 (93%)</td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>48/163 (30%)</td>
<td>114/163 (70%)</td>
<td></td>
</tr>
<tr>
<td>Needle size</td>
<td></td>
<td></td>
<td>0.010</td>
</tr>
<tr>
<td>16G</td>
<td>25/125 (20%)</td>
<td>100/125 (80%)</td>
<td></td>
</tr>
<tr>
<td>18G</td>
<td>26/69 (38%)</td>
<td>43/69 (62%)</td>
<td></td>
</tr>
<tr>
<td>Number of  punctures during the procedure</td>
<td>2 (1–2)</td>
<td>1 (1–2)</td>
<td>0.036</td>
</tr>
<tr>
<td>Biopsy length according to sonographer (cm)</td>
<td>1.5 (1.5–2)</td>
<td>2.0 (1.5–2.5)</td>
<td>0.031</td>
</tr>
<tr>
<td>Biopsy length according to pathologist (cm)</td>
<td>1.5 (0.8–2.0)</td>
<td>1.8 (1.2–2.5)</td>
<td>0.057</td>
</tr>
<tr>
<td>Fragmented</td>
<td></td>
<td></td>
<td>0.870</td>
</tr>
<tr>
<td>yes</td>
<td>22/88 (25%)</td>
<td>66/88 (75%)</td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>29/107 (27%)</td>
<td>78/107 (73%)</td>
<td></td>
</tr>
</tbody>
</table>

Ultrasound guided biopsy for the accurate diagnosis of Leiomyoma in the female lower urinary tract

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DOI: 10.1055/s-0036-1587765

Purpose: Leiomyomas are benign tumors of smooth muscle origin and are rarely found in the lower urinary tract. To exclude other differential diagnoses such as urothelial cancer, cervical cancer, sarcoma or metastases, histopathological examination is necessary. CT/MRI are insufficient for the exclusion of other diagnoses. The aim of this study is to show that ultrasound guided biopsy is a suitable method for obtaining tissue for histopathology in order to select optimal treatment. Methods: Data from 16 patients with leiomyoma of the lower urinary tract, diagnosed with ultrasound guided biopsy and treated between May 2006 and April 2016, was analyzed retrospectively. Analysis included number, size and localization of the leiomyomas, symptoms, voiding function and complications. Results: Patients presented with signs and symptoms including: a palpable external genital mass, dysuria, urge urinary incontinence or dyspareunia. Usually physical examination revealed a non-tender mass, 1.5 – 6 cm in diameter, with a smooth surface located above the urethra or bladderneck. Clinical impression in nine cases included paraurethral masses, seven cases showed intramural or paravesical masses next to the bladderneck. Cystoscopy showed a normal urethra and no communication of the mass with the urethra or bladder tissue. The diagnosis was confirmed after ultrasound guided biopsy in all cases. The masses were sharply dissected and enucleated in nine cases vaginally and in seven cases via bladderoscopy. No postoperative complications were found. Two weeks after the procedure, all patients had a normal voiding function. Terminal histopathological examination showed leiomyomas with fascicles with spindle-shaped cells without mitosis. Conclusion: The diagnosis of leiomyomas of the lower urinary tract should be confirmed by transvaginal ultrasound guided biopsy and histopathological study before further therapy. The leiomyomas are always managed operatively and this can be performed easily either vaginally, bladderoscopically or transurethrally. The prognosis is excellent since it has no risk of malignant transformation.

Fig. 1: Intravesical Myoma, Bladderoscopy-Treatment
Ultrasound of the Gastrointestinal Tract

**SL11-6**

SDHeart approach for (semi-)automated evaluation of the fetal heart – ready for routine use? Prospective Data on ≥ 460 consecutive cases

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**Objective**: To scrutinize the performance and reliability of the SDHeart™ technology for standardized assessment of the fetal heart throughout pregnancy. **Methods**: In this prospective study we enrolled 485 uncomplicated singleton pregnancies undergoing targeted 1st and 2nd trimester ultrasound examination including STIC volumes of the fetal heart. All volumes were obtained with the fetus in an appropriate position (spine located between 4 and 8 o’clock), absent or minimal fetal breathing/movement and satisfying image quality. All data sets were stored and re-evaluated using the FINE software (Fetal Intelligent Navigation Echo-cardiography) in order to rule out the visualization rates of nine reconstructed cardiac planes. **Results**: A total of 461 patients were eligible for final analysis. The mean gestational age (GA) was 18.4 weeks (11.3 to 26.0 weeks). One to four STIC volumes were obtained per patient (mean 1.4 exams). In 80% of all volumes ≥ 6 planes were sufficiently visualized, and in 369/461 cases all planes were adequately displayed and labeled or not more than one diagnostic plane failed. Although the rate of non-visualized planes decreased with decreasing GA we were able to reconstruct 6 or more planes in 65% of all first trimester volumes (compared to > 94% in 2nd trimester). With advancing GA the number of properly visualized planes again decreased due to marked acoustic shadowing. Those planes that were difficult to obtain merely comprised the ductal and aortic arch in our cohort (regardless the GA). **Conclusion**: SDHeart™ technology facilitates reliable assessment of fetal cardiac anatomy even when applied as early as the first trimester, and might therefore aid early diagnosis of CHD even in unexperienced hands. With ongoing pregnancy the visualization rate of all diagnostic planes needed for complete fetal echocardiography improves rapidly (from 14 weeks onwards) and dropped substantially beyond 32 completed weeks.

**SL12-3**

High-intensity focused ultrasound (HIFU) for tumor regression and symptom relief in advanced pancreatic cancer

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**Purpose**: Evaluation of ultrasound-guided high-intensity focused ultrasound (HIFU) in patients with inoperable pancreatic cancer to reduce tumor volume and tumor-associated pain. **Material and methods**: Fifteen patients with locally advanced inoperable pancreatic cancer and tumor-associated pain symptoms were treated by HIFU (n = 6 stage III, n = 9 Stage IV UICC). Thirteen patients underwent simultaneous standard chemotherapy. JC HIFU System (Chongqing, China HAIFU Company) was used with an ultrasound device for real-time imaging. Clinical evaluation was performed by imaging (US, CT, MRI) and validated standardized questionnaires (NRS, BPI) before and up to 24 months after HIFU. **Results**: HIFU treatment was performed in all patients in spite of presence of biliary and/or duodenal stents (4/15) and tumor-induced vascular encasement of abdominal vessels (15/15). The mean treatment time was 111 min, sonication time 1103 s and total energy 386,768 J. Post-treatment imaging showed a devaskularisation of treated tumor regions with a significant average volume reduction of 63.8% after 3 months. A significant pain relief was achieved in twelve patients following HIFU therapy (n = 6 completely, n = 6 partially). **Conclusion**: US-guided HIFU can effectively be used for local tumor control and relief of tumor-associated pain in patients with locally advanced inoperable pancreatic cancer.

**SL12-5**

Tablet-sonography is a useful bedside tool during the first week after liver transplantation

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**Introduction**: Detection of vascular complications in the first post-operative week after liver transplantation are very important. In particular an early diagnosis of hepatic artery thrombosis is essential in decision-making to go for early re-intervention or re-liver transplantation. Therefore, abdominal sonography is performed several times in the first post-operative week, to look for patency of the hepatic artery, portal vein and liver veins. Hand-held devices might be expected to facilitate bedside abdominal sonography. In this study we compared sonography with regular machines, with tablet-sonography. **Methods**: In the first week after liver transplantation, sonography of the liver vessels was performed at day 0 (immediately after transplantation and arrival at the ICU), day 1 and day 7. Sonography was performed with Hitachi Avius or Hitachi Preirus systems; when the authors were on duty, Philips Visiq system (tablet) was also being used. Good patency was considered when: the Doppler signal of the proper hepatic artery was quantifiable, the maximal velocity in the portal vein was above 15 cm/s, and the qualitative Doppler signal in the liver veins was obvious. **Results**: In the study period January-February-March 2016, 21 liver transplants were performed in 21 patients. Hepatic artery thrombosis was detected in one patient immediately after transplantation, for which surgical thrombectomy was performed. There were 63 sonography moments, whether day 0, day 1 or day 7. During 31 moments the authors were able to perform sonography: at all 31 moments good patency of all liver vessels could be demonstrated, outcomes with tablet-sonography were completely in accordance with ‘regular’ sonography: 7 moments were at day 0, 13 at day 1, and 11 at day 7. **Conclusion**: First impression of tablet sonography suggests good applicability for the investigation of liver vascularisation, which is comparable to regular sonography in the setting of ‘first week after liver transplantation’.
Abdominal Ultrasound – Clinical Investigations

SL13-1 Presentation of histologically confirmed mesenteric masses in B-mode imaging and contrast enhanced ultrasound (CEUS): a 10 year retrospective study in 69 patients
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DOI: 10.1055/s-0036-1587770

Purpose: Analysis of mesenteric masses in B-mode imaging and contrast enhanced ultrasound (CEUS). Patients/Methods: from January 2006 to January 2016, n = 69 patients with mesenteric masses were examined by B-mode imaging, followed by CEUS. The contrast enhancement of the lesions was evaluated in comparison to the enhancement of the parenchymal organs. Histological diagnosis was available for all cases. Malignant diagnoses included lymphoma, GIST, NET, sarcoma and metastases, whereas benign cases consisted of mesenteritis, lymph nodes, adenopathy, tissue, panniculitis and others. Results: In B-mode imaging the lesions presented hypoechoic in n = 46 (67%), hyperechoic in n = 14 (20%), and with a complex echo pattern in n = 9 (13%). Histopathology revealed n = 45 (65%) malignant lesions and n = 24 cases (35%) with benign diagnoses. Malignant mesenteric lesions presented with arterial hypoenhancement in n = 10 (22%), isoenhancement in n = 24 (53%), a hypoenhancement in n = 7 (16%), a complex enhancement in n = 3 (7%) and n = 1 (2%) were anechoic. In the parenchymal phase, 40 cases (89%) of mesenteric lesions showed a hypoenhancement. The enhancement pattern was homogeneous in n = 29 (64%). In benign mesenteric masses arterial hyperenhancement was observed in n = 2 (8%), an isoenhancement in n = 9 (38%), a hypoenhancement in n = 10 (42%) and lesions were anechoic in n = 3 (13%) of the cases, followed by a hypoenhancement (n = 21, 88%) in the late phase. The enhancement was homogeneous in n = 16 (67%) benign lesions. Conclusion: Mesenteric masses were predominantly (65%) malignant. In B-mode sonography and CEUS, malignant and benign masses show a similar contrast behavior with a predominant parenchymal hypoenhancement. Therefore, histology must be obtained in order to correctly diagnose unclear mesenteric masses.

SL13-2 Intrahepatic vessel imaging using novel contrast settings: Low MI Harmonic Imaging and B-Flow CEUS
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1Klinikum Sidoahl-Oststadt-Heidehausen, Hannover, Germany.
DOI: 10.1055/s-0036-1587771

Patients and methods: After bolus injection of 1.4 mL SonoVue a subcostal view of the right or left liver lobe was performed with the advent of the first bubbles using a harmonic mode of an AO of 10% (HIREC). By this the intrahepatic arterial tree can be imaged. At an AO of 8% to 10% a sweep during the late arterial or portal venous phase is being performed with a low MI B-Flow (BFC). US device: GE LOGIQ E9 CA1–6. 48 liver cirrhosis patients, 20 FHN, 2 hepatocellular adenomas, 10 hemangiomas, 7 with portosystemic shunts (PSS), among one with Osler disease, 5 with portal venous thrombosis (PVT) and 40 patients with malignant liver HIREC and BFC were performed. Results: 34/48 pts. with cirrhosis had tortuous arteries with major branches being often dilated. Para-biliary veins and collaterals in pts. with PVT and pts. with PSS were best imaged using BFC, as stationary echoes were -due to its subtraction technique-cancelled out. In hyper-vascular lesions like hemangiomas, all FHN and those in the group of malignant lesions the feeding and sometimes intralesional arteries were additionally imaged, and could be imaged using the accumulation times of 3-D Mode. We found 4 intrahepatic arterial stenoses. BFC was the most reliable contrast technique to detect and prove PSS. Detection rate of small hyper-vascularized HCC was best and superior to conventional CEUS settings or CT at HIREC. Conclusions: HIREC and BFC can be beneficial in addition to conventional CEUS techniques in imaging intrahepatic vessels in diffuse and focal liver diseases.

SL13-3 Real-time grey scale contrast-enhanced ultrasonography in diagnosis of gallbladder cancer
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DOI: 10.1055/s-0036-1587772

Objective: To explore the clinical value and characterististics of contrast-enhanced ultrasound (CEUS) in diagnosis of gallbladder carcinoma. Materials and methods: 384 patients with benign and malignant gallbladder disease were examined by CEUS. The characteristics of CEUS were analyzed and compared with pathological examination. All the fundamental ultrasound examinations were performed by the Siemens Sequoia Acuson512 or Philips IU22, which were matched with contrast pulse sequence (CPS) imaging technique. Results: (1) The CEUS patterns of Gallbladder carcinomas showed quick and heterogeneous hyper-enhancement at the early arterial phases. The CEUS shape of the gallbladder carcinomas were irregular. The wall of gallbladder was irregular thick and interrupted by the mass. The basement of lesions were wide and connected with the gallbladder wall. Almost all the gallbladder carcinoma masses showed washout from hyper-enhancement to hypo-enhancement quickly after contrast agent administration. The CEUS patterns of Gallbladder benign uplift venereal change lesions showed quick and homogeneous hyper-enhancement at the early arterial phases. The CEUS appearances of Gallbladder benign uplift venereal change lesions were regular. The wall of gallbladder was succession, without intermittent phenomenon. The basement of lesions were narrow or no basal department. Almost the Gallbladder benign uplift venereal change lesions showed washout from hyper-enhancement to hypo-enhancement slowly after contrast agent administration. The biliary mud without enhanced. (2) It was significant different between benign and malignant gallbladder diseases of CEUS characterstics (P < 0.05). (3) Compared with pathological examination, the sensitivity, specificity and accuracy of CEUS in gallbladder carcinomas diagnosis was 96.6% (28/29), 99.4% (353/355), 99.2% (381/384) respectively. Conclusions: CEUS has an important clinical value in diagnosis of gallbladder carcinoma. Keywords: Contrast-enhanced ultrasound, Gallbladder carcinoma, Differentiating diagnosis.

SL13-4 Evaluation of adipose tissue distribution by ultrasonography and it’s relationship to metabolic disturbances in obese patients
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DOI: 10.1055/s-0036-1587773

Purpose: The aim of the study is to find out the relation between ultrasonographic measurements of abdominal adipose tissue and metabolic syndrome in obese patients. Material and methods: 52 obese patients (31 women, 21 men) were recruited in prospective study. Mean age 42.6(yrs), mean BMI – 47.7 kg/m². Height (H), weight (W), waist (WC) and hip (HC) circumferences, body mass index (BMI), waist to hip ratio (WHR), systolic (SBP) and diastolic (DBP) blood pressures, and fasting plasma glucose of all participants were recorded. Subcutaneous (SAT) and visceral (VAT) adipose tissue thickness was assessed by ultrasonography. Results: VAT thickness was different between men and women (7.85 cm vs. 12.37 cm, p < 0.001). In the patients with metabolic syndrome visceral fat thickness was higher compared with metabolically healthy individuals (6.69 cm vs. 10.12 cm, p = 0.04). There was very strong correlation between WC and VAT (r = 0.93) in the group of patients without metabolic syndrome. In the metabolic syndrome group there was a positive association between W (r = 0.39), BMI (r = 0.38), WC (r = 0.44), HC (r = 0.56) and SAT thickness; VAT correlated with W (r = 0.66), BMI (r = 0.41), WC (r = 0.63), WHR (r = 0.54), SBP (r = 0.33), DBP (r = 0.34) and fasting plasma glucose (r = 0.64). Conclusion: SAT and VAT thickness is related with metabolic diseases in obese patients. The ultrasonography may potentially provide an additional data for the assessment of adipose tissue, especially visceral and their influence on metabolic syndrome.
SL13-5

Duplex abdominal examination in portal vein obstruction: how much can we rely on?  
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DOI: 10.1055/s-0036-1587774

Purpose: Assessment of ultrasound imaging diagnostic particularities related to a group of patients with portal vein obstruction of various etiologies. Patients and methods: From January to December 2015, 26 patients, 17 men (65.38%) and 9 women (34.61%) aged of 60.12 ± 11.82 years, hospitalized in an Internal Medicine Clinic, met the criteria for portal vein obstruction. They underwent clinical examination, lab works up, upper and lower digestive endoscopy, abdominal duplex ultrasound (General Electric, Logiq S7, high resolution ultrasound machine, 3.5–5MHz, convex array probe), thoracic and abdominal CT or MRI exams. Results: 23 patients (88.46%) were diagnosed with portal vein thrombosis (PVT) and 3 patients (11.53%) with portal caval stenosis. The imaging diagnostic sensitivity, specificity, and accuracy of PVT is 73.07%, 100%, and 88.46%, respectively. Ultrasound finding in portal vein obstruction: (1) Doppler signal, no spectral pulsatility and partial in 4 cases (15.38%). 17 cases (69.57%), A-V collateral circulation, 5 liver metastases (19.23%), 2 pancreatic cancers (7.69). 12 patients (46.15%) had portal vein obstruction. In 11 cases (42.3%), the portal vein diameter was measured to 6.5 ± 17.9 years. Patients and methods: From January to December 2015, 26 patients were enrolled. Results: 23 patients (88.46%) were diagnosed with portal vein thrombosis (PVT) and 3 patients (11.53%) with portal caval stenosis. The imaging diagnostic sensitivity, specificity, and accuracy of PVT is 73.07%, 100%, and 88.46%, respectively. Ultrasound finding in portal vein obstruction: (1) Doppler signal, no spectral pulsatility and partial in 4 cases (15.38%). 17 cases (69.57%), A-V collateral circulation, 5 liver metastases (19.23%), 2 pancreatic cancers (7.69%). 12 patients (46.15%) had portal vein obstruction. In 11 cases (42.3%), the portal vein diameter was measured to 6.5 ± 17.9 years.

SL13-6

Value of ultrasonography in the diagnosis of inguinal hernia – a retrospective study  
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DOI: 10.1055/s-0036-1587775

Purpose: Diagnostic imaging of inguinal hernia has a high priority. Nevertheless, the ultrasound is not listed in the most recent guidelines of the European Hernia Society as a routine procedure. Aim of the study was to investigate in a retrospective cohort the importance of ultrasound diagnostic of hernias. Materials & Methods: Ultrasound findings, patient data and surgical reports of patients with sonographic documentation of inguinal hernia from April 2006 to March 2016 were collected and analyzed. Results: In the period 2006–2016 hernias were diagnosed in 321 patients, 82.6% were male. The average age of patients with a positive result was 56.5 ± 17.9 years. Conclusions: Ultrasonography has a high status in the routine diagnosis of inguinal hernia. The high value of sonography with little false-positive results will be presented.

SL14-2

Is CEUS a tool in a beginner’s hand? How much can a CAD prototype and a pseudocoloring pattern help in characterizing the malignancy of FLLs?  
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DOI: 10.1055/s-0036-1587776

Background and aim: CEUS improved the characterization of focal liver lesions (FLLs), but is an operator-dependent method. The goal of this paper was to test a computer assisted diagnosis (CAD) prototype and to see its benefit in assisting a beginner in evaluation of FLLs. Material and method: 97 good quality CEUS videos [34% hepatocellular carcinomas (HCC), 12.3% hypervascular metastases (HiperM), 11.3% hypovascular metastases (Hipom), 24.7% hemangiomas (HMG), 17.5% focal nodular hyperplasia (FNH)] were used to develop a CAD prototype based on an algorithm that tested a binary decision based classifier and a pseudocoloring technique that improved the wash-in/wash-out pattern. Two young MDs (1 year CEUS experience), two experts and the CAD prototype, reevaluated 50 FLLs CEUS videos (diagnosis of benign vs. malignant), in order to evaluate the diagnostic gap between vs. expert, first blinded to clinical data. Results: I-Beginner misdiagnosed 4/10-FNH, 3/10-HCC, 2/10-HMG, 1/10-HiperM, 1/10-HipoM. After knowing the clinical data 2/10-FNH, 1/10-HCC were misdiagnosed. II-Beginner misdiagnosed: 3/10-FNH, 3/10-HCC, 2/10-HMG, 1/10-HiperM. Unblinded: only 1/10-FNH, 1/10-HCC, 1/10-HMG misdiagnosed. Unblinded, all lesions were correctly diagnosed. II-Expert: 1/10-FNH, 1/10-HCC, misdiagnosed. Unblinded, only 1/10-FNH was misdiagnosed. The CAD classifier managed a 75.2% overall correct classification rate. The overall classification rates for the evaluators, before and after clinical data were: I-beginner-78%; 94%, II-82%; 96% expert-94%; 100%. II-96%; 98%. Conclusions: The CAD prototype can assist a beginner operator for a better CEUS diagnostic accuracy. The integration of clinical data in the CAD algorithm may be also beneficial.

SL14-3

Quantitative analysis of the uptake from ultrasound contrast agents (CEUS) in hyperechoic splenic lesions  
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Purpose: Focal splenic lesions are rare. They are divided in the fundamental ultrasound among others by their echogenicity. Differentiation according to their dignity is often difficult. Histological confirmation is usually not due to the supposedly benign etiology. The purpose of this study was the evaluation of contrast enhanced ultrasound (CEUS) characteristics from hyperechoic splenic lesions using quantitative measurement methods. Material and methods: In the retrospective, clinical-sonographic study n = 51 hyperechoic splenic lesions (26 female, 25 men) could be included. The contrast enhancement of the lesions was quantitatively analyzed in 7 time slots. The dignity of the lesions was performed in n = 14 patients (27.5%) by a histopathologic diagnosis and in n = 37 (72.5%) patients by imaging follow-up investigations with measurement of the lesions size. Results: Both benign and malignant splenic lesions showed in the CEUS in the average a hypoechoic enhancement. In malignant splenic lesions, however, there was a significantly lower uptake of the contrast agent (p = 0.001) compared to benign splenic lesions. (figure 1). If the hyperechoic lesions showed an isoechoic or a hyperechoic enhancement pattern in one or more time slots, this was highly significant for a benign lesion (p = 0.0004). Additional the male sex, an inhomogeneous echo texture in the fundamental ultrasound and a malignancy of an other region were significantly correlated with a malignancy of FLL. Conclusions: Malignant lesions are described in 97 good quality CEUS videos [34% hepatocellular carcinomas (HCC), 12.3% hypervascular metastases (HiperM), 11.3% hypovascular metastases (Hipom), 24.7% hemangiomas (HMG), 17.5% focal nodular hyperplasia (FNH)] were used to develop a CAD prototype based on an algorithm that tested a binary decision based classifier and a pseudocoloring technique that improved the wash-in/wash-out pattern. Two young MDs (1 year CEUS experience), two experts and the CAD prototype, reevaluated 50 FLLs CEUS videos (diagnosis of benign vs. malignant), in order to evaluate the diagnostic gap between vs. expert, first blinded to clinical data. Results: I-Beginner misdiagnosed 4/10-FNH, 3/10-HCC, 2/10-HMG, 1/10-HiperM, 1/10-HipoM. After knowing the clinical data 2/10-FNH, 1/10-HCC were misdiagnosed. II-Beginner misdiagnosed: 3/10-FNH, 3/10-HCC, 2/10-HMG, 1/10-HiperM. Unblinded: only 1/10-FNH, 1/10-HCC, 1/10-HMG misdiagnosed. Unblinded, all lesions were correctly diagnosed. II-Expert: 1/10-FNH, 1/10-HCC, misdiagnosed. Unblinded, only 1/10-FNH was misdiagnosed. The CAD classifier managed a 75.2% overall correct classification rate. The overall classification rates for the evaluators, before and after clinical data were: I-beginner-78%; 94%, II-82%; 96% expert-94%; 100%. II-96%; 98%. Conclusions: The CAD prototype can assist a beginner operator for a better CEUS diagnostic accuracy. The integration of clinical data in the CAD algorithm may be also beneficial.
Real-time grey scale contrast-enhanced ultrasonography in diagnosis of gallbladder cancer

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Purpose: To explore the clinical value and characteristics of contrast-enhanced ultrasound (CEUS) in diagnosis of gallbladder carcinoma. Materials and methods: 384 patients with benign and malignant gallbladder disease were examined by CEUS and the characteristics were compared with pathological examination. All the fundamental ultrasound examinations were performed by the Siemens Sequoia Acuson512 or Philips IU22. The frequency used in the mode of gray-scale US was 7 to 12 MHz, with 4 to 8 MHz in the modes of CEUS, respectively. The contrast agent was SonoVue. The process of CEUS was divided into three phases, arterial phases (after injection to 10 s), portal phases (35 s to 120 s), parenchymal phases (120 s to 360 s). Results: (1) The CEUS patterns of gallbladder carcinomas showed quick and heterogeneous hyper-enhancement at the early arterial phases. The CEUS shape of the gallbladder carcinomas were irregular. The wall of gallbladder was irregular thicken and interrupted by the mass. The basal area of lesions were wide and connected with the gallbladder wall. Almost all the gallbladder carcinomas showed washout from hyper-enhancement to hypo-enhancement quickly after contrast agent administration. The CEUS patterns of Gallbladder benign uplift venereal change lesions showed quick and homogeneous hyper-enhancement at the early arterial phases. The CEUS appearances of gallbladder benign uplift venereal change lesions were regular. The wall of gallbladder was succession, without intermittent phenomenon. The basal area of lesions were narrow or no basal department. Almost the gallbladder benign uplift venereal change lesions showed washout from hyper-enhancement to hypo-enhancement slowly after contrast agent administration. The biliary mud without enhanced. (2) It was significant different between benign and malignant gallbladder diseases of CEUS characteristics (P < 0.05). (3) Compared with pathological examination, the sensitivity, specificity and accuracy of CEUS in gallbladder carcinomas diagnosis was 96.6% (28/29), 99.4% (353/355), 99.2% (381/384) respectively. Conclusions: CEUS has an important clinical value in diagnosis of gallbladder carcinoma.

Characteristics of breast neoplasms on contrast-enhanced ultrasonography and its clinical value

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Purpose: To investigate the characteristics of breast neoplasms on contrast-enhanced ultrasonography (CEUS) and its clinical value. Materials and methods: 225 female patients with breast masses unable to be diagnosed by conventional ultrasonography were examined with CEUS and compared with the results of pathology examination. Ages range were 12 to 85 years (mean age, 45.8 ± 17.6). The process of CEUS was divided into three phases, early (after injection to 1 min), medium-term (1 to 4 min) and late (4 to 6 min). The characteristics of breast neoplasms on CEUS imaging were investigated from 8 aspects, including lesions shapes, boundary of the enhanced lesions, etc. Results: 91 cases were malignant and 134 cases were benign. The 91 malignancies displayed: irregular shapes were 80.2% (73/91), tortuous, massive or penetrating vessels were 86.8% (79/91), heterogeneous distribution of contrast enhancement were 83.5% (76/91), perfusion defect of contrast signals were 89.0% (81/91), local retention of contrast signals were 93.4% (85/91), rapidly entering and exporting from the lesions were 65.9% (60/91). Significant differences of above CEUS characteristics were found between the benign and malignant breast lesions (P < 0.05). The two most important features were perfusion defects and local retention of the contrast signals, with the sensitivity and specificity attained to 83.0% and 91.8%, and 91.4% and 92.5%, respectively. Poorly defined boundaries of the 91 malignancies were 64.8% (59/91), and the specificity was 47.8%. The malignant cases had enlarged maximum diameter on CEUS compared to pre-contrast (P < 0.05). Conclusion: The typical features of breast cancers on CEUS were irregular shapes, tortuous, massive or penetrating vessels, heterogeneous distribution of contrast enhancement, with perfusion defect or local retention of contrast signals, rapidly entering and exporting from the lesions, enlarged maximum diameter of the lesions on CEUS compared to pre-contrast. It is valuable for CEUS in the diagnosis and differential diagnosis of breast neoplasms clinically.

The importance of isolated muscular ventricular septal defect (VSD) – diagnosed in the second trimester – for pregnancy and delivery

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Purpose: The aim was to evaluate the prevalence of isolated muscular ventricular septal defects, the association with chromosomal anomalies, the rate of spontaneous closure and the importance of the delivery procedure. Material and methods: From January 2001 – December 2012 we carried out 23,500 fetal echocardiograms in the second trimester. Prevalence of VSDs were analyzed, furthermore the spontaneous closure rate, the rate of chromosomal anomalies. The frequency of caesarian section, natural delivery, forceps- and vacuum extraction delivery, pre-term delivery and perinatal acidosis and other perinatal complications was compared to data from Thuringian-Perinatal-Statistic at the same time. Also we investigated the association between higher maternal age, obesity and isolated muscular VSD. Results: 1060 congenital heart defects (CHD) were diagnosed, among 480 VSDs, in some cases with additionally intra- and extracardiac anomalies. After exclusion from these cases with additionally anomalies, we found 236 isolated VSDs, among them 185 were muscular and 51 perimembranous. One chromosomal anomaly was detected – a Klinfelder-syndrom, no case with a trisomy. In approximately 80% the isolated muscular VSD closed spontaneously until the end of the first year of life. The pregnant women with a fetus with isolated muscular VSD were older as all pregnant women in our office, but the obesity-rate was similar. The percentage of spontaneous delivery was similar too compared with all births in Thuringia at the same time, the rate of caesarian section was higher. Also no different rates were found concerning preterm-birth and acidosis peripartual. Conclusion: The most prevalent prenatal CHD is the VSD. The isolated muscular VSD had a similar risk of chromosomal anomalies like those of normal pregnancies. The prognosis is good concerning delivery, spontaneous closure and healthy life.
Thoracoamniotic shunting for fetal hydrothorax – Predictors of intrauterine course and postnatal outcome

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Purpose: To assess predictors for survival and complications among a relatively large cohort of fetuses with hydrothorax treated by thoracoamniotic shunting.

Material and methods: All cases with a prenatal diagnosis of hydrothorax detected in a 10-year period (2002 – 2011) in two tertiary referral centers were reviewed retrospectively for intrauterine course and outcome following thoracoamniotic shunting. Results: A total of 78 fetuses with hydrothorax treated with thoracoamniotic shunting were included in the study. Mean gestational age at diagnosis was 25.6 weeks (range, 12 – 34 weeks). In 31 (40%) fetuses additional anomalies were found, 13 of them had trisomy 21. Initial thoracoamniotic shunting was performed at a mean gestational age of 26.5 weeks (range, 16 – 33 weeks). A mean of 2.53 shunts (range, 1 – 7) were inserted per fetus. Of the 78 fetuses, 9 (11.5%) died in utero, 69 (88.5%) were born alive and 46 (59%) survived. Prognostic markers significantly associated with non-survival were polyhydramnios, hydrops placentae and mediastinal shift at initial scan, onset of hydrops or lung hypoplasia after first shunt placement, rupture of membranes, a shunt-birth interval < 4 weeks and low gestational age at birth. In our cohort, fetuses with trisomy 21 had a significantly better survival than euploid fetuses. They were diagnosed and treated significantly later in pregnancy, the shunt-birth interval was shorter and the number of interventions was lower than in euploid fetuses. Conclusions: Although associated with a significant rate of repeated interventions, thoracoamniotic shunting in fetuses with severe hydrothorax might be beneficial and results in an overall survival rate of 59% despite a procedure-related risk of fetal demise of 2/78 (2.5%) cases. Fetuses with hydrothorax and trisomy 21 have a better survival when compared to euploid fetuses.

First trimester intervention in twin reversed arterial perfusion (TRAP) sequence – does size matter?

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Objective: To evaluate the outcome of first trimester intervention (12th to 13th weeks of gestation) in pregnancies complicated by TRAP sequence. Methods: From 2010 onwards, all patients diagnosed with monochorionic diamniotic TRAP sequence undergoing intrafetal laser ablation (IFL) prior to 14th weeks of gestation at the University of Bonn were retrospectively analysed for intrauterine course and pregnancy outcome. Results: In the study period twelve patients were treated by IFL. The mean gestational age at intervention was 13.1 ± 0.5 weeks (range 12.6 – 13.8). In all cases one intervention sufficed to disrupt the perfusion of the TRAP twin. No case of abortion, preterm premature rupture of membranes (PPROM) or haemorrhage occurred. In five pregnancies (41.7%) daily follow up scans demonstrated intrauterine death of the pump twin at a mean of 67.2 ± 20.0 hours (range 48 – 96) after intervention. The remaining 7 pregnancies continued uneventfully with birth of a healthy infant at term. A comparison of survivors and non-survivors identified a significant difference in the median discordance between the crown-rump length (CRL) of the pump twin and the upper pole-rump length (URL) of the TRAP twin (0.56 vs. 0.36; p < 0.05). A CRL/URL ratio > 0.48 identified all 7 survivors (p < 0.05). All other assessed parameters were not significantly different. Conclusion: Although technically feasible, IFL in TRAP sequence performed in the first trimester has a significant fetal loss rate. A large TRAP twins size and a small pump twins size seems to be associated with an unfavourable outcome of IFL.

Changes in prenatal care after the introduction of insurance coverage for noninvasive prenatal testing (NIPT) in Switzerland

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Purpose: Prenatal care has been significantly influenced by the introduction of noninvasive prenatal testing (NIPT) for aneuploidies in 2012. In Switzerland starting from July 2015 the national insurance companies cover NIPT as a second line screening for women who are at an intermediate or high risk after first trimester screening (FTS). The aim of this study was to describe the changes in prenatal testing after the integration of NIPT into national health care plans. Material and methods: Retrospective analysis including all women with singleton pregnancies who presented for FTS between July 2014 and December 2015 (n = 887). After FTS the women who categorized into three risk categories for aneuploidy: low risk (<1:1000), intermediate risk (1:1000 – 1:100) and high risk (>1:100). We assessed the decision on prenatal testing according to risk category. The year before, and 6 months after the introduction of insurance coverage were evaluated. Results: 573 FTS were carried out before the introduction of insurance coverage for NIPT (group 1) and 314 after (group 2). In group 1, 9% had NIPT as compared to 22.9% in group 2. In group 2 52.3% of the high risk patients, 72.4% of women with an intermediate risk and 8.0% of the low risk patients had NIPT. The number of invasive procedures decreased by 5.7%. In group 2 81.8% of the women with a high risk who chose NIPT had a normal ultrasound exam. Conclusions: We observed a notable increase of NIPT and a further decrease of invasive procedures after the introduction of insurance coverage for NIPT. The greatest increase was within the intermediate risk category. Invasive procedures now are mostly chosen in the presence of abnormal ultrasound findings.

An optimized approach for early detection of orofacial clefting – recent data on validity of maxillary gap vs. retronasal triangle view

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To elaborate the validity and reproducibility of recent markers of orofacial clefting assessed in early pregnancy. This was a retrospective study reviewing stored 3D volume data sets of first and early second trimester fetuses with suspected or proven genetic and structural abnormalities (n = 135; 73 viable vs. 62 non-viable fetuses). Following volume adjustment, visualization and arrangement of craniofacial anatomy were examined in terms of feasibility of reconstruction of the retronasal triangle view (RNTV) in the coronal plane, and concomitantly assessment of the maxillary ridge in the corresponding midsagittal view, in order to rule out the presence of orofacial clefts. A total of 121/135 volumes were eligible for final analysis. Mean gestational age was 13+3 weeks for viable and 11+3 for non-viable fetuses (range 8+6 to 17+6 weeks). There was no difference in maternal characteristics in both groups. In 79/121 cases (65%) fetal karyotyping was prompted, showing abnormal chromosomes in 43 cases (38 viable vs. 5 non-viable; p < 0.001). Focusing on abnormal maxilla-mandible complex we found irregular RNTV in 38 cases (24/14; p < 0.05), out of which 22 were suspected of orofacial clefting (11/11). In these cases only 12 had an interrupted maxillary echo. In contrast, none of the additional 20 cases (13/7) with maxillary gap had an abnormal RNTV in the coronal plane. A markedly shortened maxilla was noticed in another 8 cases without derangement of RNTV. Of 19 fetuses (13/6) presenting an absent mandibular gap (highly suspicious of micrognathia) six (4/2) also had a maxillary gap. 3D multiplanar assessment of abnormal fetuses allows to assess craniofacial integrity by combining image information obtained from coronal (RNTV) and sagittal (longitudinal maxilla) planes both essential for prenatal work-up for the presence of orofacial clefting. While RNTV seems to be the more reliable marker, adjunctive assessment of the maxilla might be of additional value.
Comparison of HD-live 3D and 2D imaging of the fetal face and its social-psychological impact on maternal/paternal-fetal relationship building

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Purpose: Medical research has a long tradition in analyzing the value of HD-live/3D-imaging of the fetal face (FF) that provides fundamental information allowing the diagnosis of several fetal diseases. Although ultrasonic images are not only used in medical examinations, but become an integral part of the expectant parents’ social life, few researchers have focused on their social-psychological dimensions. We therefore conducted a comparative study analyzing the expecting parents’ perception, understanding and utilization of HD-live/3D versus 2D-imaging.

Methods: A randomized longitudinal study of 29 nulliparous pregnant women and 15 of their partners (20–35 years) was separated into two groups: G1, G2, performed at the prenatal-diagnosis center Erfurt, in cooperation with the department of communication science, University of Erfurt. At first-trimester screening (T1), G1-participants received 2D-FF images, while G2-participants received HD-live/3D-FF images. After image-reception, participants underwent standardized and qualitative in-depth interviews at T1 and were questioned again 12–14 days later together with their partner (T2). Interviews were recorded, dimensioned analyzed and inductively refined. Results: G1 consisted of 15 women and 6 of their partners; G2 of 14 women and 9 partners. Participants of both groups reported FF-imaging to be as visual evidence, nurturing subjective feelings of security, supporting further integrative social and socio-psychological functions (e.g. family function), reinforcement of mother/father-relationship-building). Especially shared, encouraged communication and strengthened social interactions. While G1-participants primarily saw 2D imaging as “social-technical” visual representation, similar to radiological imaging, G2-participants reported earlier and closer emotional bonding to the fetus, what especially helped fathers to put themselves in the position of ‘being a father.’

Conclusions: HD-live imaging rather than 2D-FF images are socially shared, encouraged communication and strengthened social interactions. While G1-participants primarily saw 2D imaging as ‘technical’ visual representation, similar to radiological imaging, G2-participants reported earlier and closer emotional bonding to the fetus, what especially helped fathers to put themselves in the position of ‘being a father.’

Background: It has been observed, that the caudal Axilla on the border to pectoralis muscle is predictive for the sentinel node and the sonography of lymph nodes has been the subject of multiple publications, usually dealing with malignant Melanoma. In the context of Sentinel lymph node biopsy (SLNB) in breast cancer patients, the following study examines the feasibility of the sonographic differentiation of the Sentinel lymph node (SLN) from neighboring non-SLNs and whether Axillary Ultrasound (AUS) is a useful addition or alternative to current methods of “lymphatic mapping”.

Methods: During a prospective study performed from HD-live/3D 09/2005 onwards 404 breast cancer patients (Tis-T4), the SLNB was performed using Patent blue+/− 99Tc-Nanocoll. In parable to reported earlier and closer emotional bonding to the fetus, what especially shared, encouraged communication and strengthened social interactions, we therefore conducted a comparative study analyzing the expecting parents’ perception, understanding and utilization of HD-live/3D versus 2D-imaging.

Results: The final diagnoses were: 9 primary breast cancer, 113 gynecomastia, 7 lipoma, 6 chronic mastitis, 1 fibroadenoma. Of 136 cases, 118 lesions (86.8%) were classified as BI-RADS category 2, 5 lesions (3.7%) were classified as BI-RADS category 3, 13 lesions (9.6%) were classified as BI-RADS 4 or BI-RADS 5. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy for detection of malignant breast masses of BI-RADS ultrasound were 100%, 96.9%, 69.2%, 100%, 90.4% respectively. On sonography, eight of 9 cancers were solid and hypoechogenic, one was complex mass with mixed solid and cystic components. The shape of the malignant masses was irregular (n = 8) or oval (n = 1). The margins were well-defined in 1, spiculated in 3, microlobulated in 5 of the malignant masses. Color Doppler flow imaging (CDFI) revealed hypervasularity in 5 masses, moderate vascularity in one mass, mild vascularity in 2 masses. All the malignant masses were corresponded to BI-RADS category 4 or 5. The presence of abnormal axillary lymph nodes was noted in five cases by sonography. The five patients had axillary lymph node involvement by final pathology. The distribution of the sonographic patterns of gynecomastia were 28 nodular (28/113, 24.8%), 30 diffuse (30/113, 26.5%), 55 diffuse glandular (55/113, 48.7%).

Conclusions: Male breast has a wide spectrum of diseases. Ultrasonography is useful for differentiating male breast cancer from benign diseases.

MR-navigated ultrasound with supine breast MRI for suspicious enhancing lesions not identified on second-look ultrasound in breast cancer patients

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Purpose: This study evaluated the usefulness of MR-navigated US for evaluation of MRI-detected lesions not visible on second-look US and analyzed differences of the lesion to nipple distance between supine and prone position. Methods: Of the 831 consecutive patients who were diagnosed as breast cancer and examined with breast MRI from June 2013 to September 2015, we included 40 lesions in 37 patients who underwent MR-navigated US for MRI-detected lesions which were not visible on second-look US. First MRI was performed prone in one mass using a 1.5-T imager and second MR was performed in a supine position for MR-navigated US. Results: Of 40 lesions, 31 (78%) were identified with MR-navigated US, whereas 5 (13%) lesions disappeared on supine MRI and 4 (10%) showed no correlation on MR-navigated US. Of 31 lesions with pathologic confirmation, 7 (23%) were malignant, 2 (6%) were high risk lesions and 22 (71%) were benign lesions. Comparing the US findings of benign and malignant lesions, orientation of the lesion showed significant difference (p = 0.045), whereas lesion shape, margin and echo pattern were not significantly different between two groups (p = 0.088, p = 0.094 and p = 0.412, respectively). Median difference of lesion to nipple distance on supine and prone MRI was 8 mm (0–34 mm) in horizontal direction and 5 mm (0–39.5 mm) in vertical direction. Thirteen lesions showed more than 1 cm difference in both horizontal and vertical direction. Conclusion: MR-navigated US is useful for the evaluation of MRI-detected lesions which were not visible on second-look US in breast cancer patients.
The problematic of early diagnosis of breast cancer for young women, the retrospective study Stobodněková Z1

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Introduction: Breast cancer is the most common malignancy of the female population. Recently, however, we meet more often with the occurrence of breast cancer in women between 30 and 40 year. For women this age range is not preventive screening mammography, sonography and only clinical examination-examination by touch. Material and methods: In the period from 1.5. 2005 to 31.12. 2015 we performed mammographic and sonographic examinations/more than 56,000 mammograms, while more than 120,000 sonographic examination. Preventive examination completed asymptomatic women without clinical findings. Young women and girls were examined by sonography, next if necessary mammographically too. During the monitored period, we diagnosed 328 new cases of breast cancer. In a retrospective study, we worked with a set of 328 patients. All cases are histologically verified. The age distribution of patients with newly diagnosed cancer we transparently stored in tables and graphs. We focused on women in the age group to 45year old, we analyzed the different findings, especially with respect to the possibility of diagnosing palpable, clinically and clinically only.

Results: The patients presented were finally correctly diagnosed, treated with a relatively good prognosis. Their diagnosis, however, could be faster and smaller tumors. However, despite the fact that Slovakia has enacted preventive investigation of breast young women from the 20 to 40th of clinically and sonographically, encountered in practice, often with cases of breast cancer diagnosed late. Conclusion: Case report we highlight the diversity of clinical symptoms and the possibility of imaging diagnostic techniques in the diagnosis of breast disease of young women. We also want to draw attention to some underestimation of clinical symptoms, while revaluation results of sonographic examination. An important factor is the quality of the ultrasound device and effective consultation and cooperation with other diagnostic departments.

Lung ultrasound in the evaluation of interstitial lung diseases

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Objectives: Patients with a diagnosed systemic connective tissue disease require regular monitoring from the point of view of interstitial lung disease. The main aim of this work is a description of the criteria for pulmonary fibrosis and the degree of the severity of the fibrosis during the course of interstitial lung disease through the LUS (lung ultrasonography).

Materials and Methods: 52 patients with diagnosed diffuse interstitial lung disease were qualified for this research, together with 50 volunteers in the control group. The patients in both groups were over 18 years of age and were of both sexes. The results of the TLU of the patients underwent statistical analysis and were compared to High-Resolution Computed Tomography (HRCT) results. Results: As a consequence of the statistical analysis, we defined our own criteria for pulmonary fibrosis in TLU: irregularity of the pleura line, thickening of the pleura line, the fragmentary nature of the pleura line, blurring of the pleura line, thickening of the pleura line, artifacts of line 8 ± 3 and ≥ 4, artifacts of Am line and subpleural consolidations ≤ 5 mm. As a result of the conducted research, a scale of severity of the fibrosis was devised (UL – Ultrasound Fibrosis Index), enabling a division to be made into mild, moderate and severe cases. Conclusion: Transthoracic Lung Ultrasonography (TLU) gives a new outlook on the diagnostic possibilities, non-invasive and devoid of ionizing radiation, of pulmonary fibrosis. This research work has allowed to discover two new ultrasound symptoms of pulmonary fibrosis (blurred pleural line and Am lines).

Percutaneous ultrasound-guided fine needle aspiration cytology of pulmonary lesions: a single centre experience

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Purpose: Imaging-guided percutaneous fine needle aspiration biopsy (FNAB) is routinely used for the diagnosis of pulmonary lesions. Computed tomography (CT) is the most common imaging modality used for guidance followed by ultrasound (US). To date there are few data about the use of this technique for the characterization of pulmonary lesions and above all about percutaneous US-guided fine needle aspiration cytology (FNAC). This is considered a reliable method for the diagnosis of malignant lesions despite it has some limitations, such as inadequate sampling and a limited value in the differentiation between benign and well-differentiated malignant lesions. The purpose of this study is to determine the safety and the accuracy of percutaneous ultrasound-guided FNAC of pulmonary lesions. Materials and methods: We retrospectively collected 164 percutaneous ultrasound-guided FNAC images, consecutively performed from 2010 to 2015 in our centre, namely 2010 = 21 (7.4%), 2011 = 15 (5.8%), 2012 = 30 (13.0%), 2013 = 24 (12.7%), 2014 = 37 (16.1%), 2015 = 37 (17.2%). Aspirations were performed with 22-G spinal needle. Results: Tumour malignant cells were found in 107 cases of FNAC performed with ultrasound guidance (Tab 1)

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In detail, in 2015 of 27 positive cases 11 aspirations were diagnostic for non-small-cell lung carcinoma (NSCLC), in particular 7 adenocarcinoma and 4 squamous cell, and 1 for small-cell lung carcinoma (SCLC). In none of these cases relevant complications occurred. Conclusion: Percutaneous ultrasound-guided FNAC for pulmonary lesions is a safe technique which allows to visualize images in real-time for an accurate device placement. It also provides a specific diagnosis in most of the patients with pulmonary lesions.

Prenatal Ultrasound – Clinical Investigations

Outcome of fetuses with bronchopulmonary sequestration after intrafetal vascular laser ablation

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Purpose: To assess the outcome of fetuses with bronchopulmonary sequestration (BPS) with severe pleural effusions after intrafetal vascular laser ablation (VLA). Methods: All fetuses with BPS and severe pleural effusions, that were treated with intrafetal VLA in a 5-year period, were reviewed retrospectively for clinical success rate of VLA, reliability of sonographic assessment of regression and prediction of postnatal need for sequestrectomy. Results: In the study period, a total of 10 fetuses with BPS and severe pleural effusions were treated with intrafetal laser ablation of the feeding vessel. 9 fetuses had left-sided and 1 fetus had right-sided BPS. All had significant mediastinal shift and polyhydramnios, but normal doppler flow parameters. Median age at time of intrafetal VLA was 31+5 weeks of gestation (24+0 – 33+5 weeks). In 7 fetuses, only one intrafetal VLA was performed, while in 3 fetuses a second intervention was necessary within 72 hours because of recurrent flow in the feeding vessel. Finally, in 9 of 10 fetuses the feeding vessel could be coagulated completely and the pleural effusions diminished. Preterm rupture of membranes with subsequent amniotic infection syndrome and delivery at 30 weeks occurred after unsuccessful VLA and...
pleural drainage. Postnatally, 4 fetuses required sequestrectomy because of partial sequestration. Sonographic evaluation of regression (partial or complete) prior to delivery was false in 3 of 10 fetuses. All neonates survived healthy. **Conclusion:** Intrafetal laser ablation of the feeding vessel is an effective and successful treatment of BPS with rare necessity for re-interventions and low risk for preterm rupture of membranes. But intrauterine sonographic assessment of regression and prediction of postnatal need for sequestrectomy is less reliable.

### SL17-2

**Quantified discordant placental echogenicity in twin-twin transfusion syndrome and anemia polycthemia sequence in correlation with peak systolic velocity middle cerebral artery Doppler values**

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**Purpose:** Discordant echogenicity and thickness between the donor and recipient placenta has been proposed as an additional sonographic sign of twin-twin transfusion syndrome (TTTS) and twin anemia polycthemia sequence (TAPS). Prenatal criteria of TAPS are increased (> 1.5 MoM) peak systolic velocity in the middle cerebral artery (MCA-PSV) in the donor twin and a decreased (< 1.0 MoM) MCA-PSV in the recipient. The aim of this study was to quantify the placental echogenicity discrepancy in TTTS and TAPS cases correlated with MCA-PSV Doppler findings in both twins. **Material and methods:** We retrospectively evaluated eight patients with TTTS and suspected anemia/polycthemia (n=6) or TAPS-alone (n=2) without or before fetoscopic laser treatment. All cases had difference in echogenicity of the placental part of the donor and recipient twin which were visible on the naked eye and shown on the same digital image. Prenatal placental echogenicity was quantified 40 times using an image processing program and the Doppler values of the MCA-PSV stored at the same examination were correlated to the placental brightness. The sonographic placental thickness was measured 42 times. **Results:** All patients fulfilled the prenatal TAPS criteria. The mean placental thickness was measured 40 times using an image processing program and the Doppler values of the MCA-PSV stored at the same examination were correlated to the placental thickness. The sonographic placental thickness was measured 42 times. The significant discrepancy of echogenicity between the donor and recipient group, 132.9 (STD 19.8) versus 52.7 (STD 19.1), respectively (p<0.0001). Furthermore, we found a positive correlation between placental echogenicity and MCA-PSV in the entire group (R=0.79, p<0.0001). Placental region belonging to the donor was significantly thicker compared to the recipient area (58 ± 14 mm versus 30 ± 13 mm, p<0.0001). **Conclusions:** The significant discrepancy of echogenicity between the placenta of the recipient and the donor correlates with the MCA-PSV, respectively. The prenatal quantification of sonographic placental brightness and thickness may help to investigate the severity of anemia/polycthemia in monochorionic twins.

### SL17-4

**Outcome in newborns with intervention < 48 hours postpartum in prenatally and postnatally diagnosed congenital heart disease**

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**DOI:** 10.1055/s-0036-1587795

**Purpose:** The aim of this retrospective analysis was to evaluate outcome in neonates requiring intervention within 48 hours postpartum in prenatally and postnatally diagnosed congenital heart disease (CHD). **Material and methods:** We evaluated 142 neonates who presented in our centre between 2005 and 05/2015 with surgery or catheter intervention within 48 hours postpartum and compared 30-day survival and perinatal outcome in patients with prenatally versus postnatally diagnosed CHD. **Results:** In a total of 135 of 142 neonates we had information about 12 fetuses postnatal diagnosis. 15 were lost for follow up within 30 days postpartum. In the group with prenatal diagnosis of CHD and intervention within 48h postpartum, the majority had hypoplastic left heart syndrome (HLH) (47.1%), in the group with postnatal diagnosis the majority had transposition of great arteries (d-TGA) (53.8%). 30-day-survival was 78.5% in the group with prenatal diagnosis versus 89.1% in the group with postnatal diagnosis without significant difference. Rate of caesarean section was significantly higher in patients with prenatal diagnosis than postnatal diagnosis (56.7% vs. 33.8%). Patients with postnatal diagnosis needed more often intubation before intervention (32.9% vs. 53.8%), mean umbilical arterial pH was significantly lower (7.29 vs. 7.33) and pre-intervention lactate showed tendency to higher levels than in patients with prenatal diagnosis (34.5 vs. 53.2 mg/dl). There was no difference in length of hospital stay between the prenatally and postnatally diagnosed groups (21.6 vs. 19.5 days). **Conclusion:** 30 days survival showed no difference between the two groups. Prenatal diagnosis seems to influence modus of delivery and pH, lactate levels and need for intubation postpartum. Long time follow up is necessary to evaluate differences in survival and outcomes.

### SL17-3

**Fetal loss following invasive prenatal testing: a comparison of transabdominal chorionic villus sampling, transascival chorionic villus sampling and amniocentesis**

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**Purpose:** The aim of this study was to compare transabdominal chorionic villus sampling, transascival chorionic villus sampling and amniocentesis with respect to their total fetal loss rates. **Material and methods:** We retrospectively evaluated procedures of invasive prenatal testing performed during a 14-year period (2001 – 2014) including 936 amnio-centesis procedures and 1051 chorionic villus samplings, of which 405 cases were executed transabdominally and 646 transascivally. Only singleton pregnancies before 24+0 weeks of gestation where the pregnancy outcome was known were included. Fetal loss was defined as an abortion occurring either before 24+0 weeks of gestation or less than 2 weeks after the procedure. **Results:** The total fetal loss rates were determined to be 1.73% for transabdominal chorionic villus sampling, 2.01% for transascival chorionic villus sampling and 1.18% for amniocentesis. No statistically noticeable differences between the total fetal loss rates of all three procedures were found (p=0.399). **Conclusions:** Our study has shown that chorionic villus sampling (either transabdominal or transascival) and amniocentesis are equal methods for invasive prenatal testing with respect to their abortion risk.

### SL17-5

**Bilateral nasal bone measurements in normal first trimester fetuses and fetuses with trisomy 21 by use of 3D ultrasound**

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**DOI:** 10.1055/s-0036-1587796

**Purpose:** Three-dimensional ultrasound with its different display modes allows an accurate demonstration of the ossified bones of the fetal face in the first trimester. In particular, the nasal bones can be evaluated on both sides and measured separately. The aim of this study was to establish the normal range for the left and right nasal bone and to demonstrate the development of the nasal bones in cases with trisomy 21 in the first trimester. **Material and methods:** In 200 normal fetuses and 12 fetuses with trisomy 21 the left and right nasal bone was measured in the multiplanar 3D mode after aligning the fetal head into an exact upright posi-
tion to get a true profile. All scans were performed using E8/E10 GE equipment (Zipl, Austria) with a 5 – 8 MHz 3D abdominal or a 5 – 9 MHz 3D vaginal transducer. Gestational age was between 10+3 and 14+0 weeks of gestation. Results: In the normal fetuses 151 cases had the same nasal bone length on both sides. In 43 cases a difference of up to 5 mm between the left and right nasal bone could be observed and in 3 cases even absence of the nasal bone on one side was found. In the 12 fetuses with trisomy 21, 3 cases showed bilateral hypoplasia of the nasal bones and 9 cases absence of nasal bones on both sides. Conclusions: Three-dimensional ultrasound is a useful tool in the evaluation of the nasal bones in the first trimester. Because 23% of the normal cases showed a difference between the left and right nasal bone length, it is important to measure the nasal bone length on both sides consequently.

Increased nuchal translucency at a crown rump length < 45 mm
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DOI: 10.1055/s-0036-1587797

Aim: Nuchal translucency (NT) measurement is established for risk evaluation of chromosomal abnormalities between a crown rump length (CRL) of 45 to 84 mm. According to the german regulations the first ultrasound screening takes place between 9th and 11th week of gestation. This result in cases with increased NT and CRL < 45 mm, where risk calculation is impossible. In this retrospective study we analysed the outcome of these cases. Methods: Between July 2010 and September 2015 we identified 24 pregnancies with a CRL from 35 to 45 mm and a NT above the 95th centile adjusted for a CRL equivalent of 45 mm. Measurement of CRL and NT was performed by four FMF London certified examiners. The outcome was evaluated by data base analysis and direct contact to the patient. Results: Median CRL was 43 mm (35.4 – 44.9 mm) with a median NT of 3.9 mm (2.5 – 6.6 mm). Median maternal age was 29 years (14 – 38 years). In 17 of 24 cases (71%) the pregnancy resulted in a delivery of a healthy child. In one of these cases a minor ventricular septal defect was found. In 6 cases postnatally an invasive procedure was performed for fetal karyotyping revealing six fetuses (25%) with chromosomal disorders resulting in the termination of pregnancy. In one case with normal karyotype further sonograms revealed a complex syndrome with hyoplastic cerebellum. In all cases without karyotyping outcome was normal at delivery. The NT in all cases with abnormal karyotype was ≥ 3.9 mm. Discussion: In cases with NT < 3.9 mm and CRL < 45 mm it is very likely, that a healthy child will be born. Lacking the possibility of risk calculation non-invasive prenatal testing (NIPT) may be the first choice for these pregnancies.

Gynaecological Ultrasound II – Clinical Investigations

SL18-1
Significance of the size of fetal anterolateral neck cysts in early gestation
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Purpose: To recognize the association between the size of fetal anterolateral neck cysts and nuchal translucency, chromosomal aberration and fetal malformations. Material and methods: We examined a consecutive collective of 51 fetuses with lateral neck cysts that presented between the 11 and 17 weeks of gestation in the years 2009 to 2016 in our department. The volume of the nuchal cysts was measured. We examined thereafter the statistical association between the cyst volumes, increased nuchal translucency, chromosomal aberrations and fetal anomalies. Results: 21 out of 11 fetuses showed lateral neck cysts, while 5 had a unilateral lateral 26 fetuses had a chromosomal aberration, 9 fetuses had structural malformations without genetic anomaly and 16 fetuses had a normal outcome. All cases with a normal nuchal translucency had a normal outcome (n = 11). 5 fetuses with an increased nuchal translucency in early gestation had a normal outcome. All fetuses with a chromosomal abnormality or structural malformations had an increased nuchal translucency (n = 35). The cyst volume significantly correlated with the outcome (normal cases 13.6 mm3, abnormal cases 136 mm3; p < 0.001), the nuchal translucency (105.5 mm3; p < 0.001), chromosomal aberration (97.6 mm3; p < 0.001) and fetal malformations (296 mm3; p < 0.001). A cyst volume of less than 2.4 mm3 was always associated with a favorable outcome regardless of the diameter of the nuchal translucency. Conclusion: In addition to the nuchal translucency in early gestation, in case of their presence, anterolateral nuchal cysts play a significant role in predicting the fetal outcome.

SL18-2
Longitudinal analysis of myocardial function and cerebral perfusion in fetuses with left heart defects
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DOI: 10.1055/s-0036-1587799

Purpose: Fetuses with left heart defects leading to reduced or retrograde perfusion of the aortic arch show decreased resistance in the cerebral arteries and reduced head growth. Aim of this study was to evaluate a linkage of these parameters alterations of fetal myocardial function. Methods: Longitudinal examination (20 – 26, 27 – 33 an 34 – 40 weeks of gestation) of fetuses with left heart defects (HLH, HLHC, critical aortic stenosis). Head circumference, umbilical artery and middle cerebral artery pulsatility index and the cerebro-placental ratio (CPR) were measured. Myocardial function was assessed by measuring mitral annular plane systolic excursion (MAPSE) and tricuspid annular plane systolic excursion (TAPSE) in M-Mode and isovolumetric contraction time (ICT), ejection time (ET) and isovolumetric relaxation time (IRT) in pulsed wave tissue Doppler imaging (PW-TDI). E’, A’, E’ and A’ wave peak velocity and the systolic downward motion (’S’) were measured, E’/A’ ratios and myocardial performance index (MPI) were calculated. Results: 75 fetuses with left heart defects with retrograde or antegrade arch flow were included. Fetuses with retrograde arch flow presented with a significant decrease in head growth between the second and third examination as well as a reduced CPR. Fetuses with antegrade flow in the aortic arch did not show these alterations. Parameters reflecting myocardial function did not change over pregnancy and did not differ between fetuses with antegrade or retrograde arch perfusion. Conclusion: Fetal myocardial function did not change over pregnancy and was independent of flow direction in the aortic arch in fetuses with left heart defects.

SL18-3
Methamphetamine abuse in pregnancy – Prenatal sonographic findings
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DOI: 10.1055/s-0036-1587800

Purpose: Drug abuse, particularly methamphetamine (METH) is very common in Saxony (Germany). Official reports show an increase since METH is cheap and easy available. It is a strong central nervous system stimulant, that is mainly used as a recreational drug and is associated with a high potential for abuse and dependence. The impact of prenatal METH exposure on pregnancy and development in childhood is unknown. Material and methods: At the University Hospital of Dresden pregnancy data and sonographic fetal findings from all METH consuming pregnant women between 2011 and 2015 were retrospectively analyzed. Results: The number of METH using pregnant women is continuously rising since 2011 and effects 1% of deliveries since 2013 at the University Hospital of Dresden. Between 2011 and 2015 105 METH using women were seen during pregnancy, 94 of them delivered in our hospital. Beside METH abuse 79% of women admitted nicotine and 30% Cannabis abuse. In 24% of cases pregnancy was detected late or without prenatal care. 32.9% were premature pregnancies, 26.6% small for gestational age (SGA) and 8.5% of cases intrauterine growth retardation. 4 cases were stillbirth. 38% of women received specialized DEGUM II ultrasonic differential screening. Sonographic abnormalities showed a broad spectrum: intracranial septal defects (VSD), complex heart defects, cleft lip and palate and sporadic kidney abnormalities. Congenital was the high rate of microcephaly (6.4%). Conclusion: METH use is an increasing problem in
Saxony and problems especially arise because of a higher rate of prematurity or SGA-pregnancies. Specific METH related fetal abnormalities were not detected. Association with a higher rate of microcephaly might be possible. Often women were seen late in pregnancy and ultrasonic differential screening was difficult to assess. More research needs to be done to evaluate the impact of METH abuse on intra- and postnatal development of children.

### Measurement and evaluation of fetal fat layer in the predication of Macrosomia in pregnancies complicated with gestational Diabetes

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**Purpose:** A current assessment of the gestational outcomes in pregnancies complicated by preterm premature rupture of membranes (preivable PPROM) (<24 weeks of gestation) and neonatal survival after expectant treatment. **Study design:** The perinatal data was collected for the last five years regarding patients with preivable PPROM, including the short-term neonatal outcomes. **Results:** 63 patients with 83 fetuses (46 singletons and 37 multiples) were hospitalized. A total of 37.5% (n=24) patients opted for termination of pregnancy (TOP), 19% (n=12) suffered a miscarriage, while 42.8% (n=27) proceeded to a live birth; including 18 singletons and 21 neonates from multiple pregnancies after an average latency period of 39 days (range 2-126 days). Of the life born infants 81.6% survived the perinatal period. The most common neonatal sequelae were respiratory distress, bronchopulmonary dysplasia, and connatal infection. The overall survival, not including elective termination but including miscarriages, was 56.3%.

### The use of pentaerythritol tetrานitrate (PETN), a nitric oxide donor, to improve utero- and fetal-placental perfusion pregnancies with established pathological flow pattern in the Aa. uteri nea between 20 weeks of gestation

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**Purpose:** The purpose of this study was to assess by Transient Elastography in non-alcoholic steatohepatitis (NASH) patients

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**Evaluation of liver fibrosis using Transient Elastography in non-alcoholic steatohepatitis (NASH) patients**

**Elastography in non-alcoholic steatohepatitis (NASH) patients**

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**Methods:** We conducted a prospective observational study at the Department of Obstetrics, University Hospitals – Campus Kiel, Germany in collaboration with diabetic clinic staff. The examinations were performed at 31, 34 and 37 week of gestation. The clinical outcomes of pregnancy and birth weight were collected from the obstetric record. All the women enrolled had an early pregnancy ultrasound scan previously to confirm gestational age. Participants underwent a third-trimester scan and an extra measurement fetal fat layer was added. **Results:** In total, 71 women were initially enrolled into the study. The mean age of the study population was 32.26 (SD 5.06) years with 60% primigravidas. In terms of prediction macrosomia with an ultrasound abnormality with birth weight >4000 g 37 babies with macrosomia were treated with insulin, and 7 women had a vaginal delivery. The measurement of fetal fat layer with a cutoff 0.5 cm at the 37 weeks of gestation it was documented by 7 babies more than 0.5 cm recording the maximum of 0.8 cm by a macrosomic newborn with 4850 gram, which was born by caesarean section. Only two women in the macrosomic group were treated with insulin, and 7 women had a vaginal delivery. The measurement of fetal fat layer with a cutoff 0.5 cm at the 37 weeks of gestation was strongly useful. **Conclusion:** We conclude that the measurement of the fetal fat layer in addition to the standard measurement might be useful for prediction of macrosomia and is worthy further evaluation.

**Conclusions:** Within the first week of prophylaxis, PETN improved uteroplacental perfusion significantly (mean PI 1.26 ± 0.36 vs. 1.49 ± 0.44; p < 0.01). An umbilical ARED flow has to be diagnosed in 21 (18.9%) cases in the course of pregnancy, 13/57 (23%) in the placebo and 8/54 (14%) in the PETN group. Fetal brain sparing occurred in 8/57 (21%) in the placebo vs. 4/54 (7.5%) in the PETN group. Mean gestational age at fetal brain sparing was at 162 ± 23 d in the high risk group and at 203 ± 23 d in the low risk. In the high risk group PETN prophylaxis could postpone fetal brain sparing by 19 days (172 ± 8 vs. 153 ± 8 d in controls). **Conclusion:** Pregnant women with a high risk for placental insufficiency could have a benefit from a secondary prophylaxis with the NO donor PETN. **References:** [1] Kahler C., Schleußner E., Möller A., Seewald H.-J. Europ J Gynaecol Obstet RB 2004; 115: 10 – 14 [2] Schleussner E, Lehmann T, Köhler C, Schneider U, Schlembach D, Groten T, J Perinat Med. 2014 Jan 14: 1 – 8

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SL19-2

Spleen Stiffness measured by point Shear Wave Elastography (pSWE) – Comparison between VTTQ/Acoustic Radiation Force Impulse (ARFI) and ElastPQ
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Purpose: A comprehensive comparison between Acoustic Radiation Force Impulse (Siemens Acuson S3000) and ElastPQ (Philips EPQ 7) by means of spleen stiffness (SS) measurement. Standard values of spleen stiffness measured with pSWE until today have been generated solely by means of ARFI. In former studies, measurement of SS is recommended in the lower pole of the spleen. Material and methods: In 200 healthy subjects (78 male) 122 female, mean BMI 22.56 ± 2.57 kg/m2, mean age 27.93 ± 8.13 years, mean fasting time = 3.74 ± 1.84 hours) SS was measured in 3 defined regions of the spleen using VTTQ/ARFI and ElastPQ (lower pole LP, mid region MR, upper pole UP). Shear wave velocities (SWV) were compared between both techniques, furthermore regarding region of measurement, probands gender, BMI, alcohol intake and fasting time. Results: Values measured with ElastPQ are significantly lower than measured with VTTQ/ARFI (mean SWV in m/s: ElastPQ: UP 2.30 ± 0.87, MR 1.89 ± 0.38, LP 1.88 ± 0.40; VTTQ/ARFI: UP 2.53 ± 0.58, MR 2.53 ± 0.44, LP 2.05 ± 0.54). There is no significant correlation between the values measured with both techniques in the LP (p = 0.3799) or in the MR (p = 0.0618). Correlation can be verified in the UP (p < 0.0001). However, correlation in the UP is not verifiable when BMI is > 25 kg/m2 or age > 30y.

Conclusions: The mean SWV values for spleen stiffness measured with VTTQ/ARFI do not equally apply to ElastPQ, which should be considered when diagnosing patients with portal hypertension and during their follow-up. Due to the lack of correlation, no valid conversion factor can be calculated.

SL19-3

The performance of 2D SWE.GE compared to transient elastography for the evaluation of liver stiffness
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DOI: 10.1055/s-0036-1587806

Aim: To evaluate the performance of 2D-SWE.GE in noninvasive fibrosis assessment as compared to a validated method-Transient Elastography (TE). Material and Method: Our study included 255 consecutive subjects with or without chronic hepatopathies (only compensated liver disease evaluated for decision regarding treatment), in which liver stiffness (LS) was evaluated in the same session by means of 2 elastographic methods: TE (M or XL probes) and 2D-SWE.GE (LOGIQ E9, General Electrics Health-care). Reliable LS measurements were defined as follows: for TE – the median value of 10 measurements with a success rate of ≥ 60% and an interquartile range< 30% and for 2D-SWE.GE – the median value of 10 measurements acquired in a homogenous area and an interquartile range (IQR)<30%. Results: Reliable LS measurements were obtained in 241/255 (94.5%) subjects by 2D-SWE.GE, and in 240/255 (94.1%) by TE (p = 0.997). The final analysis was performed on 229 subjects with valid measurements by both methods. Based on TE cut-off values (F1 – 6, F2 – 7,2, F3 – 9.6 and F4 – 14.5 kPa), we divided our cohort into 3 groups: F2: 62/229 (27%); F2-F3: 44/229 (19.3%); F4: 4 – 123/229 (53.7%). We found a strong correlation between the LS values obtained by the 2 methods: r = 0.833, p < 0.0001. The mean values obtained by 2D-SWE.GE considering TE cut-off values as reference were: F0-F1: 5.88 ± 1.39; F2-F3: 9.86 ± 2.21; F4: 13.57 ± 2.76 (p < 0.001). The best cut-off values for 2D-SWE.GE were: F2 – 6.7 kPa (AUROC = 0.975, Sensitivity = 96.87%, Specificity = 87.1) and for F4: 10.7 kPa (AUROC = 0.911, Sensitivity = 81.68%, Specificity = 84.37%). Conclusions: 2D-SWE.GE and TE (using M and XL probes) had good feasibility (94.5% and 94.1%), with no statistical differences between them (p = 0.097). There was a strong correlation between the two methods, with LS values significantly increasing with the severity of fibrosis. The best 2D-SWE.GE cut-off values for predicting F2 and F4 were 6.7 kPa, and 10.7 kPa.

SL19-4

Shear wave elastography of peripheral muscle stiffness in patients with congestive heart failure – A new diagnostic ultrasound method to detect muscular deficits
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It is well established that patients (pts) with chronic heart failure often suffer from severe peripheral muscular weakness resulting in difficulties performing daily life tasks. Reduced oxygen delivery, lowered lactate turnover and mitochondrial capacity are thought to be responsible for a diminished contractility of peripheral muscles in heart failure pts. To date, only invasive muscle biopsies are suitable to diagnose this condition. Purpose: We sought to investigate whether shear wave elastography (SWE) is useful tool in identifying weaknesses in extension (stretch) and flexion of peripheral muscles. Material and methods: 25 subjects were enrolled into the study. pts with previously documented heart failure (CHF, age 66±1.24) and reduced LV-function and 10 control persons (CP, age, 63±1.15, p = n.s.) without heart failure met the inclusion/exclusion criteria. SWE of the peripheral muscles was performed using a Loqio E9 XDClear ultrasound machine (GE Healthcare) applying a 9L-linear array scanner. Applying a standardized protocol, resting kPa, exercise kPa and difference (Δ) between resting- and exercise kPa of the muscles were measured at a range of 0 – 300 kPa. Data are expressed as mean ± SD and were compared using the unpaired Student’s-t test with Bonferroni correction when appropriate. Results: Resting kPa of the muscles was not different in CHF and CP subjects, neither in flexors (16.7±2.7 vs. 18.7±2.2 p = n.s) nor in extenders (12.6±3.9 vs.14.4±3.6, p = n.s.). Exercise kPa of the gastrocnemius muscle, however, was markedly reduced in CHF- compared with CP pts (58.9±1.9 vs. 80.0±2.5, p = 0.001). Δ kPa was reduced as well in CHF pts (46.3±23.3 vs. 73.7±16.8, p = 0.005) when compared with CP. Conclusion: Shear wave elastography appears to be an extremely valuable tool to diagnose peripheral muscular deficits during exercise in patients with congestive heart failure.

SL19-5

Shear wave elastography: interobserver agreement and influencing factors for liver stiffness measurement
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DOI: 10.1055/s-0036-1587808

Purpose: To evaluate the interobserver reproducibility of 2-dimensional shear wave elastography (2D-SWE) in measuring liver stiffness and to investigate the clinical and measurement factors related to the reproducibility. Material and methods: This study used the cohort of rheumatoid arthritis patients who have been treated with methotrexate and were enrolled under informed consent between August 2011 and August 2012. Two staff radiologists performed SWE by turns at the same day. The measurement was repeated 5 times, and the median value was considered as the liver stiffness. We investigated clinical factors such as age, sex, serum cholesterol, ALT level, BMI, and waist circumference. We also considered the mean standard deviations (SD) of region of interest and mean size of ROI (ROI) as a measurement factor to investigate the relationship with LS. To investigate interobserver agreement of LS and SD between the first and second observations, we calculated concordance correlation coefficient. To explore the interobserver difference, we calculated the absolute difference of liver stiffness between two consequent observations. As well as the clinical factors, SD and ROI were considered as possible influencing factors. Uni- and multivariate linear regression analyses were also performed. Result: One hundred and seventy six patients (M:60, F:116, age 65±9.3 years) were subsequently enrolled. The best 2D-SWE cut-off values for predicting F> 2 and F> 4 were 6.7 kPa, and 10.7 kPa.

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SL19-6

Inter/intra-observer reproducibility of a 2D-Shear Wave Elastography (Logiq E9 system from GE) technique and the impact of ultrasound experience in achieving reliable data

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DOI: 10.1055/s-0036-1587809

The aim of this paper was to evaluate the reproducibility of a new SWE technique -2D SWE.GE and the impact of ultrasound experience in acquiring reliable measurements, since no recommendation are available. Liver stiffness measurements were made in 60 healthy subjects by 2D-SWE.GE using Logiq E9. Three examiners, (one with both ultrasonographic and elastographic experience of more than one year – E1; one with only ultrasonographic experience for more than one year – E2; and one without any experience – E3) performed 10 valid measurements for each subject and a median and interquartile range (IQR) were calculated (m/s). The inter-observer reproducibility was assessed by calculating the interclass correlation coefficients (ICCs) for median and IQR. For the intra-observer reproducibility, we calculated, for each examiner, the medians for the first five and the last five measurements, respectively. We then calculated, for each examiner, the ICCs for the two medians. The final study group included 58 subjects: 56.9% women, with a mean age of 32.69 ± 13.37 years and mean BMI 22.68 ± 3.96 Kg/m². 92.7% were healthy volunteers and 8.3% had compensated liver cirrhosis. The ICCs for median values of valid measurements were excellent both between E1 and E2, and E1 and E3 (0.872, 95% CI: 0.784 – 0.924 vs. 0.842, 95% CI: 0.735 – 0.907), p < 0.0001. The ICCs for IQR were only fair between E1 and E2 (0.411, 95%CI: 0.033 – 0.645, p = 0.018) and between E1 and E3 (0.443, 95% CI: 0.055 – 0.672, p = 0.004). The agreement between measurements was excellent for each examiner, however the ICCs were higher for the more elastographic experienced examiner: 0.956, (95% CI: 0.925 – 0.974) vs. 0.952 (95% CI: 0.920 – 0.972) vs. 0.984 (95% CI: 0.973 – 0.991). The good ICCs for the median values show that 2D-SWE.GE is a reproducible method for liver stiffness measurements; however experience plays a role in obtaining reliable results.

SL20-1

Therapeutic response assessment of high-intensity focused ultrasound (HIFU) ablation for pancreatic cancer: Utility of contrast-enhanced ultrasonography (CEUS)

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DOI: 10.1055/s-0036-1587810

Purpose: To investigate the utility of contrast-enhanced ultrasound (CEUS) in the assessment of the therapeutic response to high-intensity focused ultrasound (HIFU) ablation for pancreatic cancer. Material and methods: 28 patients (11 female, 17 male, mean age 66 years, range 47 – 82) with pancreatic cancer (mean 3.5 cm, range 2.2 – 6.6 cm; mean 17.7 cm², range 3.2 – 60.6 cm²) were treated with ultrasound-guided HIFU. All patients underwent CEUS and contrast-enhanced MRI (CEMRI) before and after HIFU. Following HIFU, CEUS and CEMRI were performed after 6 weeks (n = 17) and 3 (n = 15); 6 (n = 7), 9 (n = 3) and 12 (n = 3) months. CEUS and CEMRI were compared by two investigators evaluating the presence or absence of residual unablated tumour, size and volume changes compared to pre- and post-HIFU-ablation. The lesions’ contrast enhancement characteristics were graded using a four-point scale (0-none, 1-mild, 2-moderate, 3-intense). Results: CEUS was impeded early after HIFU due to edema in the acoustic pathway in 6/28 patients. A lack of contrast enhancement in the treated regions in terms of successful ablation was achieved in all patients. A mild ringlike peripheral enhance-

SL20-2

Diagnostic value of contrast-enhanced transabdominal ultrasound and contrast-enhanced endoscopic ultrasound in pancreatic cystic tumors

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DOI: 10.1055/s-0036-1587811

Purpose: Pancreatic cystic tumors account for approximately 1 – 2% of pancreatic tumors. Contrast-enhanced ultrasound has now been used for the differential diagnosis of pancreatic cancer. This research aimed to investigate the diagnostic value of contrast-enhanced transabdominal ultrasound (CEUS) and contrast-enhanced endoscopic ultrasound (CEUS) in pancreatic cystic tumors. Material and methods: We prospec-

waist circumference, SD, and ROI had significant correlation with interobserver difference of liver stiffness (p = 0.020, p = 0.015, p < 0.001, and p < 0.001, respectively). On the other hand, multivariate linear regression analysis revealed that only SD and ROI had significant correlation with interobserver difference of liver stiffness (p = 0.001 and p = 0.021, respectively). Conclusion: Interobserver agreement of liver stiffness measurement using 2D-SWE was moderate to good. Mean SD and mean size of ROI were significant factors related to interobserver difference.
tively reviewed database of patients diagnosed with pancreatic cystic tumors between April 2015 and October 2015 in our institute. The inclusion criteria were as follows: patients who underwent conventional ultrasonography, CEUS, CE-EUS, CT/MRI, endoscopic ultrasound guided-fine needle aspiration and were pathologically diagnosed with pancreatic cystic tumor. One radiologist with more than 20 years’ experience in contrast-enhanced ultrasound read all the patients’ imaging and made diagnosis. We calculated the diagnostic results from CEUS and CE-EUS with that of histopathology and made comparisons between the diagnostic efficacy of CEUS and CE-EUS. Results: A total of 55 patients were enrolled in this study. Diagnosis included pancreatic cystadenoma (n = 36), pancreatic pseudocyst (n = 6), intraductal papillary mucinous neoplasm of pancreas (n = 5), solid-pseudopapillary tumor of pancreas (n = 3), pancreatic cyst (n = 3), and pancreatic cystadenocarcinoma (n = 2). The diagnostic accuracy of CE-EUS was significantly higher than that of CEUS (78.2% vs. 85.5%, P = 0.004). For 36 cases with pancreatic cystadenoma, CEUS and CE-EUS showed comparable diagnostic accuracy of 80.6% and 88.9% (P = 0.25). Conclusion: CE-EUS is more effective in the diagnosis of pancreatic cystic tumor than CEUS.

Background and aims: To evaluate the diagnostic performance of contrast enhanced ultrasound (CEUS) in assessing focal liver lesions (FLLs) in a large monocentric experience. Methods: The study included 721 patients (57.8% male, mean age 59.6 ± 13.1 years) with 874 FLLs (mean diameter of 4.5 ± 3.1 cm), which were first characterized by CEUS and then were finally evaluated by a ‘gold-standard’ method (contrast enhanced CT, contrast enhanced MRI or histology). The CEUS diagnosis was based on the FLLs’ enhancement pattern following contrast bolus, according to the European Guidelines for CEUS. Using the “gold-standard” methods, we calculated the sensitivity (Se), Specificity (Sp), and accuracy (Ac) of CEUS for the diagnostic of FLLs. Results: From de 874 FLLs, CEUS was conclusive for the benign vs. malignant nature of the lesions in 776 (88.8%) cases. Using CT, MRI or histology, we established the final diagnostic of the lesions as follows: 246 (28.1%) hepato-cellular carcinomas (HCC), 223 (25.5%) liver metastasis, 124 (14.2%) hemangiomas, 30 (3.4%) adenomas, 37 (4.2%) hepatice abscesses, 16 (1.9%) cholangiocarcinomas, 55 (6.3%) focal nodular hyperplasia (FNH), 36 (4.1%) regenerative nodules, 3.3% (29) focal fatty liver alterations (FFLA), 15 (1.8%) liver cysts, 38 (4.3%) other benign lesions, 25 (2.9%) other malignant lesions. For benign liver lesions, CEUS had 78.3% Se, 94.8% Sp, and 97.4% Ac. For the diagnosis of malignant lesions, CEUS had 82.9%Se, 86.4% Sp, and 84.2% Ac. For HCC, CEUS had a 65%Se, 91.4%Sp, and 81.8%Ac. For the diagnostic of liver metastases, CEUS had 74.4%Se, 93.2%Sp, and 86.7%Ac. For liver hemangiomas, CEUS achieved 73.3%Se, 95.6%Sp, and 91.1% Ac for FNH. CEUS had 72.7%Se, 97.3%Sp and a diagnostic Ac of 95%. Conclusions: CEUS is a reliable diagnostic, being able to differentiate between malignant and benign lesions in 88.8% cases. The best accuracy was observed for diagnosing hemangiomas and FNHs (91 and 95%, respectively), and the lowest for HCCs (approximately 82%).

Hemangioma is the most common benign liver tumor with typical behavior in CEUS. Sometimes, washout can be noted in the late phase of CEUS examination, posing problems of differential diagnosis with hypervascular malignant tumors. The aim of this paper is assessing the incidence of atypical behavior of hemangiomas in CEUS examination. Material and methods: We studied a group of 103 patients (62 women and 41 men, average age 54.7 ± 10.3 years), where CEUS was performed starting from the suspicion in standard ultrasound of liver hemangioma (typical/ atypical aspect of CEUS). Using the “gold-standard” methods, we calculated the sensitivity (Se), Specificity (Sp), and accuracy (Ac) of CEUS for the diagnostic of FLLs. Results: From de 874 FLLs, CEUS was conclusive for the benign vs. malignant nature of the lesions in 776 (88.8%) cases. Using CT, MRI or histology, we established the final diagnostic of the lesions as follows: 246 (28.1%) hepato-cellular carcinomas (HCC), 223 (25.5%) liver metastasis, 124 (14.2%) hemangiomas, 30 (3.4%) adenomas, 37 (4.2%) hepatice abscesses, 16 (1.9%) cholangiocarcinomas, 55 (6.3%) focal nodular hyperplasia (FNH), 36 (4.1%) regenerative nodules, 3.3% (29) focal fatty liver alterations (FFLA), 15 (1.8%) liver cysts, 38 (4.3%) other benign lesions, 25 (2.9%) other malignant lesions. For benign liver lesions, CEUS had 78.3% Se, 94.8% Sp, and 97.4% Ac. For the diagnosis of malignant lesions, CEUS had 82.9%Se, 86.4% Sp, and 84.2% Ac. For HCC, CEUS had a 65%Se, 91.4%Sp, and 81.8%Ac. For the diagnostic of liver metastases, CEUS had 74.4%Se, 93.2%Sp, and 86.7%Ac. For liver hemangiomas, CEUS achieved 73.3%Se, 95.6%Sp, and 91.1% Ac for FNH. CEUS had 72.7%Se, 97.3%Sp and a diagnostic Ac of 95%. Conclusions: CEUS is a reliable diagnostic, being able to differentiate between malignant and benign lesions in 88.8% cases. The best accuracy was observed for diagnosing hemangiomas and FNHs (91 and 95%, respectively), and the lowest for HCCs (approximately 82%).

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played: irregular shapes were 80.2% (73/91), tortuous, massive or penetrating vessels were 86.8% (79/91), heterogeneous distribution of contrast enhancement were 83.5% (76/91), perfusion defect of contrast signals were 89.0% (81/91), local retention of contrast signals were 93.4% (85/91), rapidly entering and exporting from the lesions were 65.9% (60/91). Significant differences of above CEUS characteristics were found between the benign and malignant breast lesions (P < 0.05). The two most important features were perfusion defects and local retention of the contrast signals, with the sensitivity and specificity attained to 89.0% and 91.8%, and 93.4% and 92.5%, respectively. Poorly defined boundaries of the 91 malignancies were 64.8% (59/91), and the specificity was 47.8%.

The malignant cases had enlarged maximum diameter on CEUS compared to pre-contrast (P < 0.05). Conclusion: The typical features of breast cancers on CEUS were irregular shapes, tortuous, massive or penetrating vessels, heterogeneous distribution of contrast enhancement, with perfusion defect or local retention of contrast signals, rapidly entering and exporting from the lesions, enlarged maximum diameter of the lesions on CEUS compared to pre-contrast. It is valuable for CEUS in the diagnosis and differential diagnosis of breast neoplasms clinically. Key words: breast neoplasms/contrast media/ultrasonography

Abdominal Ultrasound – Clinical Investigations and Case Reports

PS1-01 Systemic and regional hemodynamics in children and adolescents with bone sarcomas of upper and lower limbs
Begin I
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DOI: 10.1055/s-0036-1587816

The aim: To study the hemodynamic of upper and lower extremities taking into account of cardiac output and volume of tumors in patients with bone sarcomas. Patients and methods: Analysis of data obtained during of the initial ultrasound examination of the 56 patients aged 8–18 years with morphologically proven bone sarcomas of extremities was performed. Were estimated: cardiac output (CO), volume of blood flow in main femoral and subclavian artery (Q ml/min), indices – resistance and pulsation (RI, PI), as well as size of their percentage deviations for the affected limb compared with the contralateral (3Q, 3RI, 3SPI). Results: In system “organism-tumor” were noted the change in cardiac output with increasing tumor volume (r = 0.42; p < 0.05), so-called “systemic effects of the tumor” on the background of the interdependence of volume blood flow in the main artery of the affected and healthy limbs (r = 0.67; p < 0.05). Herewith a negative correlation between index value of 3Q and blood flow to the healthy limb – Q (r = 0.39; p < 0.05), is confirmed, that one of component of hemodynamic changes there is redistri-

Causess of hydropnephrosis in dogs and cats
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DOI: 10.1055/s-0036-1587817

Purpose: Hydropnephrosis represents a comparatively rare disease of the kidneys in dogs and cats. In this study patients of the clinic for small animals with proven hydropnephrosis are evaluated and causes of hydropnephrosis are compared. Materials and methods: The patient data between 2005 and 2015 from the clinic for small animals were evaluated. In this study we included those animals that had at least one kidney being altered in terms of hydropnephrosis. The underlying cause had to be confirmed either by a pathological examination or by surgery. Additionally, all those cases were included in which the underlying cause could not be identified during surgery. Those animals, which were diagnosed with hydropnephrosis based on ultrasound examination, but which did not undergo any further investigations, were excluded. Results: In this study 29 animals from the examination period were finally included, comprising six cats and 23 dogs. In four animals a bilateral hydropnephrosis could be diagnosed, ten animals showed a right-sided hydropnephrosis, 15 animals neoplasia was responsible for hydropnephrosis including seven transitional cell carcinomas. Furthermore we found an ectopic ureter in five animals and a ureteral calculus in four animals. Conclusions: There are different causes for hydropnephrosis in dogs and cats; in young animals an ectopic ureter should always be considered whereas in older animals a neoplastic disorder is most likely.

PS1-03 Accessorial spleen within the pancreatic tail as differential diagnosis to pancreatic tumour
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DOI: 10.1055/s-0036-1587818

Purpose: Accessorial spleens are often incidental findings in abdominal ultrasound. Because of their echogenicity and behavior in contrast enhanced ultrasound they can be misjudged as malignant tumours if found in an atypical location. Material and methods: During routine abdominal ultrasound a small round slightly hypoechoic lesion without halo was detected within the pancreatic tail of three persons (size 8–20 mm). EUS and CEUS have been performed as well as contrast enhanced MRI, which showed a hypoenhancing lesion without washout. Two lesions have been punctured, one lesion has been operated (pancreatic tail resection and splenectomy). Results: All three lesions were histologically confirmed as being accessorial spleens within the pancreatic tail. Conclusion: Accessorial spleen in the pancreatic tail is an important differential diagnosis to NET tumors of the pancreas. Accessorial spleens show a moderate hypoenhancement and washout together with the normal spleen tissue during CEUS. A histological/cytological diagnosis by EUS puncture should be performed before operation is performed.

Effectiveness of contrast enhanced ultrasound examination after radiofrequency ablation liver metastasis
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DOI: 10.1055/s-0036-1587819

Purpose: Estimate of contrast enhanced ultrasound examination (CUS) after radiofrequency ablation (RFA) liver metastasis. Material and methods: 10 patients (7 male and 3 female) after radiofrequency ablation liver metastasis under CUS control using “SonoVue”. Patients age ranged from 46 to 77 years (M=62). 9 patients had colorectal liver metastasis; one has nodular form of hepatocellular carcinoma. Prior RFA for detect and size calculation of liver metastasis standard US (Philips IU-22 Matrix) in B-mode and duplex mode had been done as well as contrast enhanced CT (GE Discovery HD750) or MRI (GE Optima MR450w). Size of metastatic nodules varied from 9–40 mm to 24–34 mm. Tumor angiogenesis had been mapped using CUS in dynamic mode with 2 ml intravenous injecting of “SonoVue” before and after RFA. Scanning protocol and 2D CUS video sequences were identical before and after RFA. We found absence of contrast uptake in tumor nodules in arterial and portal phase after RFA and presume as full tumor ablation after RFA. Conclusion: Contrast enhanced ultrasound examination in dynamic mode is a reliable non-ionizing method of liver node radiofrequency ablation effectiveness.

The possibilities of ultrasonography in tumors of the small intestine
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DOI: 10.1055/s-0036-1587820

Tumors of the small intestine are rare diseases. Preoperative diagnosis of these tumors is difficult, radiological methods of detection are not always effective. Purpose: The work is devoted to the capabilities of ultrasono-
Purpose: In recent years several papers have been published investigating the use of shear wave elastography of the bowel on operation specimens or on laboratory animals with models simulating Crohn’s disease. These studies indicate that shear wave elastography can be used to quantify the degree of fibrosis in the bowel. No clinical trials using transabdominal shear wave elastography have been published. The aim of this study was to examine if shear wave elastography can be used to measure the stiffness of the bowel wall during a clinical ultrasound examination.

Material and methods: Fifteen patients with Crohn’s disease undergoing ileocolonoscopy were invited to participate and scored with the Simple Endoscopic Score of Crohn’s disease (SES-CD). Endoscopic remission was considered as SES-CD< 2. Ultrasound was performed using a Logiq E9 ultrasound scanner. The area with the most pronounced bowel wall thickening was considered the most affected and examined with shear wave elastography. Nine single measurements were made in the longitudinal direction of the bowel with a linear ultrasound transducer (9L) with and without pre-compression. The onboard software allowed freehand tracing of the region of interest. The quality criterion for the measurements was a standard deviation less than 30% of the average of the measurements.

Results: Satisfactory measurements were made in 9/15 patients without precompression and 7/15 patients with precompression. The success rates were 60 and 47%, respectively. SES-CD correlated with the elastography measurements with \( r = 0.87, p = 0.02 \) and without \( r = 0.80, p = 0.016 \) precompression, but there was no significant difference between patients with endoscopic activity and patients in remission.

Conclusion: Elastography measurements of the bowel of patients with Crohn’s disease using the shear wave method on the Logiq E9 ultrasound scanner correlate with SES-CD, but the variability is considerable and the method needs optimization before being introduced in clinical routine.

Shear wave elastography of the bowel of patients with Crohn’s disease

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DOI: 10.1055/s-0036-1587821

Purpose: To evaluate the diagnostic accuracy of superb microvascular imaging (SMI) in the differential diagnosis of focal liver lesions in clinical practice.

Material and methods: Standard methods: Satisfactory measurements were made in 9/15 patients without precompression and 7/15 patients with precompression. The success rates were 60 and 47%, respectively. SES-CD correlated with the elastography measurements with \( r = 0.87, p = 0.02 \) and without \( r = 0.80, p = 0.016 \) precompression, but there was no significant difference between patients with endoscopic activity and patients in remission.

Results: Satisfactory measurements were made in 9/15 patients without precompression and 7/15 patients with precompression. The success rates were 60 and 47%, respectively. SES-CD correlated with the elastography measurements with \( r = 0.87, p = 0.02 \) and without \( r = 0.80, p = 0.016 \) precompression, but there was no significant difference between patients with endoscopic activity and patients in remission.

Conclusion: Elastography measurements of the bowel of patients with Crohn’s disease using the shear wave method on the Logiq E9 ultrasound scanner correlate with SES-CD, but the variability is considerable and the method needs optimization before being introduced in clinical routine.

Sonoporation by microbubbles as gene therapy approach for liver cancer

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Purpose: We use an innovative method, known as sonoporation, to induce the expression of silenced gene in liver cancer cells (HepG2), such as (but not restricted to) TRAIL in a specific manner. Aim of the project is the re-activation of silenced apoptotic pathway in liver cancer models, using diagnostic microbubble synovial as plasmidic gene delivery. Material and methods: HepG2 ATCC were used to assess all the experiments. Microbubble (Sonovue®) were used at standard condition according to manufacturer’s instructions. pEGFP-TRAIL plasmid (Plasmid #10953 addgene) and the respective control were selected and propagated in LB broth in order to obtain the necessary amount. Plasmid was purified with Invitrogen PureLink (thermo-fisher scientific Cod. K210017) kit. Transfection was mediated by Ultrasound device (Sonitron 2000, Artison corporation®) compared with standard protocol for lipofectamine 2000 (Invitrogen). GFP (Green Fluorescent Protein) was acquired via FACS exceeding 50% transfection efficacy was acquired and TRAIL re-expression induced apoptotic effect.

Conclusion: Results showed the possibility to restore the expression of
pro-apoptotic gene TRAIL in a liver cancer model HepG2. The future goal, in our vision, is the translation in animal model of our system, in order to evaluate the in-vivo effect of plasmidic gene therapy in hepatocarcinoma cells.

Contrast-Enhanced Ultrasound – Clinical Investigations and Case Reports

**PS2-01**

**Diagnostic assessment of acute respiratory distress syndrome with lung ultrasound – comparison with Computed Tomography-preliminary data**

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DOI: 10.1055/s-0036-1587824

**Objectives:** Lung ultrasound (LUS) is increasingly used in intensive care medicine to monitor invasive ventilation, however little data exists on the comparison of common lung ultrasound (LUS) findings in Acute Respiratory Distress Syndrome ("b-lines", consolidations) with the imaging gold standard Computed Tomography (CT). Therefore the aim of our study was to examine these findings under controlled conditions at different Positive End Expiratory Pressure (PEEP) levels in healthy and diseased piglets and compare them with dynamic CT scans.

**Methods:** After approval of the ethics committee, 8 piglets were studied during pressure controlled mechanical ventilation before and after surfactant depletion. Vessels and bronchi differentiated themselves as echoless structures within the parenchyma. **Discussion:** Tumors were detectable centrally in lung and differentiated from the surrounding lung parenchyma after OLF. Infiltration of the tumor into adjoining functional structures was also identifiable. This information is essential for sonographic guided interventions where its use for FUS ablation has been shown. Further studies are required exploring US guidance for therapeutic applications (RF, SEEDS) or diagnostics (Biopsy) under OLF in-vivo, justifying the additional invasivity of OLF.

**PS2-02**

**Sonographic appearance of bronchial carcinoma in atelectasis versus flooded lung**

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**Background:** Sonography of central lung tumours is limited, when surrounded by gaseous lung. Only in cases of bronchial- pleural invasion or when atelectatic lung serves as acoustic contact it becomes imageable. Further it has been shown that One Lung Flooding (OLF) is safe and enables sonological examination. For ultrasound guided interventions the tumour demarcation from lung tissue is essential. Therefore the visualization of lung tumours in flooded and atelectatic condition was assessed. **Methods:** Human lung lobes received from surgery after lobectomy were used in 13 cases (10 NSCLC bronchial carcinomas, one CRC lung metastasis, one SCC and benign Hamartochondroma). Tumors were sonographically examined first in atelectatic lung than after flooding transpleurally (Micromaxx, Sonosite, USA) and endobronchially. Flooding was performed with isotonic NaCl 0.9% until a hydrostatic pressure of 20 cmH2O was achieved. Rate of tumour detection and sonomorphology was assessed. **Results:** Sonographic examination under atelectasis was limited by residual gas in non-collapsed bronchi. Tumors were detectable in 42.6% and additional sonographic scans from the surrounding lung tissue in 15%. Tumors and atelectatic tissue presented mostly isoechoic. After flooding, 71.4% of lung lobes could be completely examined. All tumors were visualized by ultrasound after flooding. Tumors were predominantly hypoechoic, polycyclically configured with finger-shaped runners, well-demarcated from surrounding lung. Endobronchial tumor growth and destruction of bronchial wall was observed. Vessels and bronchi differentiated themselves as echoless structures within the parenchyma. **Conclusion:** In both situations new ultrasound findings were adding to the diagnostic accuracy. The result of OLF was described as being safe, thus enabling ultrasound guided CT localized interventions.

**PS2-03**

**The greater omentum mimics chest tumor – case report**

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Mild tumours of the chest wall appear rare. The most often mild lesions are lipomas. Differing with malignant lesions and stating the certain recognition require imaging tests and also often the histopathological examination and even the surgical treatment. Here was presented the case of 57-year old man with a tumour in the left pleural cavity, burden with nicotineism and a coronary. In the subjective and objective examination were found: the persistent cough and a deterioration in the effort tolerance. In order to verify the lesion’s nature (mild or malignant) was performed the classical imaging tests (US and CT) and CEUS. On the basis of the conducted imaging tests the worst found were features of lipoma. During the intraoperative examination were found the displacement and formation into pathological mass of the left pleural cavity’s greater omentum. The prognosis in case of the mild lesion diagnosis in the pleura is very good. However at the stage of diagnosis, mild lesions should be differentiated from more frequent metastatic cancer lesions or diffuse malignant mesothelioma. In diagnostics are useful imaging tests like: US, CEUS, CT or MRL. CEUS is worth noting because this is the test allowing to assess the lesions’ nature in the pleural cavity more accurately. Moreover it is deprived of ionizing radiation and it is cost less. In the event of doubt, we should try to establish the histological diagnosis in order to exclude the malignant neoplastic process.

**PS2-04**

**Elevation of the value of contrast-enhanced ultrasonography (CEUS) in radiology departments in Germany**

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**Purpose:** Contrast Enhanced Ultrasound (CEUS) is established methodically for years and is an increasingly important pillar in diagnostic imaging of different organ systems. However, the modality is rarely performed by radiologists, but more often within other disciplines. The present questionnaire study aimed at determining the current value of CEUS in radiology and to stimulate a re-evaluation of the establishment of this method within the discipline. **Materials and methods:** A total of 560 medical directors of radiological departments throughout Germany were contacted and a 3-page questionnaire was presented. On the basis of 37 questions on 5 sets of issues (general structures, CEUS and interdisciplinarity, CEUS in pediatric radiology, education/training, prospect), the importance of CEUS in departments of radiology was determined. In the event of doubt, the current use of CEUS was requested. **Results:** The response rate was 42.3%. A comprehensive statistical analysis of the issues was performed, including subgroup analyses.
Overall, it was found that CEUS is indeed practiced in relatively few radiology departments (26.6%), but the significance of the method is perceived by a total of 81.8% by radiologists and is mostly esteemed in the medium to high range of importance. Even more than half of the pollees (54.9%) would support to incorporate the method within the radiology specialist training. Conclusions: The nationwide questionnaire survey to collect the value of CEUS in radiology revealed a very high response rate. This fits the perception of the importance of the subject area through the radiological discipline. A large discrepancy between the currently low rate of application of the method within radiology and the still relatively high assessment of the significance of CEUS by many radiologists could be shown. The statistical analyses of the issues offer important professional political aspects of this topic within the radiological discipline.

Age-dependency of cardiac morphology and function: results of the LIFE-Adult-Study – analysis of the echocardiographic substudy
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In the NORRE study (EHJ/CVI (2014) 15, 680 – 690) normal values determined by echocardiography were published in healthy subjects (n = 734) with mean age of 46±13 years (range: 20 – 78). Left ventricular (LV) volumes showed good correlations to the participants’ (pts’) age. LV-volumes were decreased and LV ejection fraction (EF) was increased according to the increase of the pts’ age. A significant correlation between age and LV-mass was only found in women. Left atrial (LA)-volumes did not significantly change with age. Parameters of diastolic function showed a strong age-dependency (increase of E/A-ratio, increase of E/E’-ratio). In the present LIFE-Adult analysis echocardiographic parameters of 773 pts (326 males and 447 females; median age: 51 years), standardised transthoracic echocardiography was performed according to the national and international recommendations. The following parameters were analysed: LV- and LA-volume analyses by M-Mode measurements and 2D-LV planimetry, maximum E-and A-velocity, E/A-ratio and E/E’-ratio. The cohort was divided in age related subcohorts between 20 - 40, 41 – 50 and 51 – 60 years. Mean LV-diameter was 54 ± 5 mm (males) and 49 ± 4 mm (females). There was no age-dependency in males, but a tendency of LV-diameter increase in females. Mean LA diameter was 39 ± 4 mm in males and 35 ± 4 mm in females. Mean LA-diameter-index was 20 ± 2 mm/m² (males) and 20 ± 2 mm/m² (females) showing Age-dependency of an increasing LA-diameter in males and females. LV mass-index was 100 ± 20 g/m² (males) and 83 ± 19 g/m² (females) showing a tendency of increasing LV mass-index with age in males and females. Subsequently, septal and posterior wall thickness slightly increases with age. No differences of LVEF with increase of the pts’ age could be observed. E/A-ratio was decreased and E/E’-ratio was increased with increase of the pts’ age. The analysis of the echocardiographic parameters of the LIFE-Adult trial showed differences of the age-dependency in comparison to the NORRE data.

Detection of cardiotoxicity in patients with breast cancer treated with chemotherapy
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DOI: 10.1055/s-0036-1587829

Purpose: The aim of the present study was to detect early cardiac changes in patients receiving chemotherapy with respect to the conventional and deformation parameters of 2D echocardiography. Material and methods: Thirty patients with breast cancer receiving cardiotoxic chemotherapy (taxane: paclitaxel/docetaxel) underwent 2D echocardiography (General Electric Norway). All patients were examined before and during cardiotoxic chemotherapy at a 6-month follow-up. Systolic function (left ventricular ejection fraction and global longitudinal strain) and diastolic function (septal E/E’) were analyzed with 2D echocardiography. Results: For left ventricular ejection fraction and global longitudinal strain no significant differences were detected 6 month after the start of the chemotherapy. According to our results, myocardial dysfunction induced by cardiotoxic chemotherapy can be detected by early diastolic alterations. The E/E’ was significantly higher after 6 month than before the chemotherapy as a marker of the diastolic dysfunction (E/E’ before: 5.24 ± 3.4 vs. E/E’ after: 11 ± 2.0, p: 0.026, paired sample t-test). Conclusion: To detect myocardial dysfunction by global longitudinal strain and left ventricular ejection fraction potentielly requires a longer follow-up. E/E’ seems to be the one of the sensitive parameters to detect early myocardial damage during chemotherapy.

A new diagnosis tool for the evaluation of liver fibrosis: Parametric Arrival Time imaging (PAT)
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Introduction: Liver biopsy is the “gold standard” method for staging liver fibrosis, but it’s an invasive procedure and is associated with risk of some complications. There are also noninvasive techniques for assessment of liver fibrosis such as elastography and biological tests, but these techniques can fail or generate false measurements depending on subjects conditions: food intake, ascites, obesity, etc. The aim of this study is to determine whether liver fibrosis can be evaluated using the parametric arrival time imaging (PAT) using contrast enhanced ultrasonography (CEUS). Material and method: Ultrasonography was performed using the LOGIQ E9 (GE Healthcare, Chalfont St. Giles-UK) system. CEUS using Sonovue as contrast was performed in each subject. Liver scanning during the first 30 s following the injection of contrast agent through the cubital vein were saved as raw data on hard disk. The examination was performed with the patients in left lateral position with the right arm elevated above the head and the patients were instructed to hold their breath for some seconds. Images showing liver parenchyma and the right kidney were a single shot to the NORRE study. In 773 pts (326 males and 447 females; median age: 51 years), standardised transthoracic echocardiography was performed according to the national and international recommendations. The following parameters were analysed: LV- and LA-volume analyses by M-Mode measurements and 2D-LV planimetry, maximum E-and A-velocity, E/A-ratio and E/E’-ratio. The cohort was divided in age related subcohorts between 20 - 40, 41 – 50 and 51 – 60 years. Mean LV-diameter was 54 ± 5 mm (males) and 49 ± 4 mm (females). There was no age-dependency in males, but a tendency of LV-diameter increase in females. Mean LA diameter was 39 ± 4 mm in males and 35 ± 4 mm in females. Mean LA-diameter-index was 20 ± 2 mm/m² (males) and 20 ± 2 mm/m² (females) showing Age-dependency of an increasing LA-diameter in males and females. LV mass-index was 100 ± 20 g/m² (males) and 83 ± 19 g/m² (females) showing a tendency of increasing LV mass-index with age in males and females. Subsequently, septal and posterior wall thickness slightly increases with age. No differences of LVEF with increase of the pts’ age could be observed. E/A-ratio was decreased and E/E’-ratio was increased with increase of the pts’ age. The analysis of the echocardiographic parameters of the LIFE-Adult trial showed differences of the age-dependency in comparison to the NORRE data.

Analysis of coronary sinus, coronary arteries and left ventricular function during carillon device implantation
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Mitrval valve annuloplasty via the coronary sinus (CS) is possible by the Carillon device which can create the construcing force after insertion into the CS transmitted to the mitral valve and mitral annulus. To strategise this procedure the knowledge about the size and anatomy of the CS in relation to the mitral annulus is crucial. 30 consecutive patients with sinus rhythm were investigated by TEE to test the visualisation of CS and branches of the coronary arteries in the posterior region of the mitral annulus as well as the feasibility of speckle tracking strain analysis of the CS. An image acquisition protocol for sufficient analysis of these features should be worked out in these patients. The ostium region of the CS, the middle part of the CS in the posterior mitral annulus as well as the distal CS between anterolateral mitral commissure and left atrial appendage can be acquired in ZOOM multidimensional data sets with highest spatial resolution. The completion of this proposed protocol was possible in 80% of the patients’ cohort with sinus rhythm and in 6 of 8 Carillon patients. The complete CS visualisation succeeds in 70%, the determination of the coronaries in 50% and the TEE adjustment of the
Purpose: Computed tomography (CT) is the gold standard technique in gunshot injuries imaging. In military missions and in case of mass casualties availability of CT scanning and capacity of airborne transporting may be limited. FAST (Focused Assessment with Sonography in Trauma) remains the primary imaging examination in abdominal trauma. Contrast-enhanced ultrasound (CEUS) could close the diagnostic gap between CT scanning and FAST and back-up shortage of diagnostic availabilities. Material and methods: We report a case of gunshot wound of the liver during military mission in Afghanistan. FAST and CT scanning were done as first diagnostic imaging. CEUS was performed additionally in the emergency room by CX 50 Phillips ultrasound system and SonoVue contrast agent. CEUS was repeated after each following operation and also done intraoperative to estimate the damage of the liver and hæmatoma.

Results: The wound tract extension of traumatic gunshot wound could not be estimated on first CEUS examination due to aerodermectasia and gas echo extended along the wound track. Subsequent CEUS after first operations were done revealed that the wound track echo was enhanced in majority. CEUS effectively detect the wound tract, hæmatoma, and the liver area injured by the gunshot and could accurately reveal necrotic tissue in the injured area and differentiate it from normal tissue.

Conclusions: Application of CEUS may provide important imaging for gunshot wound debridement in its follow up and avoid repeated CT scannings. Thus may spare time and transport capacity in military missions. CEUS is an interesting diagnostic tool in blunt and gunshot trauma of the abdomen.

Education in Ultrasound

PS3-01

US B-mode and CEUS (Contrast-Enhances Ultrasound) patterns in n = 62 patient with traumatic and spontaneous non-traumatic (n = 33) and traumatic (n = 29) splenic ruptures: a comparative study between 12/2003 and 2/2010
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Introduction: Both US B-mode and CEUS are well established procedures when diagnosing traumatic splenic ruptures (TSR). It is uncertain whether spontaneous splenic ruptures (SSR) and TSR differ concerning clinic, B-bild and CEUS pattern and prognosis. Material and methods: Between 12/2003 and 2/2010 n = 33 SSR and n = 29 TSR were diagnosed in an medical university ultrasound laboratory. All patients were examined with B-Bild and CEUS. Clinical data, US B-mode and CEUS pattern incl. Grading and course were retrospectively analysed and compared.

Results: There were significant differences concerning clinical data, such as age, underlying disease and splenomegaly. No differences could be shown between Grading of TSR and SSR neither in B- Bild nor in CEUS. As expected, CEUS was significant superior to B- Bild concerning the grading of splenic ruptures and in certain subgroups the choice of therapy was therefore influenced by CEUS. The mortality within 4 weeks was significantly higher in SSR than in TSR. Conclusion: There are differences between SSR and TSR especially concerning clinical data (age, course and prognosis). Regarding the sonographic pattern SSR and TSR show identical lesions. When suspected splenic rupture, CEUS should always be performed.
PS3-04

Ultrasound education for medical students using e-learning and self-directed hands-on training

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Purpose: Ultrasound training is time and cost intensive limiting its distribution especially during medical school curriculums. We wanted to assess whether the two-point compression technique (2-pc) used to diagnose deep vein thrombosis (dvt) can be learned without an instructor.

Material and methods: 30 medical students were recruited for the study. They were given access to a novel e-learning curriculum including podcasts for 6 days. A pre-test was required to enter the self-directed hands-on training (sHT). All students were given pocket cards designed for this study showing the 2-pc with physiologic and pathologic findings. The sHT took place without an instructor being present. At the end of the sHT students were asked to perform a 2-pc, which was filmed (test A) and evaluated later by experienced instructors. The control group (n=24) had a class-room lecture and HT with an instructor. Statistical analysis with Mann-Whitney-U-Test. Results: 23 students completed the study protocol of the experimental group, control n=24. The control group performed significantly better in test A (mean 82.7, CI 74.7–90.7%) compared to the experimental group (mean 65.7%, CI 59.9–72.6%; p=0.0009).

Regarding preparation, sequence of 2-pc and scan of the inguinal and femoral region there was no difference between both groups. Conclusion: Theoretical basis of DVT can be transferred using e-learning. A learning pathway solely consisting of e-learning and self-directed HT achieves acceptable results regarding practical skills but is inferior to HT with an instructor. Regarding the sequence of the exam, preparation of the machine and the patient a self-directed learning pathway showed equivalent results. Interactive e-learning curricula and other media such as pocket cards should be incorporated into ultrasound education.

PS3-05

Enhancing ultrasound peer-to-peer teaching: criteria for a student ultrasound tutor

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Purpose: The importance of teaching ultrasound (US) during medical studies is steadily increasing. Nearly all German medical universities provide theoretical and practical classes. Besides different contents, group sizes and the duration, the concepts vary due to the person who supervises the trainees. It has been shown that students, dedicated and trained in specific skills, could encourage curricular teaching. Especially in skills-labs they are indispensable. Furthermore, the most successful ultrasound projects in Germany are acting on the basis of peer-to-peer-teaching. Nevertheless, standardised procedures are essential to make sure, that these tutors are able to teach their fellows with reliable knowledge and practical skills.

Material and methods: The working group students in the DEGUM (German Society for Ultrasound in Medicine) has developed a catalogue of criteria which shall be used for the qualification of a student ultrasound teacher. This draft focuses on a three-stage-training: (1) theoretical knowledge, (2) profound practical skills in performing an examination and (3) learn how to teach it. Among a complete basic and advanced ultrasound skill training, the tutor should complete a unique didactic training focusing on special needs for teaching in ultrasound. Subsequently one has to pass a clinical internship of at least 2–4 weeks, undertaken by an level II-III certified ultrasound trainer of the DEGUM. Results: To ensure high-quality education, a standardised training for student tutors is required. From the viewpoint of the working group, this catalogue of certification contains the minimum demand for establishing a quality standard in the field of student peer-to-peer teaching regarding on profound theoretical, practical and didactic knowledge.

Conclusion: This catalogue can therefore be an important contribution to enhance the quality of peer-to-peer teaching. This causes in a unified and well-structured education in US, likewise as an element of quality assurance in general.

PS3-06

Ultrasound in acute kidney injury – showing them how it’s done in 4 hours

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Purpose: Due to its worldwide increasing prevalence and mortality, acute kidney injury (AKI) has become an immensely important health care challenge. About 10% of AKI cases are caused by postrenal obstruction, with ultrasound (US) being the procedure of choice for diagnosis. Therefore we developed FARIUS (focused on acute renal injury with US), a 4 hours course to educate students and physicians in diagnosing postrenal obstruction via US aiming for an expertise similar to an experienced US examiner.

Material and methods: FARIUS was developed as a 4hours programme for training in renal US. After positiv voting of the local scientific commission (GFP) the US room was composed US rooms with 20 FARIUS-participants (20 students, 13 physicians) with those of 10 experts (2 ICU physicians, 3 urologists, 1 nephrologist and 4 internal specialists). Following, we present the results of two quality parameters, (i) defining length (cm) of the right kidney of a female volunteer, (ii) diagnosing postrenal obstruction via US aiming for an expertise similar to an experienced US examiner.

Results:

(i) FARIUS: n = 33; mean = 10.25; SD = 0.45; min = 9.7; max = 11.3. Statistical analysis did NOT reveal a significant difference between groups (p = 0.908). (ii) Evaluation of US images reveal 86.3% (12.9 of 15) correct answers (min = 8; max = 15; SD = 1.9), high sensitivity (98.8%), moderate specificity (80.0%), positive prediction 71.2%, negative prediction 99.2%. Conclusion: We could demonstrate that, after completing FARIUS, participants were able to provide renal US examination concerning postrenal obstruction at a similar quality level as experts. Identification of pathological results had a high sensitivity and excellent negative prediction. Thereby treatment of ICU patients with AKI can be more independent from external conditions while offering equivalent diagnostic quality.
**A low cost training model for MRI-Ultrasound fusion guided biopsy**

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**Purpose:** Ultrasoundography (US)-guided biopsy may be used for the diagnosis of a wide variety of other bladder and pelvic suspicious lesions, however magnetic resonance imaging (MRI)-US fusion combines the superior diagnostic accuracy of MRI for detecting suspicious lesions with the cost effectiveness and familiarity of US biopsy. To the best of our knowledge to date there is no model for training operators in MRI-US fusion guided biopsies. The aim of this study is to report on a model for fusion guided biopsies including an MRI visible phantom that is invisible on US. **Methods:** A regular matrix for image phantoms is made from agarose gel (3% to 5%). Three phantom mediums were created (with Copper sulphate, Ferric hydroxide and medical mineral mud). After cooling and consolidating, these phantom mediums were cut to 0.5 cm cubes. An agar gel of 2–5% gives US and MRI representations that are equally artefact-free. A house hold plastic container was filled with a 2–3 cm layer of agar gel. Some phantom particles were placed on the agar gel and then covered with an additional 2–3 cm layer of agar gel (figure). Results: The MRI-US fusion images were able to identify and localize the phantom particles. While the agar particles including Ferric hydroxide and medical mineral mud were visible by both MRI and US, the Copper sulphate agar particles were visible only by MRI. **Conclusions:** We were able to create a low cost, home-made training model for MRI-US fusion guided biopsy.

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**Ultrasonic teaching application for mobile devices**

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**Purpose:** Sonography for medical examination is a widely used technology. However, the proper handling of the ultrasound transducer and the understanding of the resulting data is highly dependent on the physician’s skills and require a long training, which is not necessarily part of the academic medical career. Thus, students of the university Bonn successfully established an ultrasound academy, the Sono Education Academy (S.E.A), to practice an examination with ultrasound scanners. This program was easily uploaded on the smartphone. An application will simplify this procedure and give access to image processing. **Conclusion:** The future prospect of the S.E.A program and its application is broad and constantly growing. It will serve as an helpful exchange platform for students.

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**Ultrasound of gout in routine rheumatologic practice**

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**Purpose:** In gout ultrasound imaging has become a relevant part of rheumatologic practice for precise evaluation intra-articular and periarticular structures. In routine rheumatologic practice muscular-skeletal ultrasound is demanded tool to assess common features of gout: joint inflammation, enthesopathies and “double-contour”. **Objectives:** To assess ultrasound imaging utility in gout patients in routine rheumatologic practice. **Methods:** Database of patients admitted to tertiary rheumatology department in 2015. **Results:** Inpatient database of rheumatology department include 1,021 patients (2015). Diagnosis of gout was established in 18 patient. Ultrasound investigation was done in 9 patients out of them. Feet ultrasound was done in 4 patients, ankles – in 5, knees – in 2, elbows – in 2, shoulders – in 2, wrists – in 2, hands – in 1 patients. We observed synovitis in 11 (61.1%) joints, in 72.7% it was symmetrical, in 22.2% it was heterogeneous with hyperechogenic inclusions. The double-contour phenomenon was observed in 16 (88.8%) joints. Periarticular tissue involvement was also assessed; enthesopathies were found in 16 joints, teno-synovitis – in 17 joints, tendinitis – in 9 joints. **Conclusion:** Ultrasound investigation is useful tool to assessment common features in gout: symmetrical knowledge. **Methods:** The application will be developed for the mobile operating system iOS. Xcode will be used as integrated development environment based on the programming language Swift. A newsletter of the ongoing events and programs at S.E.A will keep students updated. An interactive multiple choice test will be provided so that a recapitulation of already learnt knowledge is possible at anytime. One further feature will be the import of ultrasound images and videos which were taken in the lesson. Retrospectively, the images and data can be analyzed by examining image parameters such as resolution and using simple statistical methods. The application provides a platform for self-studies and facilitates students to understand the ultrasound technology by interactive lessons. It extends S.E.A courses in terms of a blended learning approach. **Results:** The courses of S.E.A has been successfully realized and surveys have given a very positive feedback. The resulting data of the courses are exported as video and image files and can be easily uploaded on the smartphone. An application will simplify this procedure and give access to image processing. **Conclusion:** The future prospect of the S.E.A program and its application is broad and constantly growing. It will serve as an helpful exchange platform for students.

**Imaging remission by musculoskeletal ultrasound leads to a better functional outcome – results of the us 7-score implementation study in early rheumatoid arthritis**

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**Background:** Novel treatment options together with a treat-to-target strategy present new challenges to imaging procedures in terms of therapy monitoring. **Objectives:** To evaluate the functional outcome measured by Health Assessment Questionnaire (HAQ) as the primary outcome in patients with early rheumatoid arthritis (RA) who were treated by standard clinical care (clinical cohort) in comparison to patients in whom treatment decisions were additionally based on musculoskeletal ultrasound (US) using the US 7 score (US-cohort) in a nationwide investigator initiated study in Germany. **Methods:** Functional (HAQ), clinical (DAS28, patient’s Visual Analogue Scale [VAS] for disease activity) and laboratory parameters (ESR, CRP) were analyzed at seven different time points for a total of 18 months and compared between the two study cohorts. Treatment decision was made according to local standard of care (SOC) with a treatment goal of DAS28 < 3.2. In the US-cohort, imaging remission criteria were defined as Gray-scale US < 2 and Power Doppler-US < 0 per joint level. In a subgroup analysis, US patients were analyzed separately regarding imaging remission status and the parameters outlined above. **Results:** Data of 313 patients (US-cohort [n = 166], clinical cohort [n=147]) demonstrated a reduction of HAQ, DAS28, VAS and laboratory activity (ESR, CRP) to low disease activity status 18 months after the beginning/change of antirheumatic therapy according to SOC. The results of functional and clinical outcome in both cohorts did not show significant differences. However, subgroup analysis of the US-cohort with imaging remission resulted in a significantly lower HAQ, DAS28 and VAS compared to patients not fulfilling these US remission criteria. **Conclusions:** Treatment strategies by a treat to target approach in early RA patients reduced disease activity and improved functional outcome of HAQ irrespective of imaging guidance. However, patients with imaging remission by US exhibited a significantly better functional outcome and lower disease activity status.

**The routine use of contrast enhanced ultrasound in the imaging work-up of focal liver lesions: A proposed algorithm**

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**Background:** Grey scale ultrasound study of the liver is frequently performed for routine health screening or surveillance of high-risk patients. Our institution performs an average of 15000 ultrasound liver examinations a year. Focal liver lesions (FL) are detected in about 10–15% of these patients, requiring further work up. Contrast enhanced ultrasound (CEUS) is now a widely accepted imaging technique for characterization of liver lesions. However, they are considered less established when compared to CT or MRI imaging. While various guidelines on its use in liver imaging have been published, some recommendations are not universally accepted or disputed by local and regional practices. We sought to establish a practical algorithm in which CEUS can be included as both a first line investigation or problem solving tool. **Methods:** We reviewed major guidelines available for surveillance of liver lesions and use of contrast-enhanced ultrasound. Appropriateness and cost effectiveness are major considerations when designing the algorithm. The proposed algorithm was discussed and endorsed by the institution’s hepatobiliary multi-disciplinary team. **Results:** The proposed algorithm is based on two major considerations, patient’s risk factors and size of detected FL. Lesions smaller than 10 mm are generally observed rather than characterized. For low risk patients in which a benign aetiology is strongly expected, CEUS may be used as a first line investigation as there are strong evidences to suggest that CEUS is sensitive and has high predictive value for malignant lesions. For high-risk patients, CEUS is more commonly deployed as a problem-solving tool, when CT/MR evaluation is indeterminate or contraindicated. **Conclusion:** CEUS has been successfully fully integrated into our practice. It is deemed a reliable tool, particularly in the hands of experienced operators. Future hope or experience will help others introduce CEUS into their routine practice.

**Intraoperative US of liver tumors using acoustic radiation force impulse (ARFI, shear wave elastography and contrast enhanced ultrasound (io-CEUS) for optimization of surgical resection**

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**Purpose:** Intraoperative US characterization of liver tumor morphology and surrounding tissue before surgical resection using ARFI and CEUS. **Material and methods:** Intraoperative US during elective liver tumor surgery performed by one experienced radiologist using multifrequency linear probes (6–9 MHz), Localisation and characterization by B-mode, ARFI and contrast CEUS. ARFI values for characterization of tissue stiffness collected placing 5 ROIs in the tumor’s center and 5 ROIs in the surrounding tissue. Tumor characterization by io-CEUS after bolus injections of...
max. 5. ml sulphur hexaflourid microbubbles. Wash-in/-wash – out kinetics analyzed in arterial, portal venous and late venous phase (~5 min). Findings correlated to histopathology after tumor resection. Results: Retrospective analysis of DICOM-US data (08/2015 – 03/2016) of 24 patients w/30 liver lesions ranging from 0.5 – 5.25 cm in size. Histology showed 27 malignant and 3 benign lesions. Signs of malignancy were found in all 27 malignant tumors displaying late wash out up to 5 min in Io-CEUS. All 3 benign lesions displayed benign findings in Io-CEUS without late wash out. ARFI values ranged from 0.85 to 6.99 m/s (mean 3.3 m/s, SD ± 1.84) in tumors’ center. ARFI values in surrounding liver tissue ranged from 1.02 to 3.58 m/s (mean 2.33 m/s, SD ± 0.56). According to histopathology after surgical resection ARFI could correctly detect fibrosis, cirrhosis (> 1.8 m/s) or steatosis in patients’ liver in 22/30 cases. Assuming a cut off value of 2.5 m/s for malignancy ARFI could correctly characterize 17 of 27 malignant lesions. Sensitivity was 63%, specificity 100%. Findings of Io-CEUS and ARFI lead to immediate changes in surgical approach in 20/30 cases, including 3 cases w/non-resectability and 11 cases w/intraoperative ablation (RFA etc.). Conclusion: Intraoperative US diagnostics and consequently liver tumor surgery can definitely be optimized by modern US performed by an experienced examiner.

Strain elastography is a diagnostic method that adds quality in the evaluation of benign versus malignant thyroid nodules. Meta-analysis are suggesting overall sensitivity of 0.85 with a pooled specificity of 0.80. The present study is a retrospective analysis of the main causes of false positive and false negative results in thyroid nodular disease. Material and method: 433 thyroid nodules, that were operated, were evaluated by conventional ultrasound and real time elastography (RTE), with linear multifrequency probe, Hitachi Preirus Machine, Hitachi Inc., Japan; qualitative (Rago criteria) and semiquantitative evaluation (strain ration potential, 5/48 follicular proliferation and 8/48 mixomatous thyroiditis and 12/48 autoimmune thyroid disease with high fibrotic content. There were also 24 false negative results: 19/24 cases were papillary and 5/24 were follicular carcinoma. There is to mention results: 23/48 were Hurthle cell proliferations, without vascular involvement, 8/19 being classified as proliferating lesions with uncertain evolution potential, 5/48 follicular proliferation and 8/48 mixomatous thyroiditis and 12/48 autoimmune thyroid disease with high fibrotic content. ARFI values in surrounding liver tissue ranged from 1.02 to 3.58 m/s (mean 2.33 m/s, SD ± 0.56). According to histopathology after surgical resection ARFI could correctly detect fibrosis, cirrhosis (> 1.8 m/s) or steatosis in patients’ liver in 22/30 cases. Assuming a cut off value of 2.5 m/s for malignancy ARFI could correctly characterize 17 of 27 malignant lesions. Sensitivity was 63%, specificity 100%. Findings of Io-CEUS and ARFI lead to immediate changes in surgical approach in 20/30 cases, including 3 cases w/non-resectability and 11 cases w/intraoperative ablation (RFA etc.). Conclusion: Intraoperative US diagnostics and consequently liver tumor surgery can definitely be optimized by modern US performed by an experienced examiner.

PS4-02

Point shear wave elastography is comparable to transient elastography for the assessment of liver fibrosis in patients with chronic hepatitis B or C infection
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Background: Non-invasive evaluation of liver fibrosis is important in determining prognosis in patients with chronic hepatitis B (HBV) and C (HCV) virus infection. Transient elastography (TE) (FibroScan; Echosens, Paris, France) is a well-established method for assessment of liver stiffness (LS). Point shear wave elastography (pSWE) (ElastPQ, Philips) is a new technique that measures the speed of a shear wave to determine LS. This method could result in more accurate assessment of liver fibrosis due to real time imaging. Our aim was to determine if pSWE is comparable to TE in the assessment of LS. Methods: A retrospective international multicentre study was conducted. Patients with chronic HBV and HCV infection for whom a paired TE and pSWE LS measurement was available, were enrolled. Successful TE was defined as 10 successful measurements with an interquartile range (IQR) of ≤ 30% of the median. At least 10 successful ElastPQ measurements were needed. A Bland-Altman assessment for agreement was used. In addition we used linear correlation and regression analysis. Results: For 265 patients both a successful TE and pSWE were available. The majority was female (54%), mean age was 52.9 (19 – 79) and had chronic HCV infection (67%). The overall median LS with TE and pSWE was 10.7 kPa (range: 2.7 – 75) and 7.5 kPa (0.72 – 44.1). Mean difference between TE and pSWE was 1.28 kPa. TE failed in 17 patients (6.4%) and pSWE failed in 3 patients (1.1%). There was a strong linear correlation (spearman’s rho: 0.85, p < 0.001) between TE and pSWE. The Bland-Altman analysis (figure 1) showed a mean bias of 0.25 kPa with limits of agreement -0.55 to 1.07. Regression analysis did not show a significant difference between the two methods (p = 0.191). Conclusion: There is good agreement between TE and pSWE in the assessment of LS among patients with chronic HBV and HCV.
matched control patients with other metabolic disorders and normal liver functions (Group 2) were enrolled in this study. Hepatic and splenic SWV values were obtained by two sonologists with high interobserver agreement, using standard point shear wave elastography (pSWE) technique. The sonographic examinations were performed without being informed with clinical diagnoses. Results: Group 1 consisted of 21 patients with spingolipidoses, 30 patients with mucopolysaccharidosis, 10 patients with glycogenosis and 23 patients with other metabolic diseases. Hepatic and/or splenic enlargement was significantly more common among the patients of Group 1. The SWV values obtained in the livers of the patients in Group 1 had a significantly higher median value (1.36 m/s; IQR = 1.23 – 1.56) than the ones obtained in Group 2 (1.26 m/s; IQR = 1.16 – 1.37). Median splenic SWV values of Group 1 and Group 2 were 2.74 m/s (IQR = 2.52 – 3.02) and 2.65 m/s (IQR = 2.46 – 2.72), respectively. The difference among them was not significant. Similarly, the ratios of splenic/hepatic SWV values were 1.94 m/s (IQR = 1.68 – 2.22) and 2.01 m/s (IQR = 1.83 – 2.26), respectively, and did not differ significantly. Further analysis of pSWE parameters among the patient subgroups and control group did not yield any significant difference. Conclusion: We concluded that congenital metabolic liver diseases result in higher hepatic SWV values compared to other diseases of metabolism, suggesting increased liver stiffness due to disease processes.
Exclusion criteria were focal liver lesions, age ≤ 18, BMI > 35, severe extrahepatic comorbidities. LS was sampled intercostally from at least one intercostal space with both equipments. 110 LS measurements were obtained with both techniques from the same intercostal space and tested with Pearson correlation, Lin's correlation concordance coefficient (CCC) and Bland-Altman analysis (B&A) which investigates systematic deviation of the study test versus the reference at different thresholds.

**Results:** Pearson coefficient resulted 0.77 (95% CI 0.68 – 0.84; p < 0.0001), CCC similarly was 0.75 (CI 0.66 – 0.82), with precision of 0.77 and accuracy of 0.97. B&A plot shows a mean of only -0.7 (CI -2.0 – 0.6) KPa with limits of agreement at -14.0 and 12.7 Kpa, confirming absence of statistical difference (p = 0.3016). **Conclusion:** pSWE shows results well correlating with the reference. Overall degree of concordance resulted remarkable, with good accuracy and precision in assessing LS, even though B&A were assessed with the reference. Overall degree of concordance resulted remarkable, with good accuracy and precision in assessing LS, even though B&A were moderately correlated (R2= 0.50). This could be explained either by unclear regions at interest resulting in difficult measurements or by differing stiffness of both sites. The stiffness of the right liver lobe measured by SWE did not correlate with the stiffness of the spleen. **Conclusion:** In a homogenous cohort of patients with primary sclerosing cholangitis stiffness of the right liver lobe measured by Shear Wave Elastography correlated well with the technique of transient elastography. The reasons for moderate correlation of liver stiffness in the right and left liver lobe need to be further studied including histological fibrosis staging. Further studies with greater numbers of patients are required.

**Liver stiffness measured with the new technique of Shear Wave Elastography in patients with primary sclerosing cholangitis – A prospective comparison with transient elastography**

**Purpose:** Elastography is a well-established non-invasive method to evaluate fibrosis and cirrhosis in chronic liver disease. The aim of this study was to evaluate the new technique of Shear Wave Elastography (SWE) in a homogenous cohort of patients with primary sclerosing cholangitis (PSC). **Methods:** In total 49 patients with PSC were included in this study. Clinical characteristics, B-mode ultrasound, Transient Elastography (TE – Echosens, FibroScan) and Shear Wave Elastography (GE, Logiq E9) of the right and left liver lobe and spleen were obtained in patients with primary sclerosing cholangitis (PSC). Patients were previously diagnosed with PSC mainly by magnetic resonance cholangiopancreatoscopy (MRCP), laboratory findings and/or liver biopsy. **Results:** The relationship between both liver stiffness techniques SWE and TE was well described using an exponential correlation (R^2= 0.65) (Picture). The values of liver stiffness measured by SWE did not increase exponentially as the values measured with TE did (Maximum TE 70 kPa vs. SWE 22 kPa). The stiffness of the right and left liver lobe measured by SWE were moderately correlated (R^2= 0.50). This could be explained either by unclear regions at interest resulting in difficult measurements or by differing stiffness of both sites. The stiffness of the right liver lobe measured by SWE did not correlate with the stiffness of the spleen. **Conclusion:** In a homogenous cohort of patients with primary sclerosing cholangitis stiffness of the right liver lobe measured by Shear Wave Elastography correlated well with the technique of transient elastography. The reasons for moderate correlation of liver stiffness in the right and left liver lobe need to be further studied including histological fibrosis staging. Further studies with greater numbers of patients are required.

**Comparative study between two 2D-Shear Waves Elastography techniques for the assessment of liver stiffness: 2D-SWE.SSI vs. 2D-SWE.**

**Aim:** The aim of this study was to compare the feasability of two 2D-Shear Waves Elastography (2D-SWE) methods for the assessment of Liver Stiffness (LS) and also to compare the methods with a validated one – Transient Elastography (TE). **Material and method:** Our study included 130 consecutive patients with chronic hepatopathies (HCV-90%, HBV-6%, other-4%), in which LS was evaluated in the same session by means of two 2D-SWE techniques: 2D-SWE.GE (LOGIQ E9, GE Healthcare) and 2D-SWE.SSI (Aixplorer® ultrasound system, SuperSonic Imagine) and also by
an elastographic reference method: Transient Elastography (TE) – FibroScan, EchoSens (M and XL probes). Reliable LS measurements were defined as follows: for 2D-SWE.GE: the median value of 10 measurements acquired in a homogenous area and an interquartile range (IQR)<30%, for 2D-SWE.GE: the median value of 3 measurements acquired in an homogenous area and for TE- the median value of 10 measurements with a success rate ≥60% and an interquartile range ≥30%. Spearman’s rank correlation coefficient (r) was used to assess the correlation between measurements by means of 2D-SWE.GE, 2D-SWE.SSI and TE.

Results: Valid measurements were obtained in 94.6% (123/130) for 2D-SWE.GE, 90.7% (118/130) for 2D-SWE.SSI and 89.2% (116/130) for TE (p > 0.05). The values ranged from 4.17 to 20.48 kPa for 2D-SWE.GE and from 3.4 to 82.4 kPa for 2D-SWE.SSI. The mean LS values by 2D-SWE.GE were significantly higher than those obtained by 2D-SWE.GE: 19.1 ± 13.2 kPa vs. 12.1 ± 7.8 kPa (p < 0.0001). There was a significant correlation between 2D-SWE.GE and 2D-SWE.SSI LS values (r = 0.7, p < 0.0001). The correlation between 2D-SWE.GE and TE was r = 0.746, p < 0.0001, and between 2D-SWE.SSI and TE was r = 0.604, p < 0.0001, with no significant differences between them (p = 0.0565).

Conclusion: Both 2D-SWE techniques have a good feasibility for the noninvasive liver fibrosis assessment and both have a strong correlation with TE. LS values obtained by 2D-SWE.GE are significantly lower than those obtained by 2D-SWE.SSI.

Background: Liver biopsy is the “gold standard” for diagnosing liver fibrosis, but it also can be diagnosed by means of noninvasive techniques, either biological tests or elastographic techniques. 

Aim: The aim of this study was to compare the performance of five ultrasound elastographic techniques and FibroTest in diagnosing compensated HCV liver cirrhosis.

Methods: We performed a prospective study, including 54 consecutive patients diagnosed with HCV liver cirrhosis. All patients were evaluated by five elastographic techniques: Transient Elastography (TE)-FibroScan, EchoSens, Virtual Touch Quantification (VTQ)-Acuson S2000, Siemens, ElastPQ-Affinity, Philips, 2D Shear Waves Elastography (Aixplorer, SuperSonic Imagine (SSI)) and the LOGIQ E9 (GE HealthCare, Chalfont St. Giles, UK). In the same session, while FibroTest was performed within a month. Results: Our cohort included 54 subjects (34 women and 20 men), mean age of 59.9 ± 7.9. Reliable LSM by means of vtq, ElastPQ, 2D-SWE.GE were obtained in 54/54 subjects, by means of TE in 51/54 subjects (94.4%) and by means of SSI in 49/54 subjects (90.7%), so the final analysis included 46/54 subjects (85.2%), TE elastography had 95.6% accuracy, VTQ – 89.1%, ElastPQ – 82.6%, 2D-SWE.GE – 78.2%, SSI – 86.9%, and FibroTest – 82.6% for the diagnosis of liver cirrhosis. There were no significant statistical differences between FibroTest vs. TE (p = 0.25), FibroTest vs. VTQ (p = 0.55), FibroTest vs. ElastPQ (p = 0.95), FibroTest vs. SSI (p = 0.77), FibroTest vs. 2D-SWE.GE (p = 0.78) respectively. Neither between TE vs. VTQ, ElastPQ, SSI, VTQ vs. ElastPQ, VTQ, SSI, 2D-SWE.GE, ElastPQ vs. SSI, 2D-SWE.GE, or SSI vs. 2D-SWE.GE all p-values were > 0.05. Significant statistical differences were found only between TE and 2D-SWE.GE (95.6% vs. 78.2%, p < 0.03).

Conclusion: In this preliminary study, all ultrasound based elastographic methods had good performance for the diagnosis of compensated liver cirrhosis and this seem to be similar with FibroTest.

Background and aim: According to the manufacturer’s recommendations, in order to obtain reliable liver stiffness values, 10 valid measurements need to be performed. The aim of this study was to evaluate whether 5 LS measurements were as useful as 10. 

Material and method: 109 consecutive subjects with or without chronic hepatopathies were included in the study, in whom liver stiffness (LS) was evaluated by 2D Shear Waves Elastography implemented on the LOGIQ E9 system (GE Healthcare, Chalfont St Giles – UK). 10 valid measurements were performed in each case, and the mean, median, standard deviation (SD), and interquartile range (IQR) were calculated. We compared the first 5 measurement group with the 10 measurement group. We used the following 2D-SWE.GE cut-off values: F= 2: 8.3 kPa; F= 4: 12 kPa. Results: The structure of the cohort study was the following: Group I (F ≤ 2: 6/13/109 (39.5%); Group II (F= 2-3): 37/109 (25%); Group III (F= 3-9): 39/109 (35.5%). We found no significant statistical differences between the LS measurements in the three groups, neither for median (p = 0.86), mean (p = 0.72), IQR (p = 0.59) or SD (p = 0.41). There was also no significant difference between the LS measurements in the 3 groups of fibrosis F= 2-2F23- F= 4 (all p > 0.05). Conclusion: 5 valid measurements may be enough to quantify the liver stiffness by 2D-SWE.GE without significant loss of accuracy even in patients with advanced liver disease.
The influence of food intake on liver stiffness measurements obtained by two 2D-SWE methods

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Purpose: The aim of the study was to assess the influence of food intake on liver stiffness values obtained by two 2D-SWE techniques 2D-SWE and 2D-SWE.GE. Material and methods: 2 groups of healthy volunteers in whom liver stiffness measurements were performed first in fasting condition, followed by measurements made at 30 minutes, 1 h, 2 h after food intake, were included in this study. All subjects received the same standard solid meal. Group 1 included 50 subjects (39 female, 11 male) in whom the liver stiffness was assessed by 2D Shear Waves Elastography- [Aixplorer, SuperSonic Imaging (SSI)], valid measurements being defined as the median value of 3 measurements acquired in a homogenous area. Group 2 included 33 subjects (20 female, 13 male) in whom the liver stiffness was assess by 2D-SWE.GE- (LOGIC E9, General Electric), valid measurements being defined as the median value of 10 measurements. For both groups the mean values of liver stiffness on fasting, at 30 minutes, 1 h, 2 h after food intake were calculated and compared. Results: The mean LS values did not change significantly neither for 2D-SWE, nor for 2D-SWE.GE: 2D-SWE – fasting vs. 30 minutes (5.73 ± 1.18, 5.64 ± 1.07, p = 0.69), vs. 1 h (5.73 ± 1.18, 5.56 ± 0.96, p = 0.43), vs. 2 h (5.73 ± 1.18, 5.61 ± 0.95, p = 0.57); 2D-SWE.GE – fasting vs. 30 minutes (5.24 ± 0.23, 5.47 ± 0.16, p = 0.42), vs. 1 h (5.24 ± 0.23, 5.2 ± 0.23, p = 0.90), vs. 2 h (5.24 ± 0.23, 5.20 ± 0.24, p = 0.91). Conclusion: Our preliminary results show the food intake did not significantly increased the LS values obtained by 2D share wave elastography techniques.

Comparison of four elastographic methods for the assessment of liver stiffness in compensated HCV liver cirrhosis

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Aim: To compare the performance of four ultrasound elastographic techniques and FibroMax in diagnosing compensated HCV liver cirrhosis. Material and method: The study included 81 consecutive patients previously diagnosed with HCV liver cirrhosis by means of clinical, biological, ultrasound findings, liver biopsy or laparoscopy. All patients were evaluated by four elastographic techniques in the same session: Transient Elastography (TE), Virtual touch Quantification (VTQ), 2D Shear Waves Elastography from SuperSonic Imagine (2D-SWE.SSI) and from General Electrics (2D-SWE.GE), while FibroMax was performed within a month. Reliable LS measurements were defined as follows: For TE, VTQ, 2D-SWE, GE - the median value of 3 LS measurements acquired in an homogenous area. The following published cut-offs were used to diagnose cirrhosis: TE-12 kPa; VTQ-1.81 m/s; 2D-SWE.SSI-13.5 kPa; 2D-SWE.GE-11.9 kPa. Results: Reliable LS measurements were obtained in 76/81 (93.8%) for TE, 81/81 (100%) for VTQ, 71/81 (87.6%) for 2D-SWE.SSI and 79/81 (97.5%) for 2D-SWE.GE. The accuracy of the methods for diagnosing liver cirrhosis were the following: TE- 94.7%; VTQ-85.2%; 2D-SWE.SSI-81.5%; 2D-SWE.GE-71.6%. No statistical differences were found between FibroTest and VTQ (p = 0.51), FibroTest and 2D-SWE.SSI (p = 0.86), FibroTest and 2D-SWE.GE (p = 0.29), VTQ and 2D-SWE.SSI (p = 0.55), VTQ and 2D-SWE.GE (p = 0.059), 2D-SWE.SSI and 2D-SWE.GE (p = 0.3). Statistical differences were found between TE and 2D-SWE.SSI (p = 0.01), TE and 2D-SWE.GE (p = 0.003), TE and FibroTest (p = 0.01). Conclusion: All ultrasound based elastographic methods had good performance for the diagnosis of compensated liver cirrhosis.

Elast PQ a novel elastographic method for the evaluation of liver stiffness in patients with B and C chronic hepatopathies

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The purpose of this study was to evaluate the diagnostic performance of a point shear wave elastography using ARFI technique - ElastPQ, in patients with B and C chronic hepatopathies, using Transient Elastography (TE) as the reference method, since it is a validated method for liver fibrosis assessment. Materials and methods: The study included 228 consecutive subjects with chronic hepatopathies (26% HBV, 74% HCV) from whom 51% had liver cirrhosis. Liver stiffness (LS) was evaluated in the same session by means of 2 elastographic methods: TE ( Fibroscan, Echosens) and ElastPQ (Philips, Affinity). Reliable LS measurements (LSM) were defined as follows: for TE – the median value of 10 LSM with a success rate ≥60% and an interquartile range < 30%. For ElastPQ – the median value of 10 LSM in the liver parenchyma, at least 1 cm below the capsule, avoiding large vessels. For differentiating between stages of liver fibrosis we used the following cut-off values for TE – mild fibrosis (F1)-6.1 kPa, moderate fibrosis (F2)- 7.2 kPa, severe fibrosis (F3)-9.6 kPa and for liver cirrhosis (F4) - 14.5kPa. Results: Reliable LSM were obtained in 90.7% (207/228) by means of TE and in 98.7% (225/228) with ElastPQ. In the final analysis 205 patients were included. The areas under the receiver operating characteristic curve for ElastPQ were: 0.90 for patients with mild fibrosis (F1), 0.95 for moderate fibrosis (F2), 0.96 for severe fibrosis (F3) and 0.94 for cirrhosis. The best cut-off values for discriminating mild, moderate, severe fibrosis and cirrhosis were 6.4, 7.2, 8.5 and 9.9 kPa. Conclusions: ElastPQ is a method that seems to be good for the diagnosis of all stages of liver fibrosis with good diagnostic accuracy. Reference: [1] Tsochatzis et al. Elastography for the diagnosis of severity of fibrosis in chronic liver disease: a meta-analysis of diagnostic accuracy. J Hepatol. 2011 Apr; 54 (4): 650 – 9.

Ultrasound imaging of breast implants: A pictorial essay demonstrating normal morphology and implant related complications

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Objective: Ultrasound imaging is widely used for screening of breast implants. It is an inexpensive and reasonably reliable tool in the hands of good ultrasound operators. As breast implants are not infrequently encountered in clinical practice, the sonographers and radiologists should be familiar with and competent in recognizing normal morphology and implant related complications. We aim to demonstrate these features in our educational poster. Materials and methods: A selection of breast implant ultrasound images seen in our institution are organized and curated for this purpose. The common types of implants, site of implantation, normal morphological features and variances are discussed. Important and common types of implant related complications as well as pitfalls are also reviewed. When available, counterpart mammograms or MRI images will be shown for correlation and comparison. Results: Commonly encountered complications in our practice include capsular retraction, intra-capsular rupture and extra-capsular rupture. Conversely, normal morphological appearances are also commonly observed and should not be mistaken for pathological changes. These appearances include radial folds, reverberation artifacts, peri-implant seroma, implant valve capsular calcifications and other appearances. Conclusion: Ultrasound can reliably identify the appearances of normal and abnormal breast implants. Knowledge and recognition of these features
will enable the accurate assessment of implant integrity and consequential delivery of appropriate patient care.

### PSS-02

**Maternal serum copeptin, MR-proANP and procalcitonin levels at 11–13 weeks gestation in the prediction of preeclampsia**

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**Purpose:** We investigated the potential value of maternal serum copeptin, midregional proatrial natriuretic peptide (MR-proANP) and Procalcitonin (PCT) levels at 11–13 weeks gestation in the prediction of preeclampsia (PE) in a case-control study. **Materials and methods:** Maternal serum concentration of copeptin, MR-proANP and PCT were measured at 11–13 weeks gestation in cases of PE (n = 35) and controls (n = 100). The PE group was divided into early-onset PE (EO-PE) and late-onset PE (LO-PE). From the regression model, the value in each case and control was expressed as a multiple of the expected median (MoM). The Mann-Whitney test was used to determine the significance of differences in the median MoM in each outcome group from that in the controls. **Results:** In the PE group, compared to controls, maternal serum concentrations of copeptin, MR-proANP and PCT were not significantly different. Conclusion: The maternal serum copeptin, MR-proANP and PCT levels are higher in EO-PE and LO-PE patients, but the difference is not significant. Thus, their levels in first trimester are not proven to be effective markers to screen for PE.

### PSS-03

**Impact of maternal serum levels of Visfatin, AFP, PAPP-A, sFlt-1 and PI GF at 11–13 weeks gestation on small for gestational age births**

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**Purpose:** Investigating potential value of maternal serum Visfatin, sFlt-1, PI GF, AFP, PAPP-A levels at first trimester for prediction of small for gestational age (SGA) at birth. **Materials and methods:** Measurements were performed in 20 SGA and 65 control cases. Logistic regression analysis adjusted for age and weeks of pregnancy at data collection was performed to estimate odds ratios (OR), 95% confidence intervals (95% CI) and p-values separately for each potential predictor. A multiple regression model was used to assess the impact of all promising predictors adjusted for each other. Receiver operating characteristic (ROC) analysis was used to indicate the ability to discriminate between SGA cases and controls. **Results:** There was an association of serum PlGF levels (OR 0.53 per interquartile range [IQR] increase in PlGF; 95% CI 0.24 – 1.16), sFlt-1/PI GF ratio (OR 1.42 per IQR increase in sFlt-1/PI GF; 95% CI 1.03 – 1.96), serum Visfatin levels (OR 0.31 per IQR increase in Visfatin; 95% CI 0.10 – 0.95) and smoking (OR 4.24: 95% CI 1.10 – 16.37) with SGA at birth. **Conclusions:** Associations between SGA and lower PI GF, Visfatin levels as well as increased sFlt-1/PI GF ratio and smoking status were detected which may contribute to predict SGA.

### PSS-04

**Carotid artery stiffness precedes the clinical onset of preeclampsia and persists postpartum: A longitudinal study**

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**Purpose:** Arterial stiffness is associated with an increased risk of cardiovascular events and preeclampsia is linked with profound changes in the maternal cardiovascular system. The aim of this prospective study was to characterize differences in several arterial elasticity parameters throughout pregnancy and postpartum in relation to preeclampsia development. **Material and methods:** We longitudinally assessed pulse wave velocity (PWV), 8-stiffness index (RSI), incremental elastic modulus (IEM), diameter (dD) and pressure difference (dp), compliance coefficient (CC), diameter distensibility (DD) and compliance (DC), cross-sectional distensibility (CSD) and compliance (CSC) of the carotid artery in 406 pregnant women (31 ± 5 years), in the first (T1: 11.4 ± 1.9 wks), second (T2: 21.5 ± 2.3 wks) and third trimester (T3: 32.5 ± 2.9 wks) and postpartum (21.6 ± 2.6 wks), using high-resolution ultrasound and an automated reading program. Comparisons were made with univariate ANOVA, data are expressed as mean (95%CI). **Results:** 54 women (32 ± 5 years) who later developed preeclampsia had higher PWV: 7.9 (7.1 – 8.7), RSI: 1.8 (1.4 – 2.1) and IEM: 1242.1 (984.9 – 1499.3) throughout pregnancy compared with 352 women who did not develop preeclampsia [PWV: 6.7 (6.5 – 7.1), RSI: 1.3 (1.2 – 1.4) and IEM: 814.5 (730.6 – 898.4)], adjusted for age, body mass index, mean arterial pressure and family history of cardiovascular disease. These differences persisted postpartum. There were no differences in dD, dp, CC, DD, CSD and CSC between the two groups. **Conclusion:** Increased maternal arterial stiffness, as assessed by pulse wave velocity, 8-stiffness index and incremental elastic modulus, pre-dates the development of preeclampsia and persisted postpartum.

### PSS-05

**Rare case of malignant yolk sac tumor and contralateral teratoma in pregnancy**

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A 32year old nulligravida was referred to our outpatient clinic in her 24th week of pregnancy with suspicion of placenta praevia. In our scan we could locate the placenta in the fundal area, but in the right adnexal region we detected a 17 × 9 cm inhomogeneous mass with cystic and non-cystic areas. The tumor presented with increased doppler perfusion but without papillary structures, No ascites was found. The contralateral ovary could be visualised. CA 12 – 5 was 78U/ml, CEA normal, AFP and ß-HCG highly elevated. Adnexectomy of the right ovary via a longitudinal incision was performed. The histopathological analysis of the tumor revealed a malignant yolk sac tumor of the ovary. After 4 weeks and in her 28th week of pregnancy we started chemotherapy with bleomycin, etoposide and cisplatin and applied 3 cycles in total. Regular scans of the fetus were performed, growth, doppler of the umbilical artery and amniotic fluid were normal. With 40 weeks she delivered vaginally a 3000 g male baby. In the follow up scan 6 weeks after delivery we detected a 5 cm inhomogeneous mass together with normal ovarian tissue in the area of the left ovary without ascites, highly suspicious for a teratoma. ß-HCG and AFP were still normal, so we decided to excise only the tumor and preserve the main part of the ovary. In the area of the left ovary we detected a 5 cm inhomogeneous mass together with normal ovarian tissue in the area of the left ovary without ascites, highly suspicious for a teratoma. ß-HCG and AFP were still normal, so we decided to excise only the tumor and preserve the main part of the ovary. Histologic analysis confirmed the diagnosis of a benign teratoma. Malignant tumors of the ovary in pregnancy are rare. Most of the tumors represent germ cell tumors. The treatment of the tumors in pregnancy follows same protocols as in nonpregnant women but long term effects on the fetus are not clear. This is a rare case of a malignant yolk sac tumor and contralateral teratoma.
Objective: Disinfection of transvaginal ultrasound (TVUS) probes is currently under discussion in Europe. As there is a potential risk of nosocomial infection, an appropriate disinfection method has to be used. Automated methods are relatively new in Europe and scientific background is scarce, so in this study we compared an automated method to our standard method. Methods: For this purpose, we designed a prospective randomised controlled clinical study. Currently, we are collecting samples from TVUS probes in our outpatient department. In one group disinfection is done with Antigermux® (high level disinfection using UV-C radiation) and in the other manually with Mikrozid sensitive® wipes. Samples are taken before and after disinfection and are then analysed for microbial growth. Results: We are still evaluating our samples and will present our final results. Data will be evaluated separately for the probe handle and body. Conclusion: There is no doubt that disinfection of TVUS probes has to be adequate. Automated methods are easy to handle, meet criteria of national hygiene recommendations but are expensive. Scientific background and guidelines of the leading ultrasound societies are needed to implement the most effective method as a standard.

Reference values for carotid intima-media thickness and flow-mediated dilation in normal pregnancies from 8 to 41 weeks gestation and from 8 to 14 weeks postpartum

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Purpose: To determine carotid intima-media thickness (cIMT) and flow-mediated dilation (FMD) and to describe the characteristic of both endothelial markers, throughout pregnancy and postpartum. Material and methods: A cross-sectional analysis of 566 low-risk singleton pregnancies, including 587 visits, was performed from 8 to 41 weeks gestation and from 8 to 14 weeks postpartum, using high-resolution ultrasound and an automated reading program. Results: When segregated for gestational age, the mean ± SD cIMT was 0.32 ± 0.09 in the first (1T), second (2T) and third trimester (3T) and 0.35 ± 0.09 at postpartum period (PP). The means for FMD were as follows: [1T]: 7.6 ± 6.2; [2T]: 8.5 ± 6.6; [3T]: 7.7 ± 5.7; [PP]: 6.5 ± 4.9]. No significant changes from the midline in cIMT and FMD were observed with increasing gestational/postpartum weeks. Conclusion: Normal reference ranges for cIMT and FMD were established. This may serve as a basis for further studies and patients with abnormal endothelial function.

Abnormal posterior brain and molar tooth sign in a fetus with Joubert syndrome at 11 – 13 weeks – new gene mutation discovered: Case report

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Purpose: Joubert syndrome (JS), a rare autosomal recessive disorder, is characterized by the molar tooth sign on an axial magnetic-resonance-imaging (MRI). This abnormality results from a complex brain malformation and co-occurs with agenesis/hypoplasia of the cerebellar vermis, that leads to an abnormal enlargement of the fourth ventricle (4V). The adverse outcome of JS is characterized by episodes of hyperpnea, abnormal ocular movement, hypotonia, ataxia and developmental delay. Variable features, including cystic kidneys have led to a broader classification, such as JS and related disorders. Results: We describe abnormal sonographic findings of 4V, brainstem and kidneys in one fetus with JS. A 26-year-old nulliparous woman was referred for evaluation after a nuchal translucency of 3.5 mm had been measured (11+4wks). The mid sagittal view displayed: enlarged 4V (cisterna magna, increased BS/BOB-ratio), demyelination of the brainstem. A high risk for cystic posterior fossa malformations, particularly Dandy-Walker continuum, was suspected. The molar tooth shaped cerebellar peduncles on an axial view in the first trimester were noted in the sonographic imaging review. The kidneys appeared normal at this stage. Chorionic villus sampling was performed and revealed a normal male karyotype. Sonographic evaluation (15+4wks) showed marked vermician hypoplasia, deep interpeduncular fossa, brainstem dysplasia, echogenic kidneys. Confirmed by fetal-MRI (16+4wks). After termination of pregnancy (17+6wks), further fetal-DNA analysis revealed two mutations in the INPP5E-gene, which carry a high probability in causing JS in this family and of which one mutation has not been previously described. This allows early prenatal genetic diagnosis in their future pregnancies. Conclusion: As exact prenatal genetic testing may not always be compelling in Joubert syndrome, the ability to identify the molar tooth sign in prenatal ultrasound before 17 weeks provides a valuable adjunct to differentiate between posterior fossa abnormalities, particularly Dandy-Walker malformation, Blake’s pouch cyst, isolated vermician hypoplasia, encephalocoele and to select appropriate genetic analysis.

Maternal Acetylcholine-Receptor Autoantibodies causing recurrent fetal Arthrogryposis

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Background: The foetal Arthrogryposis multiplex congenita is defined as the occurrence of malposition of two joints in at least two body regions. This descriptive definition comprises a multitude of genetic and non-genetic causes. The detection of the underlying aetiology is reported to be approximately 5%. A rare non-genetic cause of foetal Arthrogryposis is a maternal myasthenia gravis or maternal autoantibodies against the Acetylcholine-Receptor (AChR-AA). By passing the placenta, they cause fetal akinesia deformation sequence. Case report: A healthy 28-year-old primigravida presents in 13 weeks of gestation for first trimester screening. A cystic hygroma is detected and chorionic villus sampling is performed yielding a normal fetal karyotype. In the 16 weeks scan, a fixed extension in the knee joints, a fixed flexion in the elbow joint is detected. In 21 weeks the patient is referred with hydrops fetalis and massive skin oedema. The liver function tests were abnormal and pregnancy was terminated due to impending mirror syndrome. Six months later the patient presents with a new pregnancy. The first trimester- as well as 16 weeks scan were uneventful. In the 22 weeks scan, the fetus exhibited extended legs, talipes on both sides, fixed flexion in the elbow joints, retrogastria and polyhydramnios. The karyotype was normal. A genetic counselling was performed and maternal AChR-AA were determined, which were elevated 40x above normal. Due to progressive fetal akinesia including thorax deformation, pregnancy was terminated. Conclusion: Maternal AChR-AA constitute a rare cause of fetal Arthrogryposis, also in the absence of symptoms of myasthenia gravis in the pregnant mother. By passing the placenta, they cause foetal akinesia deformation sequence. Differential diagnostic workup, especially in recurrent cases, should include their evaluation. Knowledge about their presence allows for diagnostic intervention such as plasmapheresis before the subsequent pregnancy.
3D Ultrasonic measurements of the Bilateral nasal bone in the first trimester fetuses and fetuses with trisomy 21
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Purpose: Three-dimensional ultrasonic with its different display modes allows an accurate demonstration of the ossified bones of the fetal face in the first trimester. In particular, the nasal bones can be evaluated on both sides and measured separately. The aim of this study was to establish the normal range for the left and right nasal bone and to demonstrate the development of the nasal bones in cases with trisomy 21 in the first trimester. Material and method: In 200 normal fetuses and 12 fetuses with trisomy 21 the left and right nasal bone was measured in the multi-planar 3D mode after aligning the fetal head into an exact upright position to get a true profile. All scans were performed using E8/E10 GE equipment (Erlangen, Austria) with a 5–8 MHz 3D abdominal or a 5–9 MHz 3D vaginal transducer. Gestational age was between 10+3 and 14+0 weeks of gestation. Results: In the normal fetuses 151 cases had the same nasal bone length on both sides. In 43 cases a difference of up to 5 mm between the left and right nasal bone could be observed and in 3 cases even absence of the nasal bone on one side was found. In the 12 fetuses with trisomy 21, 3 cases showed bilateral hypoplasia of the nasal bones and 9 cases absence of nasal bones on both sides. Conclusions: Three-dimensional ultrasonic is a useful tool in the evaluation of the nasal bones in the first trimester. Because 23% of the normal cases showed a difference between the left and right nasal bone length, it is important to measure the nasal bone length on both sides consequently.

Cloacal dysgenesis sequence and myelomeningocele in maternal obesity and gestational diabetes
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Purpose: The risk of prenatal caudal regression syndrome in worse managed gestational diabetes mellitus is four hundredfold and in women with BMI >40 threefold higher in comparison to normal collective. This constellation is often found in pregnant women with a deficiency of folic acid. We describe a case of fetal malformation in obesity and gestational diabetes. Method: Case report. Result: The 25 years old woman (BMI 43) ist seen in the first pregnancy because of an insulinindependent gestational diabetes mellitus. The perinatal outcome was without pathological findings. After this pregnancy she gained weight for 20 kg. A postnatal observation did not occur. In the second pregnancy (BMI 48) she already received insulin since the 8th week of gestation. During the second trimester an anhydranmmion occurred. Furthermore we found an intraabdominal cystic mass. We suspected a cloacal dysgenesis, which was confirmed after pathologic examination after induced abortion. After one year she was seen with the third pregnancy für insulin therapy during 12 th week of gestation. During the second screening we found a fetal myelomeningocele and an arnold chain malformation. Periconceptional the HbA1c was quite normal (<6%). We suspect the reason for this malformation in deficiency of folic acid in obesity. Conclusion: The close meshed interdiciplinary care in women with obesity and gestational diabetes mellitus should be carried out experienced. Especially in preparation of following pregnancies such women have to lose weight after child birth and should obtain 5 mg folic acid per day preconceptional.

Growing renal mass: mesoblastic nephroma in pregnancy
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Case report: A 41-year-old GIII/PI presented for the first time at 30+3 weeks of pregnancy with a newly diagnosed fetal abdominal mass, which hadn't been visible 6 weeks before. At prenatal ultrasonography reveals a 66 × 56 × 66 mm left renal mass with abundant vascularisation and a macromosal male fetus. The right kidney is normal in size and shape. The consulted pediatric nephrologist suspects a wilms tumor or a mesoblastic nephroma. Fetal MRT shows a solid mass, 160 ml in volume, the radiologists suspect a mesoblastic nephroma. Because of the maternal pain and respiratory distress of the severe polyhydramnios amnioreduction is performed weekly. During the following three weeks the tumor grows from 160 ml to almost 400 ml. The case is presented to the pediatric oncology board; together, it is decided to allow the pregnancy to go to term despite the fast growth of the tumor. At 34+3 weeks of pregnancy, a spontaneous rupture of membranes occurs 3 days after the last amniosentesis is performed at the mothers request without complication. The newborn is cyanotic without spontaneous breathing, APGR 3/5, pH 7.31, BE -2.3. Intubation is necessary because of the respiratory failure caused by the big abdominal mass. On the 3rd day of life, left radial transplenteral nephrectomy and staming lymphanadectomy is performed. The operation proves to be difficult to carry out because of the extensive blood vascularisation of the tumor, with great loss of blood. The exchange of 1.5 times the total blood volume is necessary, the newborn receives catecholamine therapy for 2 days. Histology shows a mesoblastic nephroma with tumorfree staning lymph nodes, SIOP Stade II. The newborn is discharged from hospital on day 22 of his life. Follow-up examinations have been uneventful until now.

Fatal neonatal hemochromatosis as a rare cause of intrauterine growth restriction
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Fatal neonatal hemochromatosis in the newborn accompanied by extrahepatic siderosis. This Gestational Alloimmunnic Liver Disease (GALD) is resulting from the placental transfer of maternal IgG antibodies against fetal hepatocytes. Diagnosis is often made post mortem for the severe and unexpected occurrence [1]. A 27 y east-african patient (GIII/II, 2 healthy children born at term in 2003/SGV and 2012/CS for cephalohetic disproportion) was admitted in our unit because of an unexplained increase in maternal CRP serum level. Under the suspicion of occult PRP steroids were given accompanied by antibiotic coverage and delivery was performed at 32+0 wksGA. PRP could be excluded biochemically; sonographic assessment revealed an increased cardiovascular ratio and peak systolic velocity in the MCA, changing over time, with otherwise normal sonanatomy and fetomatale Doppler findings. The patient has been known for severe anemia since 15 wksGA and presented with an unexplained increase in maternal CRP serum level. Under the suspicion of occult PRP steroids were given accompanied by antibiotic coverage and delivery was performed at 32+0 wksGA. A preterm, asymmetrical dysmature, severely anemic baby was delivered in intact membranes (1190 g, 39 cm). Cardiotor-espiratory adaptation was impaired (APGR 1/8/8, pHUA 7.33). The infant presented with peripheral edema, reduced muscular tone and des- ranged hematologic and plasmatic coagulation parameters. Over the next days the clinical situation deteriorated despite neonatal intensive care from primary liver leading into fatal multi-organ failure after 7 days.
Results:
Patients underwent a following magnetic resonance imaging in order to中央神经系统 anomalies based on ultrasound evaluation. All anomalies approached and appropriate counseling. Taking this into consideration we believe magnetic resonance imaging can bring additional information or clarify a diagnosis of central nervous system abnormalities and to report its additional and differential value being used as a second line diagnostic procedure. Material and methods: This was a retrospective study based on 54 women in singleton pregnancies with recognized or suspected fetal central nervous system anomalies based on ultrasound evaluation. All patients underwent a following magnetic resonance imaging in order to confirm or exclude ultrasound diagnosis or to incorporate additional findings. Results: Fetal ultrasound was performed at mean gestational age of 21 weeks (range 12–33) and fetal magnetic resonance imaging at 27 weeks (range 21–35). In 51.9 percent of the cases the diagnosis from ultrasound and MRI were the same. In 37 percent of the patients the diagnoses were also concordant, but magnetic resonance imaging brought additional information. In 88.9 percent of the cases diagnostic results have been confirmed by MRI. Lack of concordance between both techniques was found in 11.1 percent of the cases. Patient MRI ultrasound conditions like oligo or anhydramnios or the use of 3 dimensional ultrasound did not show statistically significant results in this particular study. Conclusion: MRI plays a significant role as an addition to ultrasound in diagnosing fetal central nervous system anomalies. Our data supports the hypothesis that ultrasound alone is highly predictable, but magnetic resonance imaging can bring additional information or clarify a suspected finding. This sometimes can lead to a change in treatment approach and appropriate counseling. Taking this into consideration we can state that both the ultrasound and MRI should still be used as complementary techniques in prenatal diagnosis of central nervous system abnormalities.

**Prenatal MRI: Is it still useful in the clinical management of fetal central nervous system malformations diagnosed by ultrasound?**

**PS5-14**

**Purpose:** To evaluate the role of magnetic resonance imaging in the diagnosis of central nervous system abnormalities and to report its additional and differential value being used as a second line diagnostic procedure.

**Material and methods:** This was a retrospective study based on 54 women in singleton pregnancies with recognized or suspected fetal central nervous system anomalies based on ultrasound evaluation. All patients underwent a following magnetic resonance imaging in order to confirm or exclude ultrasound diagnosis or to incorporate additional findings. **Results:** Fetal ultrasound was performed at mean gestational age of 21 weeks (range 12–33) and fetal magnetic resonance imaging at 27 weeks (range 21–35). In 51.9 percent of the cases the diagnosis from ultrasound and MRI were the same. In 37 percent of the patients the diagnoses were also concordant, but magnetic resonance imaging brought additional information. In 88.9 percent of the cases diagnostic results have been confirmed by MRI. Lack of concordance between both techniques was found in 11.1 percent of the cases. Patient MRI ultrasound conditions like oligo or anhydramnios or the use of 3 dimensional ultrasound did not show statistically significant results in this particular study. **Conclusion:** MRI plays a significant role as an addition to ultrasound in diagnosing fetal central nervous system anomalies. Our data supports the hypothesis that ultrasound alone is highly predictable, but magnetic resonance imaging can bring additional information or clarify a suspected finding. This sometimes can lead to a change in treatment approach and appropriate counseling. Taking this into consideration we can state that both the ultrasound and MRI should still be used as complementary techniques in prenatal diagnosis of central nervous system anomalies.

**Introduction:** Congenital urolithiasis is a rare congenital abnormality. In a period of 8 years two male fetuses were referred to our centre because of dilated bowels with intraluminal echogenic foci combined with oligohydramnios. Suggested prenatal diagnosis, management and outcome diverged. **Case 1:** In 2007 a 37-year-old second gravida was referred for ultrasound at 24 weeks of gestation. We found bowel dilatation with intraluminal fluid and enterolithiasis. Amniotic fluid was decreased. Fetal sphincter ani could be detected. We performed amniocentesis showing normal results. Further investigations showed increasing bowel dilatation and decreasing amniotic fluid. The suggested diagnosis was colon stenosis. At 34 weeks of gestation cesarian section was performed due to therapy resistant preterm labor. The birth weight was 2700 g. The newborn presented with respiratory problems and oliguria of unknown cause. On day three laparotomy was performed and a colostoma constructed because of high anal atresia. Furthermore intraoperative inspection revealed a rectovesical fistula. In the postoperative course the boy was depressed and died the next day by sudden asystolia following surfactant application. **Case 2:** In 2015 a 26-year-old first gravida was referred for ultrasound at 31 weeks of gestation. There were similar findings like in case 1 this time suggesting urointestinal fistula. In a prenatal interdisciplinary conference with pediatric surgeons an explorative laparotomy right after birth was planned. At 39 weeks of gestation the boy was delivered by cesarian section. The birth weight was 2930 g. Supraventricular atresia and rectovesical fistula were confirmed. Postoperative course had no complications. 6 weeks after surgery the child is developing with no particularly. **Discussion:** Because direct imaging by ultrasound is not possible, prenatal diagnosis of urointestinal fistula is difficult. Dilated fetal colon with echogenic foci caused by enterolithiasis combined with oligohydramnios serve as sufficient diagnostic signals. Early postnatal operation seems to be mandatory for positive outcome.

**PS6-01**

**Two cases of fetuses with urointestinal fistula**

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**Purpose:** Abdominal pain is a common symptom in emergency room (ER), covering 10% of the assists. The delay in diagnosis and treatment adversely affects the patient’s prognosis. Transabdominal ultrasonography is most commonly used to obtain images of hepatobiliary, urogenital, and pelvic structures. However, improvements in ultrasound technology and increasing familiarity with ultrasonographic findings in a variety of gastrointestinal disorders, as Crohn’s disease (CD), are broadening its applications, and it is an aspect to be considered by emergency physicians (EP) in patients with recurrent abdominal pain. We present a case of CD, diagnosed at ER, through the use of ultrasound scanning by EP. **Material and methods:** A patient with abdominal pain, with a final diagnosis of an CD. Results: 36 year old male, was admitted to the ER for the third time by abdominal pain. Emergency analytical were unre- markable, as in the preceding cases. Because of the pain the emergency physician underwent an ultrasound scan observing area terminal ileum same transluminal thickening with luminal narrowing and decreased peristalsis, involvement of the mesenteric lymph nodes and multiple underlying fat, suspecting CD. We entered the patient performing CT abdomen and ileo-colonoscopy confirmed the diagnosis. **Conclusion:** Bedside ultrasound of the patient by the EP could be an useful tool in cases with abdominal pain whose clinical data and laboratory are unclear: Suspicion of CD, the sensitivity of ultrasound is nearly 90%, especially if ileal location, as in the case presented; being the specific data and the transmural segment thickening, and the presence of fistulæ or abscesses. Stenosis exists ultrasound specificity is greater than 95%. Due to its great advantages such as low cost, accessibility, not irradiated and non invasive ultrasound should be considered in the diagnosis and monitoring of all CD, therefore EP must be trained to diagnose sonographically acute complications of this disease.

**PS6-02**

**Bedside ultrasound in the emergency department and abdominal pain**

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**Purpose:** Assessing and training ultrasound to undergraduate students of 3rd year medical assigned to Valme Hospital, University of Sevilla. **Material and methods:** Descriptive study developed in February, March and April of 2012 by 48 medical students from 3rd year who studied the subject of Medical Pathology. They were divided into groups of 8, and each group was taught a Theoretical and practical 4-hour workshop. The contents was the protocol Focused Assessment With Sonography for Trauma (FAST) for detecting abdominal free-flowing liquid. The workshop was led by two emergency physicians with extensive training and experience in clinical ultrasound. After the theoretical explanation of each block, students practiced the basic plans using their peers as models for over 3 hours. Upon completion, students had to complete a questionnaire and they were asked, using a Linkert 5-point scale (very good = 5, ... very bad =1), to evaluate the agreement or disagreement about their experience with the workshop. Their knowledge did not evaluate ultrasound. **Results:** 100% of students (50) evaluated the workshop as very useful.

**PS6-03**

**Undergraduate teaching in ultrasound to medical students**

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A 40-year-old male was admitted for weight loss of 5 kilograms and abdominal pain. Diarrhea was denied. He had no further history of disease. At physical examination we found slight tenderness of the abdomen, no other pathological findings. His general practitioner had already arranged a CT-scan of the thorax, which showed enlarged mediastinal and retroperitoneal lymph nodes without tumor growth in thorax and abdomen. The patient was sent for ultrasound guided puncture of the abdominal lymph nodes to our ultrasound laboratory. We found the lymph nodes being hyperechoic and settled the puncture because of the typical aspect. Gastrointestinal stromal tumors are common mesenchymal tumors of the digestive tract. They have a characteristic morphology, are usually positive for CD117 (c-kit), CD34 and S100. The tumor is caused by a mutation in the KIT or PDGFRA. The tumors predominantly appear in stomach (60%) and small intestine (30%), rarely in rectum. Gastrointestinal stromal of the appendix are extremely rare, 0.1% of the cases described. 9 cases have been reported in the world literature to date, one malignant, the others benign. The age of the patients described so far are between 56 to 78 years with a mean age of 67 years. Our patient is the oldest patient previously described.

**Purpose:** Case study of gallbladder ascariasis complicated with acute hepatitis, diagnosed at ED, through the use of US scanning by EP. **Materials and method:** A patient with jaundice, with a final diagnosis of Ascariasis infestation assessing US, performed by EP. **Results:** 16-year-old male suffering malaise and jaundice for two days, without fever. He was hemodynamically stable, with extended jaundice. Abdomen was soft, depressible, painless and non-palpable masses or organ enlargement, no signs of peritoneal irritation. The analytical tests showed AST 1488, LDH 552 and bilirubin of 9.1, along with coagulopathy with INR of 1.88. The emergency physician made an abdominal ultrasound scan, which showed an echogenic tubular image without posterior acoustic shadowing. The patient was admitted to the Infectious Diseases Unit. Within 24 hours of admission there was a rapid and progressive deterioration of the liver and renal function and overall severe liver failure, requiring an urgent liver transplant. **Conclusions:** Ascaris lumbricoides is the largest and most predominant of the human helminths. Infection occurs by ingestion of the embryonated eggs. The released larvae from the eggs in the intestine go into a pulmonary migration phase. The larvae attain sexual maturity within three months after reaching the small intestine. It is proven that ultrasound can diagnose this worm infestation hepatobiliary in up to 84% of cases, it may however, fail in cases where the parasite has died or the visualisation is hindered by the presence of stones. Ascariasis of the gallbladder is a very rare occurrence and its relationship with acute hepatitis has not been well studied, therein lies the importance of this case, along with the news of the diagnosis of a case of this type, for the use of ultrasound by the emergency physician.

**Usefulness of bedside ultrasound by emergency physicians in a patient with acute hepatitis**

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**PS6-04**

**Gastrointestinal stromal tumor of the appendix, extremely rare, mostly benign**

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A 92-year-old female is admitted with acute right-sided lower abdominal pain. On admission the patient is in good general condition. The abdomen is soft, with tenderness in the right lower abdomen, peristalsis is downright. In the abdominal ultrasonography we find a 2.5 cm long and 14 mm wide cockade with preserved wall stratification in the right lower abdomen. Immediate laparoscopy is initiated. It reveals a necrotic, fibrinous appendix with ischemia of the distal cecum. Laparoscopic appendectomy with ileocecal resection is performed. Wound healing is primarily, the patient can be discharged after 5 days. Histological examination shows a gangrenous appendicitis with ischemic colitis. There is a 5 mm large gastrointestinal stromal tumor with 4 mitoses per 21 HPF. Immunohistochemistry shows a strong positivity for CD34 and DOG1 and focal positivity for S100. 1A4, Desmin and Calponin are negative. Risk group is 0 by Miettinen and Lasota.

**Fig. 1:** Cockade of cecum

**Gastrointestinal stromal tumors are common mesenchymal tumors of the digestive tract. They have a characteristic morphology, are usually positive for CD117 (c-kit), CD34 and S100. The tumor is caused by a mutation in the KIT or PDGFRA. The tumors predominantly appear in stomach (60%) and small intestine (30%), rarely in rectum. Gastrointestinal stromal of the appendix are extremely rare, 0.1% of the cases described. 9 cases have been reported in the world literature to date, one malignant, the others benign. The age of the patients described so far are between 56 to 78 years with a mean age of 67 years. Our patient is the oldest patient previously described.**

**Hyperechoic mesenteric lymphnodes, weight loss and abdominal pain**

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A 40 years old male was admitted for weight loss of 5 kilograms and abdominal pain. Diarrhea was denied. He had no further history of diseases. He reported a cigarette consumption of about 25 pack years. At physical examination we found slight tenderness of the abdomen, no other pathological findings. His general practitioner had already arranged a CT-scan of the thorax, which showed enlarged mediastinal and retroperitoneal lymph nodes without tumor growth in thorax and abdomen. The patient was sent for ultrasound guided puncture of the abdominal lymph nodes to our ultrasound laboratory. We found the lymph nodes being hyperechoic and settled the puncture because of the typical aspect. We sent the patient for upper gastrointestinal endoscopy, which revealed duodenal lymphangetiasis. Histological analysis of mucosal specimens showed Whipple’s disease. The patient got antibiotics and recovered fully.

**Fig. 1:** Hyperechoic lymph node in whipple’s disease

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Conclusions: Three findings can be drawn from this case:
1. Patient with an advanced tubal ectopic pregnancy can present asymptomatic and common clinical findings can be absent leading to misdiagnosis.
2. Advanced tubal ectopic pregnancy can be managed laparoscopically.
3. The mucosal layer of the fallopian tubes is capable to provide an environment for implantation and supply for fetal growth up to 11 weeks of gestation.

PS6-08
Fetal intrauterine volvulus in cystic fibrosis
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Purpose: Up to 15% of fetuses with cystic fibrosis develop meconium ileus and 50% of these are associated with perforation, volvulus and atresia. Intrauterine volvulus is a life-threatening condition and rarely diagnosed prenatally. We present a case of intrauterine volvulus associated with cystic fibrosis in a mother with a previously affected child.

Case: The 26-year-old, gravida 2, para 1 was referred at 35+3 gestational weeks for the planning of delivery. In the first pregnancy she had caesarean section at term for fetal meconium ileus and ileal atresia, with the diagnosis of cystic fibrosis. In the current pregnancy the patient had normal first and second trimester ultrasound scans. Amniocentesis was not performed due to the presence of a retroplacental hematoma. Ultrasound examination revealed polyhydramnion, dilated and aperistaltic bowel loops and ascites. In one section the bowel loops corresponded to the so-called “whirlpool sign”. By suspicion of a volvulus with meconium peritonitis, an urgent caesarean section was performed. A girl, 2490 g (APGAR 9/9/9, umbilical artery pH: 7.30) was delivered. She had a massively distended abdomen with livid discoloration. Laparotomy revealed a partial, 720° volvulus and a long-standing perforation in the right upper abdomen. The bowel loops were filled with meconium pellets. Fifteen cm of necrotic distal ileum were resected and a “double-barrel” ileostomy was performed. A reanastomosis was performed on the 4th postnatal day. The newborn suffered from an exocrine pancreas insufficiency and was diagnosed with cystic fibrosis. The baby was discharged on the 37th postnatal day.

Conclusion: Cystic fibrosis induced meconium ileus can be associated with intrauterine fetal volvulus. Bowel obstruction may not be apparent at the time of anomaly delivery. The obstetric history led to a targeted ultrasound examination at presentation with a high index of suspicion of intrauterine volvulus necessitating delivery. Such timely intervention prevents fatal fetal outcomes.
The study of normal parathyroid echogenicity
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Background: Some of the normal parathyroid can be shown on an ultrasound image. To our knowledge, however, either high or low echoic level of the normal parathyroid has been described without the confirmation of an experiment. Therefore, the echogenicity of the normal parathyroid was studied using intraoperative ultrasound.

Materials and methods: Between October 2015 and January 2016, the parathyroid was examined in thyroidectomy procedures of 16 contiguous patients with thyroid disease using an intraoperative array 8–18 MHz probe sheathed with a sterilized covering. There were 12 female and 4 male patients with an age range of 29–74 years old (mean, 47 ± 15). After one thyroid lobe or whole thyroid gland was removed, the parathyroid was found out by the surgeon. Then the parathyroid was scanned directly and through frontally-padded muscle of the neck, respectively. Results: The pathology results were thyroid papillary carcinoma (n = 11), thyroid medullary carcinoma (n = 2), thyroid adenoma (n = 1), retrosternal nodular goiter (n = 1), and thyroid nodular goiter (n = 1). Totally, twenty-five parathyroids were scanned in operation, including 8 right superior, 6 right inferior, 6 left superior, and 5 left inferior glands. All the parathyroids were visualized as hypechoic structures, being homogeneous in texture (n = 22, 88%) and oval (n = 20, 80%), round (n = 3, 12%), or strip-like (n = 2, 8%) in shape. The length, width, and thickness averaged 6.8 ± 2.9 mm (range, 4–18 mm), 4.3 ± 1.6 mm (range, 3–10 mm), and 3.5 ± 1.3 mm (range, 1–7 mm). Conclusion: The normal parathyroid was confirmed to have a hypechoic echogenicity, with most of them being homogeneous and round-shaped, and measuring an average size of 6.8 × 4.3 × 3.5 mm through intraoperative ultrasound.

Purpose: The hypoglossal nerve provides the motor innervation for the tongue. A lesion of the nerve can lead to dysphagia, dysarthria, and finally to atrophy of the tongue. Established imaging protocols with MRI and CT solely include the assessment of the supposed path of the nerve and do not allow the direct visualization of the nerve. The aim of this study is to determine the feasibility of the direct sonographic visualization of the nerve and to evaluate it in a clinical setting.

Materials and methods: First, the nerve was marked with ink in 24 neck sides of 12 fresh human cadavers. Subsequently the nerve was exposed for confirmation. Second, the nerve was morphometrically assessed in healthy volunteers. Third, 2 resident physicians with little and intermediate experience in ultrasound scanned volunteers. Fourth, patients with motor symptoms of the hypoglossal nerve were examined. Results: The hypoglossal nerve was identified correctly in all cadaver specimens and all volunteers. We found a cross sectional area of around 1.9 – 2.1 mm². The resident physicians could locate the hypoglossal nerve correctly in 19/22 cases. Finally, we could depict pathological alterations of the nerve in clinical cases. Conclusion: A direct visualization of the hypoglossal nerve in the neck is reliably and reproducibly feasible.
benign and malignant lesions, independent of conventional B-mode parameters. The combination of SWE parameters and conventional B-mode parameters does not significantly improve the diagnosis of malignant thyroid nodules. The presence of MCs can influence the SWE-whole value, while the presence of CAT may not.

**Static and dynamic sonography of facial muscles in healthy subjects – intra-observer and inter-observer reliability in dependence of intervellent measurements**

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**Purpose:** Are static and dynamic ultrasound measurements of facial muscles reliable when measuring with two week intervals? The intra- and inter-observer reliability has shown good results in facial muscle area measurements, but high variability in longitudinal and cross-diameter when measuring twice within 48 hours (Sauer, 2014). Short timeframes seem to improve the intraclass correlation coefficient (ICC), because the observer has the chance to remember the position of the probe and the ultrasound scan plane (Satiroglu et al. 2005). In clinical practise, patients are typically followed over longer time intervals. That is why this study was designed with measurement intervals of 14 days.

**Material and methods:** Using an eZono4000, eZono, Germany, with linear probe and the ultrasound scan plane (Satiroglu et al. 2005). In clinical practise, patients are typically followed over longer time intervals. That is why this study was designed with measurement intervals of 14 days. The similar ICCs of the intra-observer reliability were lower than in recent studies (areas: ICC/median 0.815 – 0.986/0.090; diameters: 0.162 – 0.988/0.678 with 2-weeks-interval; areas: 0.826 – 0.996/0.990; diameters: 0.221 – 0.991/0.860 with a 2-day-interval). The ICCs of the intra-observer reliability were 0.476/0.968 with 2-weeks-interval vs. areas: 0.495 – 0.977/0.907; diameters: 0 – 0.931/0.660 with a 2-day-interval. **Conclusion:** A longer timeframe in the intra- and inter-observer reliability creates lower ICCs (p < 0.002). Nevertheless they still showed a good reproducibility over time (especially for area measurements). As a result the standardized protocol can be applied to monitor changes in facial muscles over time even when performed by different examiners.

**Static and dynamic sonography of facial muscles in healthy subjects – Impact of the process of manual muscle segmentation on inter-observer-reliability**

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**Purpose:** Identifying the impact of manual segmentation on the reliability of static and dynamic ultrasound measurements of facial muscles. The inter-observer-reliability (for scanning and manual segmenting by two independent observers) in recent studies has shown good results in area measurements (intra class coefficient (ICC)/median: 0.960 – 0.997/0.98), but high variability in longitudinal and cross-diameter (0 – 0.954/0.83 Sauer, 2014). The aim of this study was to figure out the impact of the muscle-segmentation on the ICC in 2014 to the impact of the ultrasound scans. **Material and methods:** Bilateral scans of seven facial muscles and two masticatory muscles were performed on 10 volunteers (5 women; age: 21 to 27 years) using an eZono4000, eZono, Germany, with linear probe (L3 – 12). The scans were based on a standardized examination protocol (Sauer, 2014) and were made by two different examiners (T.S. and A.H.) at two separate time points. Both sets of ultrasound pictures were manually segmented by both examiners. **Results:** There was a high inter-observer-reliability (scanning and segmenting by two different examiners) in area measurements (0.49 – 0.98/0.91) and high variability in diameter measurements (0 – 0.91/0.66). The inter-rater-reliability (segmenting of the same scans by two different examiners) showed similar results with nearly the same ICCs (areas: 0.814/0.98/0.92; diameters: 0.12 – 0.95/0.75). **Conclusion:** The similar ICCs of inter-observer-reliability and inter-rater-reliability prove that most variability is due to the process of manual segmentation, not to the ultrasound scanning. Reversely, this means that the existing ultrasound protocol is already a good instruction to achieve reproducible images of facial muscles. To improve the reproducibility of the segmentation, especially of the longitudinal and cross-diameter measurements, based on the presented results, a new instruction focused on segmentation was developed. Using this segmentation-instruction is believed to further improve the reliability of quantitative ultrasound of facial muscles in future studies.

**Sonoelastographic modalities in the evaluation of salivary gland disease**

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**Purpose:** The evolution of sonoelastographic modalities facilitated new diagnostic options in the evaluation of pathologies in numerous regions of the human body. While sonoelastographic modalities could be implemented in the clinical routine of various specialities, its benefit in the clarification of salivary gland pathologies, despite good accessibility, is still part of ongoing investigation. **Material and methods:** Sonoelastographic modalities have been evaluated in the diagnosis of both tumorous lesions of the salivary glands and in general salivary gland disorders (chronic inflammation, irradiation, Sjögren’s syndrome). Reproducibility of SWV was evaluated with inter- and intrarater reliability. A review of the available literature including various publication from our study group is presented. Results: SWV proved to be reliable in the diagnosis of Sjögren’s syndrome, mainly early presentations of this disease. There is first evidence, that SWV might be suitable for the monitoring of local-therapeutic measures, e.g. in Sjögren’s syndrome but also irradiated salivary glands. Sonoelastographic modalities are not able to provide reliable information in respect of the entity and dignity of salivary gland tumors and should therefor not be applied as single imaging modality. Our study group developed indications for the application of sonoelastography within the setting of a multimodal sonographic pathway. The reproducibility of SWV in the submandibular gland proofed to be limited, in the parotid gland SWV should be performed by experienced examiners. **Conclusion:** Sonoelastographic modalities for the evaluation of tumors of the salivary glands should only be applied within the framework of multimodal sonographic pathways. There is increasing evidence that SWV is beneficial in the evaluation of general salivary gland diseases, mainly in patients with Sjögren’s syndrome.

**Doppler based algorithm for detection of blood flow restriction in vertebral artery**

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**Purpose:** Arterial diameter and flow velocity are manipulated variables of flow volume and local blood pressure drop. The total pressure drop in right vertebral artery (VA) equals left. Based on here we propose an algorithm for detection of flow restriction in VA by standard extracranial vascular sonography of V2. **Material and method:** The blood pressure drop in VA in the quasi-stable enddiastolic flow phase results from the sum of pressure drops dp, thus in sample volume of vascular sonography of V2. After Hagen-Poiseuille is valid dp = k·v²/d², whereby v represents maximum enddiastolic flow velocity, d diameter of VA measured in the color mode and k a factor. Dividing dp of right and left VA results in a ratio, which describes, aroundhow enddiastolic pressure drop in sample volume of both VAs differs. This blood pressure drop ratio will be set in relation to the diameter ratio of VA. The measured values by vascular sonography of V2 in 303 patients were arranged on the basic of CT- or MR-angiography and sonographic findings as moderate or severe flow restriction or normal. **Results:**

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Values of severe pathology show allower smaller blood pressure drop in the sample volume (pressure drop ratio is smaller in same diameter ratio) in comparison to normal. This deviation fails smaller for moderate pathology, but increases for both pathological groups with larger diameter ratio. **Conclusions:** The proposed algorithm illustrates reduction of pressure drop in V2 due to flow restriction in another location of VA and is recommended as screening parameter in standard extracranial vascular sonography. Particularly a reactively narrowed VA in pathological case can be distinguished from hypoplasia.

### PS7-10

**Aorto-caval fistula mimicking severe liver disease – Problems and possibilities of EVAR in a ruptured aortic aneurysm**

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**Purpose:** To show primary and secondary symptoms and diagnostic problems of a high flow aorto-caval fistula. **Material and methods:** A 60 year old male was admitted to hospital due to severe pulmonary hypertension (PH), cardiomyopathy and liver cirrhosis with ascites. Cardiac output was elevated up to 12.1/min. CT and Color coded duplex sonography (CCDS) without and with contrast (CEUS) are compared with angiography. LFTs and elastography (Shear wave technique) were controlled over more than 6 months. **Results:** CT showed an infra-renal aneurysm of 8 × 9 cm with early filling by contrast misinterpreted as a sign of tricuspid insufficiency. CEUS showed a high flow aorta caval fistula proved by angiography. An aortic stent was implemented (Aorfix, Lombard Medical). First control measurements showed a reperfusion by A. mes. inferior and lumbar arteries. After three re-interventions with occlusion of feeding vessels and a coated stent in the IVC only a small leakage persisted with shrinking size of the aneurysm during follow-up. Ascites disappears immediately after fistula occlusion. Liver stiffness reduces after 3 month from more than 3 m/s to 1.5 m/s. **Conclusions:**

1. High volume fistula and severe right heart failure can mimic severe liver cirrhosis. Especially high pressure in the liver can cause false positive fibrosis measurements with Fibroscan® and ARFI technique.
2. EVAR in cases of persistent fistula showed a high rate of reperfusion. In this case 3 interventions were necessary and helpful for reducing the HZMV slowly.
3. In cases with severe hypertension a systematic search for fistula should be done.

**Fig. 1:** Blood pressure drop ratio as a function of diameter ratio of VAs

### PS8-01

**Two cases of an acute arterial embolic occlusion following ultrasound guided thrombin injection of iatrogenic femoral artery pseudoaneurysm**

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**Purpose:** Here, were present 2 cases of iatrogenic femoral pseudoaneurysm following transfemoral arterial valve implantation (TAVI). Shortly after therapeutic thrombin injection postinterventional embolic occlusion of the femoral artery developed. **Material and methods:** A 86-year-old- and a 83-year-old male patient were admitted to our hospital because of severe aortic stenosis. TAVI (Edward Sapiens XT bioprosthesis, 26 mm) was carried out using a large femoral bore-catheter (18 french) Postinterventional B-mode-imaging and color duplex revealed a 3 × 2 cm p.a. near the outlet of the right V. femoralis, and one 2 × 1 cm on the left side in the second case. The neck was < 1 cm in both cases. Ultrasound-guided thrombin injection (Beriplast® P Combi-Set 1 ml) was attempted. **Results:** Immediately after successful thrombin obliteration, a sufficient perfusion of the femoral artery was observed on duplex sonography. However, few hours later both patients developed a sudden onset of lower leg pain with sensor motor deficits. Acute embolic occlusion of the femoral artery confirmed by computertomographic angiography and duplex sonography. Emergency thrombectomy of the affected arteries was performed in both cases with successful reperfusion. Histopathology showed fresh thrombus material. **Conclusion:** Acute arterial embolic occlusion is a rare but serious complication of ultrasound guided
thrombin injection of p.a. TAVI is increasingly used in interventional cardiology and requires the use of large bore catheters (18 french). Our two reported cases are aimed to raise awareness of the increased risk of 1) development of p.a. in these patients, and 2) an increased risk for postinterventional embolic occlusions following therapeutic thrombin injections. Moreover, a short p.a. neck (<1 cm) can be considered as additional risk for embolic complications.

**Importance of preoperative ultrasound diagnosis of peripheral nerve tumors**

**PS8-04**

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Purpose: A significant proportion of soft tissue tumors are peripheral nerve tumors. So far, it is difficult to make a diagnosis preoperatively. In recent years Neurosonography becomes increasingly important. The aim of the study is to work out morphological characteristics of peripheral nerve tumors in B-mode sonography, Spectral Microvascular Imaging (SMI) and contrast enhanced ultrasound (CEUS) and to compare the results with histopathological findings. **Material and methods:** Within a prospective observational study a total of 11 cases with peripheral nerve tumors (54.5% women) were examined by B-mode, SMI, and CEUS. **Results:** Postoperative histopathology yielded 8 schwannomas (72.7%), 2 neurofibromas (18.2%) and one (9.1%) malignant peripheral nerve sheath tumor (NST). In B-mode, all examined tumors showed hypoechoic patterns. Often the incoming and outgoing nerve of a schwanna can be depicted. Using conventional Doppler method moderate vascularization could be detected in 7 of 10 benign nerve sheath tumors (70%). However, no vascularization was detectable in the malignant peripheral NST. SMI showed vascularization in 10 of 11 nerve sheath tumors, a differentiation between benign and malignant tumor was not possible. By use of CEUS the nerve sheath tumor and the neurofibromas showed a slightly faster contrast-enhancement than the schwannomas. Altogether within 8 tumors vascularization could be detected. In the malignant peripheral NST a cystic area was detected by means of CEUS. 4 of 8 schwannomas showed a chaotic, early arterial, iris-like contrast uptake; 3 schwannomas revealed no contrast uptake. **Conclusion:** Peripheral nerve tumors can be depicted well by means of ultrasound and appear predominantly hypoechoic in B-mode. The highly sensitive Doppler method seems to be suitable for the characterization of peripheral nerve sheath tumors. CEUS exhibits to be very heterogeneous in those tumors. Studies with larger numbers of cases are needed to further evaluate the value of those sonographic methods in this context.

**Complication rates of ultrasound-guided liver biopsies in dogs and cats**

**PS8-03**

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Purpose: The interpretation of ultrasound detectable liver changes is very difficult. The diagnosis can be made after examination of a liver specimen which could be taken by ultrasound guidance. There are some known complications associated with ultrasound-guided biopsies. The most common complication after sampling is bleeding which could lead to death. The aim of the study is to prove the correlation of observable ascites and changes in coagulation parameters. **Materials and methods:** Retrospective study. The database of the Department of Small Animals of the Veterinary Faculty at the University Leipzig was searched for patients with ultrasound-guided liver biopsies. Included patients must have the findings of the ultrasound examination and at least the coagulation parameter thromboplastin time (TPT) or the combination activated partial thromboplastin time (aPTT) and prothrombin time (PT). **Results:** The data of 104 patients met the inclusion criteria. There were 90 dogs (37 male, 12 male neutered, 21 female, 20 female neutered) and 14 cats (3 male, 5 male neutered, 3 female, 3 female neutered). After the ultrasound-guided biopsy there were 20 of the 90 dogs with free abdominal fluid of whom ten patients showed an altered coagulation. One dog with devitalized necrosis) were checked with contrast-enhanced ultrasound (CEUS) in specified intervals. **Conclusion:** Microwave ablation with the intention of a curative treatment is a effective and save alternative for patients with malignancies of various entities up to a size of 5 cm, especially when there is an increased risk in surgical resection. The success rate is high with a low rate of complications. The follow-up examination with CEUS is safe and radiation-free and does not interfere with renal or thyroid function.

**PS8-05**

**Longitudinal gliding of the median nerve in the carpal tunnel: anatomical study and evaluation of mobilization exercises**

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Purpose: Nerve gliding exercises are a promising new conservative therapeutic approach to carpal tunnel syndrome. These exercises should improve the gliding of the median nerve, thus reduce mechanical stress on the nerve. Unfortunately they lack strong evidence for efficacy. The aim of this study is to evaluate median nerve gliding exercises during these gliding exercises in the carpal tunnel. **Material & Methods:** In 2 stages a total of 18 arm from 18 fresh, non-embalmed, whole-body cadavers with a mean age of 82.3 years were examined. Under ultrasound guidance pieces of steel wire were implanted at 3 sites (within the carpal tunnel, proximal to the carpal tunnel, and distally to the pronator teres muscle). These pieces of wire were inserted longitudinally inside the median nerve using a spinal needle. Slightly larger pieces were placed into the peristem of the adjacent bone. During the exercises gliding of the nerve markers were visualized with ultrasound. The extent of gliding was measured. After conventional exercises we also evaluated a new set of exercises. **Results:** During conventional exercises we found gliding of the median nerve of around 6 – 12 mm at the forearm measurement sites, but close to no gliding in the carpal tunnel. During the novel exercises, which include the adduction and abduction of the fingers, we could evoke a substantial nerve gliding in the carpal tunnel of around 13.8 mm. **Conclusion:** Conventional nerve gliding exercises lead to nearly no gliding of the median nerve in the carpal tunnel and significant gliding in the forearm. Our new exercises led to substantial gliding in the carpal tunnel to the same extent as in the forearm.
A 24 year old woman with a history of anterior cruciate and lateral ligament rupture of the right knee was referred to our hospital because of acute peroneal nerve injury with foot drop and toe lifter palsy on the right side after reconstruction surgery of both ligaments in an external hospital. Our neurosurgeon referred her to our neurosonographical consultation. Electromyography (EMG) and neurosonography of common peroneal nerve (CPN) were performed. A complete foot lifter paralysis and an incomplete deficiency of sensory components of superficial peroneal nerve were seen. EMG of the anterior tibial muscle suggested complete denervation. It showed massive pathological spontaneous and no volitional activity. During neurosonography of the CPN a hypoechogenic structure was seen perforating and compressing CPN at the site of fibular head (picture 1 – A: yellow arrow pointing at CPN, C: black arrow pointing at perforating structure). We strongly recommended an operative exploration of the CPN at the fibular head. During surgery which was done both by a neurosurgeon (AG) and an orthopedic surgeon it became obvious that the tendon graft of the lateral ligament perforated the CPN at the fibular head (picture 1 – A: black arrow pointing at perforating structure, yellow loops around CPN, tweezers holding CPN). The loosened tendon graft was cut and pulled under the CPN and reinserted again. The foot lifting power reached muscle strength grade (M) 1 preserved – so no transplantation had to be done. Three months after the operation the foot lifting power reached muscle strength grade (M) 1, so physiotherapy was still needed.
Impact of endocardial fibroelastosis of the left ventricle on right ventricular function in fetuses with hypoplastic left heart syndrome

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Purpose: Postnatal outcome of fetuses with hypoplastic left heart syndrome (HLHS) is determined by right ventricular function (RVF). Our study examines, whether there are differences in RVF of HLHS fetuses with endocardial fibroelastosis of the left ventricle (LV EFE) without LV EFE and controls during gestation. Material and methods: A prospective study was conducted with 10 gestational age matched fetuses in each of the three groups. M-mode was used to assess displacement of the tricuspid annulus (TAPSE), the umbilical and middle cerebral artery pulsatility index (UA-PI), the early wave to early diastolic annular relaxation velocity (SF). PW-Doppler and PW-TDI derived velocities were assessed. Among others the early wave to early diastolic annular relaxation velocity (E/E') ratio, the early diastolic annular relaxation velocity to late diastolic annular relaxation velocity (E/A') ratio and the myocardial performance index (MPI) were calculated. Conventional fetal Doppler parameters, the umbilical and middle cerebral arterial pulsatility index (UA-PI, MCA-PI) and the CPR (cerebroplacental ratio) were obtained to test for possible correlations to cardiac function indices. Results: HLHS fetuses with LV EFE revealed significantly lower velocities, lower peak A' velocities and higher values for EF and SF compared to those without LV EFE (p < 0.05). Furthermore they showed significantly higher values for peak E wave velocity, E/E' and both EF and SF compared to healthy controls. In HLHS w/o LV EFE but not in HLHS LV EFE fetuses, TAPSE increased significantly during gestation. In HLHS fetuses with LV EFE peak A' velocity was significantly negatively correlated with UA-PI. HLHS fetuses w/o LV EFE showed significant positive correlations of TAPSE with CPR. Conclusions: Significant differences in RVF of HLHS fetuses with LV EFE, without LV EFE and healthy controls are present during gestation. These results might lend support to the notion of negative ventricular-ventricular interaction in case of HLHS with LV EFE possibly influencing surgical outcomes.

Combined tracheal and esophageal atresia with fatal outcome

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Purpose: Congenital tracheal atresia is a rare anomaly (1:50,000). The defect consists of partial or complete absence of the trachea below the larynx. The lower airway often is connected to the gastrointestinal tract via a distal tracheo- or bronchoesophageal fistula. Material and methods: This is a case report of an extremely rare combination of tracheal and esophageal atresia with fatal outcome. Results: A 32 years old woman (gravidity 2/parity 0) presented with suspected esophageal atresia in 32+4 weeks of gestation. Secondary diagnoses were gestational diabetes and hypertension. Ultrasound examination revealed polyhydramnios, absent stomach and amniotic sac prolapse. There were no further sonographic abnormalities. Antenatal corticosteroids were given and amniocentesis because of labour was necessary twice (32+2 and 33+4 gestational weeks). Preterm premature rupture of the membranes and labour occurred with 36±5 weeks of gestation. Emergency caesarean section for abnormal fetal blood analysis was conducted, and the newborn was resuscitated because of no audible cry and fetal bradycardia. Despite multiple attempts intubation and ventilation failed. So, resuscitation was stopped after 60 minutes. The autopsy revealed non-ventilated lungs and a combined tracheal and esophageal atresia. A tracheoesophageal fistula below the atresia was found. Therefore, CHAOS did not develop prenatally. There were no further malformations. Conclusions: Combined tracheal and esophageal atresia can be very difficult to detect prenatally which results in high risk for fatal outcome.

Influence of the frame rate (DICOM vs. acoustic frame rate) on strain analysis assessed by two-dimensional (2D) speckle tracking in fetal echocardiography

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Purpose: Frame rates (FR) used for strain analysis assessed by speckle tracking in fetal echocardiography show a huge variation. Due to higher heart rates compared to adults, much higher FR are requested in fetuses. The aim of this study was to investigate the influence of the FR on strain analysis in two-dimensional (2D) speckle tracking. Material and methods: A prospective cross-sectional study was performed. Based on an apical or basal four-chamber view of the fetal heart, cine loops were acquired on a Toshiba Aplio 500 system. Each loop was digitally stored twice: firstly as a DICOM (digital imaging and communications in medicine) file with a FR of 30 frames per second (fps), secondly with the original FR (acoustic FR = AFR). For each loop, fetal global longitudinal peak strain values of both, left (LV) and right ventricle (RV), were assessed by 2D Wall Motion tracking. Strain analysis was performed offline by two investigators. Interobserver variability was analysed. Results: A total of n = 11 healthy fetuses with an echocardiogram performed between 19 and 34 weeks of gestation were included. The AFR was 126 ± 16 fps. Relating to global longitudinal peak strain values of both ventricles, there was no significant difference between DICOM FR and AFR (LV: -18.22% (DICOM FR) vs. -17.77% (AFR), RV: -16.30% (DICOM FR) vs. -15.28% (AFR); p > 0.05). The interobserver variability showed a strong agreement with an Intraclass Correlation Coefficient (ICC) of > 0.8. Conclusions: The influence of the FR on global longitudinal peak strain values in 2D speckle tracking seems to be less important than expected. For strain analysis in fetal echocardiography FR of > 100 fps seem to be non-essential.

Diagnostic imaging in Linnaeus’s two-toed sloth (Choloepus didactylus) – pregnancy diagnosis and fetometry

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Purpose: The knowledge of the reproductive physiology and biology of the two-toed sloth is fragmentary at best. So the data of the gestation period in the literature vary from 150 to 322 days. This study is intended to demonstrate the pregnancy diagnosis and the fetometry in the two-toed sloth with ultrasonography. Material and methods: The ultrasound investigations to visualize the genital system in this species can be performed transtubal or transrectal. Only the transtubal examinations can be performed without immobilization, if the animals are in...
medical training. The transcutaneous pregnancy examination is executed with a transducer frequency from 6 to 10 MHz. In total 23 pregnancies (n = 10 animals) were sure diagnosed. The ultrasound investigations were also used to detect the fetal development (n = 8 animals). Results: The first indication of an existing pregnancy is the visualization of the gestational sac at the end of the first month of pregnancy. With the beginning of the second month of the gestation period, the embryo is detectable. In the same gestation month the cardiac activity can also be recognized. The crown-rump length of the fetus is only measurable in the third month. For the following months the fetal development is represented on the biparietal diameter (BPD) and the abdominal diameter (AD). Conclusion: The total gestation period in a two-toed sloth lasts 330 to 350 days. In a range from 294 to 316 days, the fetal development could be visualized with ultrasound (n = 7 animals). A shorter fetal development of 265 days was registered in one female.

### PS9-06

**3D ultrasound evaluation of the fetal ear – comparison of an xMatrix probe with a conventional mechanical probe**

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**Purpose:** New 3D technologies like xMatrix probes promises superiority to conventional mechanical probes and may allow a more detailed and timesaving prenatal diagnosis. In a comparison study we evaluate the fetal ears. The aims of our study were to compare the following aspects of both techniques: (1) the ultrasound detail resolution, (2) the raw data acquisition time (AT) and (3) the influence of covariates. **Materials and methods:** 3D raw data volumes of the fetal ear were collected with the V6 – 2 (V6) and with the xMatrix (X6) probe and were stored after offline customization to a single picture. Two observers scored these images independently. Furthermore, the 3D raw data acquisition time (AT) was recorded. Concordance between observers, maternal age, body mass index (BMI), weeks of gestation and location of the placenta were evaluated. **Results:** Data volumes of 103 patients were analyzed. The X6 detected anatomic structures like the scapha (p = 0.0146), fossa triangularis (p = 0.0075) and cymba conchae (p = 0.0025) more often. Mean AT of the X6 was shorter compared to V6 (p ≤ 0.0001). A placenta location in the scanning field increased AT only for the V6 (p < 0.01). Concordance between observers was higher for the X6 in most cases. Detailed structures were less visible at the end of pregnancy for both devices. **Conclusion:** The comparison study demonstrated clear advantages of the new xMatrix technology concerning an advanced and fast examination of detailed structures like the fetal ear. Further assessments of the fetal ears with recent 3D technology generate important additional information in prenatal diagnosis.

### PS9-07

**5DCNS+ approach for (semi-)automated evaluation of fetal cranial structures – a step toward to improve detection of CNS anomalies?**

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**Objective:** To scrutinize the performance and reliability of the 5DCNS™ algorithm for standardized assessment of the fetal cranial structures in 2nd and 3rd trimester fetuses. **Methods:** In this prospective study we enrolled 440 uncomplicated singleton pregnancies undergoing targeted second and third trimester ultrasound examination at a tertiary referral center. All volume data sets were obtained with the fetus’ head in an appropriate position (transverse plane, horizontal falx cerebri), absent or minimal fetal breathing/movement and satisfying image quality. After application of the 5DCNS® software all images were scored and biometric measurements were compared with those obtained by standard 2D ultrasound assessment. **Results:** A total of 421 patients were eligible for final analysis. The mean gestational age (GA) was 18.4 weeks (ranging from 15.0 to 36.1 weeks). One to 3 separate volumes were obtained per patient (mean 1.1 exams) In > 80% of all volumes ≥ 8 diagnostic planes were sufficiently visualized. The rate of inappropriately visualized planes (≤ 6) increased with with advancing GA and was highest beyond 32 complete gestational weeks (complete exam including all 9 planes in 21% vs. 75.3% in 2nd trimester, p < 0.0001). There were no statistically significant differences between measurements derived from 5DCNS® algorithm and those obtained from standard 2D approach. **Conclusion:** 5DCNS™ technology facilitates reliable assessment of fetal CNS anatomy and might therefore aid early diagnosis of cranial anomalies particularly in early and advanced second trimester.

### PS9-08

**Prenatal second trimester ultrasound diagnosis of cloacal extrophy**

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**Purpose:** Bladder extrophy is rare and affects 1:30,000 – 50,000 live births, more often boys than girls. Prenatal diagnosis shows normal amniotic fluid with no visible bladder, but normal kidneys. Cloacal extrophy occurs in 1: 200 000 – 250 000 live births. Affecting the pelvic embryogenesis it results in the persistence of a common cloaca receiving ureters, ileum and a rudimentary hindgut in association with a wide range of urogenital tract anomalies, spinal dysraphism and imperforate anus. **Case:** A 27- year-old II Gravida II Para presented for second trimester screening. Until then, the pregnancy had been uneventful. The parents were not related. The first child is healthy, family history was unremarkable. Ultrasound detected an infra-umbilical anterior abdominal wall defect with the non-visualization of the fetal bladder, agenesis of the left kidney and a right single umbilical artery. The column spine appeared wavy and the cord-like segment of soft tissue protruding from the anterior abdominal wall was detected strongly resembling the trunk of an elephant. After interdisciplinary counselling the parents decided to terminate the pregnancy. An autopsy of the abdominal wall defect was permitted confirming the prenatal ultrasound diagnosis showing an abdominal wall defect with no bladder and imperforate anus. There was no appendicitis, an ureteral opening into the abdominal wall and left sided kidney agenesis with a right single umbilical artery. There was no macroscopic discrimination between the terminal ileum and the Colon. The Raphé testis was partially existent and an intestinal loop opened out into this. An X-ray was not performed. **Conclusion:** This case shows the feasibility of the prenatal diagnosis for midline abdominal and pelvic defects during the second trimester and confirms the elephant trunk-like image as an ultrasound criteria for the diagnosis of CE, allowing adequate prenatal counselling.

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*Fig. 1: 3D images of fetal ears: left V6, right X6*
**Fetal vanishing gastrochisis and neonatal short bowel syndrome**

**Purpose:** We report a rare case of vanishing gastrochisis. With an incidence of 1:4000 Gastrochisis and Omphalocele are the most common congenital abdominal wall defects. Gastrochisis is defined by a paraumbilical defect of the abdominal wall with protrusion of mainly intestine fetal organs. **Material and methods:** A 27 year old gravida I was referred at 13+5 week of gestation (WOG) with suspected gastrochisis. Detailed sonography confirmed this finding and revealed no further abnormalities. The patient denied first trimester risk calculation, NIPT and an invasive procedure. During the next examination in 21+4 WOG of gastrochisis was still present. Sonography revealed dilated small intestine. At 28+4 WOG the gastrochisis has vanished. The intraduodenal bowel was dilated. Additionally, a dilated stomach was visualized at 33+4 WOG. Primary cesarean section was performed at 37+4 WOG because of breech presentation. **Result:** A healthy newborn was delivered weighing 2940 g, Apgar 9/10/10 and umbilical artery pH 7.37. There was no abdominal wall defect, umbilical cord insertion was normal. Sonography revealed dilated small intestine and stomach with non-propulsive peristalsis. Explorative laparotomy revealed severe dilated small intestine commencing from the duodenojejunal flexure extending blindly after 30 cm. Coecum and appendix were missing. Colon ascen- ders and transversum were atretic. An end to side anastomosis con- nected the rest of the small intestine with colon descendens. Because of the short bowel syndrome parenteral alimentation was necessary for six weeks. **Conclusion:** Vanishing gastrochisis with dilated intraduodenal bowel is a rare variation of gastrochisis. Antenatal counselling should address this as an severe complication with a worse outcome.

**Response of severe IUGR human fetuses with brain sparing to amino acids supplementation via subcutaneously implanted port system with and without hyperbaric oxygenation**

**Objective:** This study aims to treat severe placental insufficiency with amino acid and glucose intraumbilical supplementation via a port system and hyperbaric oxygenation (HBO). **Study design:** A prospective clinical study of 6 IUGR very preterm human fetuses with cerebroplacental ratio < 1 with long-term intraumbilical amino acid and glucose supply. Using a subcutaneously implanted port system to provide glucose and intravascular amino acid. We were able to increase the Overall neonatal survival. **Results:** There was no abdominal wall defect, umbilical cord insertion was normal. Sonography revealed dilated small intestine and stomach with non-propulsive peristalsis. Explorative laparotomy revealed severe dilated small intestine commencing from the duodenojejunal flexure extending blindly after 30 cm. Coecum and appendix were missing. Colon ascen- ders and transversum were atretic. An end to side anastomosis con- nected the rest of the small intestine with colon descendens. Because of the short bowel syndrome parenteral alimentation was necessary for six weeks. **Conclusion:** Vanishing gastrochisis with dilated intraduodenal bowel is a rare variation of gastrochisis. Antenatal counselling should address this as an severe complication with a worse outcome.

**Introduction:** Twin to twin Transfusion syndrome is one of the most severe complications in monochorionic twin pregnancies and can cause severe impairment of fetal and neonatal outcome. In severe TTTS the fetoscopic laser coagulation is the Treatment of choice. Fetoscopic laser coagulation is associated with a morbidity and mortality due to iatrogenic rupture of membranes as well as iatrogenic placenta insufficiency. An Adaptation of the fetoscopic Tools to reduce the lesions of the amnio- Membrane can decrease the risk of PROM and increase the overall survival. **Methods:** This is a retrospective Analysis of 176 cases of mono- chorionic twin pregnancies complicated by TTTS which underwent a fe- toscopic laser coagulation between 10 and 23 week of gestation. **Results:** Long-time survival was higher in the 1 mm Group than in the control Group (90% vs. 80%). The survival of at least one twin was higher in 1 mm Group than in control Group (98% vs. 86%). The rate of intrauterine death (IUD) of both twins was lower in the pregnancies treated with 1 mm fiber optic than in the control Group (13% vs. 15%). IUD of one twin was more common in the 1 mm Group than in 2 mm control (18% vs. 13%). **Discussion:** By reducing the Diameter of the Fetoscopic tools, we are able to reduce the risks of complications in Treatment of TTTS complicated pregnancies and we were able to increase the Overall neonatal survival.

**Different outcomes in two cases of Dural Sinus Malformation**

**Fetal Dural Sinus Malformation (DSM) is a rare condition with massive dilitation of dural sinuses due to an arteriovenous shunt. It most frequently involves the confluence sinuum above the cerebellum in the posterior fossa [1,2]. Clinical courses range from intrauterine demise (IUD) to live birth with normal neurological outcome depending on associated factors like sufficient collateral venous drainage, absence of addi-
tion structural abnormalities, brain insult, infarction, ventricular hemorrhage and cardiac failure. We report on two consecutive cases of DSM. In case 1 the diagnosis was made on post mortem pathologic examination after IUD at 21 wksGA. Sonographically the abnormality was classified as a brain tumor. In case 2 a mass was spotted during routine scan at 26 wksGA and assessed by Level 2 ultrasound accompanied by fetal MRI and telemedical expert consultation. The posterior fossa mass was with a size of 4.5 × 4.9 × 6.5 cm and signs of an intraluminal thrombus was associated with mild ventriculomegaly and downwards-shift of the cerebellum. Both the size of the lesion and secondary features decreased with ongoing pregnancy. Delivery was performed 37+1 wksGA by planned caesarean section. (APGAR 9/10/10). Neonatal intensive care was required for respiratory complications due to borderline preterm delivery. Postnatal cMRI confirmed the diagnosis of thrombosis in the sagittal posterior sinus decreasing in size in comparison to prenatal findings accompanied by hypoplastic transverse and sigmoid sinuses. Thrombosis of a DSM may lead to secondary intraventricular hemorrhage and hemorrhagic cerebral necrosis which had been the cause of IUD in case 1, where the Sinus confluens showed partial thrombosis. On the contrary, in the absence of severe complications DSM may lead to favorable perinatal outcome not even requiring neurosurgical or minimal-invasive radiologic intervention [3]. [1] Asai H, et al. J Neuroimaging 2014; 24: 603–606. [2] Barbosa M, Interventional Neuroradiology 2003;9:407–424. [3] Jagadeesan et al., J Neurosurg Pediatr 2015;16:74.

**Results:** On average the women granted eight points on acceptance of the conventional visualization and ten points on the AR system. They were willing to pay (on average) 80 Euros with a spread from 40 to 150 Euros. **Conclusions:** The preclinical test shows that the AR based 4-D ultrasound system can be used in prenatal medicine. All participants were willing to pay for such an individual health service. However the visualization needs to be upgraded to 3-D textures instead of 2-D textures to improve the optical impression.

**P1-09** 58-year old patient with atypical peritoneal manifestation of diffuse amyloid deposition: presentation of systemic Amyloid Light-chain (AL) amyloidosis in B-mode imaging and contrast-enhanced ultrasound (CEUS)

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**Purpose:** Here, we present a case of atypical peritoneal manifestation of diffuse amyloid deposition in B-mode imaging and contrast-enhanced ultrasound (CEUS). **Material and methods:** A 58-year-old patient in poor general condition presented for tumor search with an increased waist circumference, dysphagia, dyspepsia and weight loss. B-mode ultrasound presented interenteric throughout the mesentry and retroperitoneum an echogenic material surrounding the intestines, which impressed soft upon compression and was thus primarily interpreted as echogenic aszites. Additionally pleural effusions on both sides, as well as pericardial effusion were observed. In contrast-enhanced ultrasound (CEUS) the interenteric material presented with a homogenous enhancement. **Result:** For tumor staging a sonographically guided biopsy of inter-enteric material was performed. After positive Congo red staining, histological examination of the material showed the findings of systemic Amyloid Light-chain (AL) amyloidosis. The bone marrow biopsy revealed the diagnosis of a multiple myeloma type Igk kappa. **Conclusion:** This case describes the diagnosis of multiple myeloma with cardiac,
Acute pancreatitis is a pathology with an unpredictable evolution that can lead to serious complications with extremely fast dynamics. The aim of this paper is to evaluate the role of abdominal ultrasound in the diagnosis and monitoring of acute pancreatitis, but also in highlighting some ultrasound changes suggestive for moderate or severe forms of acute pancreatitis. Material and method: We performed a retrospective study in which we enrolled 534 patients with acute pancreatitis (352 males, 182 females, age 56.7 ± 17.9 years, admitted between January 2014 – December 2015). We followed: the etiology of acute pancreatitis, the role of ultrasound in the diagnosis of biliary pancreatitis, ultrasound changes over the evolution of the disease: ascites, hypercoagulable omental bursa, peripancreatic fluid, areas of pancreatic necrosis and also the clinical evolution of the patient. Results: 58% of cases presented biliary etiology – suggestive ultrasound changes: gallstones, obstructive jaundice, followed by ethanolic etiology (15.8%) and acute pancreatitis due to hypothyroidism (6.4%). Other causes (~ 20%) were postERCP acute pancreatitis, non-A non-B, pancreas divisum etc. Transabdominal ultrasound detected changes in 94 patients (27.5%): ascites, hypercoagulable omental bursa, peripancreatic fluid, areas of pancreatic necrosis. In all other cases (72.5%), pancreas had normal ultrasound appearance or could not be evaluated by ultrasound. Of the 94 cases with ultrasound changes, 12 (12.7%) progressed to severe forms of acute pancreatitis with development of organ failure. Conclusions: In our study, the most common etiology of acute pancreatitis was biliary followed by alcohol consumption. Ultrasonographic changes in acute pancreatitis (ascites, hypercoagulable omental bursa, peripancreatic fluid, areas of pancreatic necrosis) were present in 27.5% of cases. Evaluation of the pancreas in acute pancreatitis can be difficult (in 41% of cases, the pancreas was not visible in ultrasound) due to associated conditions (meteorism, poor visualization of the pancreas, abdominal pain).

Ultrasonic aspects in acute pancreatitis
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Purpose: Liver FNH (focal nodular hyperplasia) are much rarer in males than in females. In case of a malignant disease they can be misjudged as a liver metastasis, especially if not previously documented. Material and methods: During routine abdominal ultrasound we detected hypoechoic liver lesions of 14–18 mm in three men: one 47 year old with a large renal cell carcinoma, one 56 year old with a bronchial neoplasm and one 71 year old patient who was diagnosed with 4 malignant melanomas in the abdominal region one year later. Colour Doppler ultrasound, CEUS and abdominal MRI were performed in all three patients. Results: Colour Doppler Ultrasound and CEUS showed the typical characteristics of a FNH. Abdominal MRI confirmed the diagnosis in two cases, the third case Doppler Ultrasound and CEUS showed the typical characteristics of a FNH. Abdominal MRI confirmed the diagnosis in two cases, the third case Doppler Ultrasound and CEUS showed the typical characteristics of a FNH. Conclusions: The diagnosis and staging of multicentric lymphoma include abdominal ultrasound, but also in highlighting some ultrasound changes suggestive for moderate or severe forms of acute pancreatitis. Material and method: We performed a retrospective study in which we enrolled 534 patients with acute pancreatitis (352 males, 182 females, age 56.7 ± 17.9 years, admitted between January 2014 – December 2015). We followed: the etiology of acute pancreatitis, the role of ultrasound in the diagnosis of biliary pancreatitis, ultrasound changes over the evolution of the disease: ascites, hypercoagulable omental bursa, peripancreatic fluid, areas of pancreatic necrosis and also the clinical evolution of the patient. Results: 58% of cases presented biliary etiology – suggestive ultrasound changes: gallstones, obstructive jaundice, followed by ethanolic etiology (15.8%) and acute pancreatitis due to hypothyroidism (6.4%). Other causes (~ 20%) were postERCP acute pancreatitis, non-A non-B, pancreas divisum etc. Transabdominal ultrasound detected changes in 94 patients (27.5%): ascites, hypercoagulable omental bursa, peripancreatic fluid, areas of pancreatic necrosis. In all other cases (72.5%), pancreas had normal ultrasound appearance or could not be evaluated by ultrasound. Of the 94 cases with ultrasound changes, 12 (12.7%) progressed to severe forms of acute pancreatitis with development of organ failure. Conclusions: In our study, the most common etiology of acute pancreatitis was biliary followed by alcohol consumption. Ultrasonographic changes in acute pancreatitis (ascites, hypercoagulable omental bursa, peripancreatic fluid, areas of pancreatic necrosis) were present in 27.5% of cases. Evaluation of the pancreas in acute pancreatitis can be difficult (in 41% of cases, the pancreas was not visible in ultrasound) due to associated conditions (meteorism, poor visualization of the pancreas, abdominal pain).

Ultrasonographic accuracy in detecting intestinal foreign body’s in dogs and cats
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Purpose: Vomiting after the suspected intake of foreign body’s or foreign material is a common reason for veterinary consultation. The foreign material can lead to intestinal obstruction and is an indication for immediate surgical removal. For diagnosing an ileus abdominal radiographs are taken routinely. The purpose of the study was to define ultrasonographic accuracy in detecting these intestinal obstructions due to a foreign body. Materials and methods: Dogs and cats underwent ultrasonographic examination of the entire abdominal cavity by two experienced radiologists when an ileus was suspected. The examiners had no further information about the history or clinical status of the patients. After the ultrasound the two examiners had to take the decision if the patients should be treated conservatively or with surgery. The animals without surgery received a clinical follow up, ultrasound and subsequent owner communication. Results: 81 patients, 24 cats and 52 dogs (16 intact males, 26 neutered males, 18 intact females and 21 neutered females) were included in the study. Radiologist number one examined 25 animals and radiologist number two 56. 8 patients were excluded from the study because of unsure follow up results. 73 animals were finally included, 21 of them were cats and 47 dogs 18 of these animals were diagnosed with obstructive ileus and sent to surgery. In 17 of these 18 the ileus was confirmed and in one only entretitis was found. Of the remaining 56, 4 undertook surgery for other reasons and no ileus was identified. For the rest of the patients the ileus was excluded due to clinical follow up, ultrasound and subsequent owner communication. Conclusions: Ultrasound is a valuable and safe method for detecting obstructive intestinal foreign bodies. In both dogs and cats no ileus was missed. In only one patient the misdagnosis ileus was made.

Evolving cystic lesions
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DOI: 10.1055/s-0036-1587923

Purpose: This didactic exhibits aims to:
- Showcase different cases of cystic lesions that turn out to be malignant.
- Highlight the importance of utilising different functions/knobs in ultrasound to classify pathologies.
Highlight the importance of close monitoring and proper documentation of ‘benign- looking’ lesions. Materials and methods: Despite the availability of CT and MRI, ultrasound being non-ionising and relatively cheap, is an important tool in primary screening and surveillance. There is a broad spectrum of sonographic appearances of lesions, regardless of benignity or malignancy. Therefore, the operators’ skills in detecting various lesions by optimising the different functions/knobs available on the ultrasound machine help to sieve out the possible entities for the differential diagnosis. This competency in ultrasound will allow for timely management and treatment. Several ultrasound cases with notable discrepancy are reviewed retrospectively, with the intentions to identify the areas to be improved. The grey scale appearances and presence of vascularity were evaluated, and correlated with available CT, MRI and operation reports. Results: This pictorial review demonstrates the possible optimisation of sonographers’ techniques in image acquisition when detecting lesions. Possible strategies for improvement are demonstrated to increase diagnostic value in ultrasound imaging. Conclusions: The ability to optimise the different functions/knobs available on the ultrasonic machine serves as an advantage in detecting various lesions and eventually classifying them further allowing for timely management and treatment.

Sonographic examination of the multicentric lymphoma in dogs
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DOI: 10.1055/s-0036-1587924

Purpose: The diagnosis and staging of multicentric lymphoma include sonographic examination of the abdomen. Routinely the spleen, liver and
abdominal lymph nodes are assessed. The aim of the present study was to evaluate whether the diagnosis “multicentric lymphoma” could be confirmed most likely on the basis of specific sonographic changes. Materials and methods: Retrospective analysis of data from 76 patients with multicentric lymphoma for which ultrasonographic images were available. Inclusion criteria were cytological or histological diagnosis of the multicentric lymphoma. Exclusion criterion was administration of cytostatic agents prior to diagnosis. Results: In all dogs with multicentric lymphoma the abdominal lymph nodes were massively rounded and enlarged. The nodal parenchyma of 73% of the 76 patients presented as hypoechoic. A moth-eaten pattern of the splenic parenchyma was diagnosed in 62 dogs. Only two patients displayed a physiological spleen. In 23 dogs the gallbladder was altered within the meaning of cholecystitis. The sonography revealed in 26 dogs hepatic parenchymatous changes. Conclusions: Sonographic changes of the spleen and abdominal lymph nodes are often diagnosed in dogs with multicentric lymphoma. Splenic moth-eaten pattern and enlarged, rounded and hypoechoic abdominal lymph nodes are combined an indicative parameter of malignancy. In contrast an abnormal appearance of the liver is no evidence that lymphoma is existing.

Contrast-Enhanced Ultrasound – Clinical Investigations and Case Reports

P2-10

Value of contrast enhanced ultrasound in evaluation of small hepatomas: a case series review
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DOI: 10.1055/s-0036-1587925

Purpose: Contrast enhanced ultrasound (CEUS) is currently well recognised as an imaging modality for evaluation of hepatic lesions. There are various published guidelines which have recognised its use as a definitive diagnostic tool for hepatocellular carcinoma (HCC) in high risk patients. However, this opinion may not be universally accepted. While we do not routinely use CEUS as a first line modality in high risk patients, we had observed and recognised its value as a problem solving tool; particularly for small sonographically detected lesions which measures less than 20 mm. Methodology: We reviewed 7 CEUS liver cases which were performed in our institution. These were patients who had hepatitis B or C cirrhosis. All subjects had a single ultrasound detected liver lesion which measured less than 20 mm. In all dogs with multicentric lymphoma the abdominal lymph nodes were massively rounded and enlarged. The nodal parenchyma of 73% of the 76 patients presented as hypoechoic. A moth-eaten pattern of the splenic parenchyma was diagnosed in 62 dogs. Only two patients displayed a physiological spleen. In 23 dogs the gallbladder was altered within the meaning of cholecystitis. The sonography revealed in 26 dogs hepatic parenchymatous changes. Conclusions: Sonographic changes of the spleen and abdominal lymph nodes are often diagnosed in dogs with multicentric lymphoma. Splenic moth-eaten pattern and enlarged, rounded and hypoechoic abdominal lymph nodes are combined an indicative parameter of malignancy. In contrast an abnormal appearance of the liver is no evidence that lymphoma is existing.

P2-11

(intresting case) multiple abscesses of liver and spleen by rheumatoid arthritis man taking Methotrexat
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DOI: 10.1055/s-0036-1587926

A 52-year-old patient with a fever for a day. Patient has known, pavi, rheumatoid arthritis since 8 years and taking MTX (Methotrexat). Sonographic examination showed multiple echo poor liver lesions. In the Sonovue – Sonography show the lesions peripheral Enhacemnt. The CT also multiple liver/and spleen lesions with peripheral enhancement. Improvement of symptoms after pause of MTX and administration of antibiotic. Result: Sepsis with detection of Fusobacterium necrophorum in blood culture with multiple abscesses in the liver and spleen. cause of odonto-

P2-12

Strain analysis in patients with Barlow’s disease
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The aim of the present study was to detect characteristic patterns of longitudinal strain curves in patients with Barlow’s disease. Standardised transthoracic echocardiography was performed in patients with Barlow’s disease (group I; n = 20) and in patients with mitral regurgitation due to Carpentier’s classification type I (group II; n = 20). Strain analysis by 2D speckle tracking was performed in all patients of both cohorts to obtain regional strain curve patterns and for determination of longitudinal strain values. The strain curves were compared to each other with respect to the segment which corresponds to the affected scallop of the mitral valve. The severity of mitral regurgitation was estimated by proximal isovelocity surface area, vena contracta and left ventricular systolic function. In 18 of 20 patients (90%) with Barlow’s disease the segmental strain curve of the affected scallop shows a characteristic positive peak (3.92 ± 1.79) at the beginning of the systole (Fig. 1). However, reduced strain values in these segments were not necessarily determined. The most affected scallop was the P2-scallop. Thus, the characteristic positive peak could be seen most often in the posterior segment of the left ventricle (Fig. 1). In group II a minor positive peak was only present in 2 of 20 patients (10%). In contrast to patients with Barlow’s disease (–21.39 ± 4.12) global peak systolic strain was reduced in these patients (–13.48 ± 6.15). In patients with Barlow’s disease the positive peak at the beginning of the systole can be defined as a characteristic echocardiographic sign. This has to be distinguished from positive peaks due to hypokinesia or dyskinesia. Artifact tracking in the far field in the region of the mitral valve annulus can also produce similar strain curves. Thus, accurate tracking of the myocardium using standardized views is the prerequisite for a correct analysis.

Fig. 1: Typical longitudinal strain pattern

P2-13

Contrast enhanced ultrasound of the spleen in pediatric patients
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DOI: 10.1055/s-0036-1587928

Purpose: Retrospective analysis of the diagnostic accuracy and safety of contrast enhanced ultrasound (CEUS) in children. Material and methods: Retrospective analysis of the diagnostic findings of CEUS in 9 pediatric patients. After written informed consent all patients underwent CEUS with a high-end ultrasound machine using sulfur hexafluoride microbubbles (Sonovue®) and a multi-frequency probe (1–5 MHz, 6–9 MHz). Results: 9 patients (median age 12.4 years, min. 5.1 years, max. 16.2 years; male n = 4) underwent CEUS for the following reasons: demonstration of the perfusion of the spleen after partial embolization (n = 3) and after trauma (n = 1) and characterization of focal lesions (n = 5): one lesion was considered to malignant (histopathologic diagnosis Hodgkin lymphoma), the remaining 4 were characterized as benign ((hem)angio-

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Correlation of the E/E’-ratio to NT-BNP: echocardiographic subanalysis of the LIFE-Adult-Study

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The E/E’-ratio is used as a surrogate parameter for the estimation of the left ventricular enddiastolic pressure. It is assumed that chronic systolic and diastolic heart failure is associated with E/E’-values of more than 15 or at least with intermediate values between 9 – 5. The aim of the present retrospective analysis of the epidemiological echocardiographic cohort of the LIFE-Adult study (Leipzig Research Centre for Civilisation Diseases) was to evaluate the correlation of NT-BNP (N-terminales propeptid BNP) values to the E/E’-ratio by the assessment of left ventricular diastolic function in this cohort. In 773 participants (pts) standardised transthoracic echocardiography was performed and in 748 pts NT-BNP was analysed. The E/E’-ratio was determined according to the international recommendations by measuring the maximum velocity of the early diastolic inflow by pulsed wave Doppler echocardiography and the basal septal maximum myocardial velocity by tissue Doppler echocardiography at early diastole. NT-BNP was determined using commercially available diagnostic tests. Pathological NT-BNP levels were assumed in the range >222pg/ml. Normal E/E’-ratios as well as normal NT-BNP levels were observed in 91% of all participants. In 1.4% of the pts elevated NT-BNP levels were found in the presence of normal E/E’-ratio. In contrast in 1.1% of the pts elevated E/E’-ratios were found in the presence of normal NT-BNP levels. Most of the pts with NT-BNP levels detected by NT-BNP values >222pg/ml also showed intermediate E/E’-ratios between 9 and 15 (42pts). In only 0.8% of the pts (5 pts) significantly elevated E/E’-ratios >15 and pathological NT-BNP levels could be observed (see fig). Only 4 pts with elevated NT-BNP values showed left ventricular systolic dysfunction. E/E’-ratio has to be verified to be suitable for the detection of heart failure patents. The present data show that E/E’-ratio of > 15 is not well correlated to increased NT-BNP levels.

Analysis of echocardiographic parameters for the evaluation of Aortic Regurgitation

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In the present study different approaches for the evaluation of aortic regurgitation (AR) in patients with chronic AR and in patient after TAVI were analysed. 55 patients with chronic AR and 15 patients with AR after TAVI were analysed by the conventional approach, semi-quantitative parameters and global left ventricular (LV) peak systolic strain (PSS). The conventional approach was performed by the assessment of the regurgitant fraction (RF), the regurgitant volume (RV), the effective and total stroke volume (SV). In TAVI patients AR was additionally analysed by the proportion of the valvular defect to the aortic valve ring. Total SV determinations by Doppler echocardiography and biplane planimetry showed good correlations. The assessment of the effective SV using the pulmonary valve (PV) diameter and the VTI_PV or the mitral valve (MV) diameter and the VTImv showed less good correlations. Higher or preserved global LV PSS values were observed in chronic AR patients. However, in extremely dilated left ventricles global LV PSS values were reduced to be predicted. The Pressure-Half-Time (PHT) could be determined in 80%, the proximal isovelocity surface area (PISA) in 21% and the vena contracta (VC) in 56% of patients with chronic AR. The PHT could be determined in 40%, the PISA in 0% and the VC in 40% of patients with AR after TAVI. The conventional analysis of AR in patients with chronic AR and in patients with AR after TAVI is feasible and suitable. Semi-quantitative parameters were less useful and will often lead to overestimation in patients with chronic AR and to underestimation of AR in patients after TAVI. Global LV PSS can be used as a descriptive parameter for the assessment of LV eccentric hypertrophy but cannot be used to characterise various stages of chronic AR. AR in patients after TAVI can be well analysed by the conventional approach.

Echocardiographic analysis of left and right ventricular function in patients after mitral valve reconstruction

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The aim of the present study was to analyse left (LV) and right ventricular (RV) function in patients after mitral valve reconstruction (MVR). Trans-thoracic echocardiography was performed in 31 patients with severe mitral valve regurgitation (MR) before and after MVR. Furthermore, patients were divided into several subgroups: firstly, asymptomatic (n = 7) and symptomatic (n = 24), secondly, isolated MVR (n = 18) and MVR with tricuspid valve reconstruction (TVP) (n = 7) or aortic valve implantation (AVI) (n = 6) and thirdly, paroxysmal atrial fibrillation (AF) (n = 23) and chronic AF (n = 8). LV dimensions and volumes were reduced after MVR. LV ejection fraction (EF) did not change after MVR. However, LV global longitudinal peak systolic strain (PSS) was reduced after MVR. In contrast to LV global longitudinal PSS values data of the free RV wall did not show reduced RV PSS values after MVR. However, TAPSE was significantly reduced after MVR. Parameters of diastolic function did not improve and systolic pulmonary pressure (sPAP) and pulmonary vascular resistance (PVR) were reduced after MVR. LV function after MVR was mostly improved in patients with asymptomatic MR, with SR or paroxysmal AF and after isolated MVR than in symptomatic patients with MR, with chronic AF and MVR with TVR or AVI. Despite of improvement of LV function the reduction of TAPSE indicates impairment of longitudinal RV deformation. However, RV strain analysis after MVR indicates unchanged RV contractility. Thus, RV function should be analysed more accurately by 3D volume changes and radial deformation analysis. In addition, a moderate MR quantified by Vena contracta-method was observed in 6 patients after MVR (20%).

Education in Ultrasound

Introduction of basic dermatologic ultrasound in undergraduate medical education

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Purpose: Teaching ultrasound procedures to undergraduates has recently been proposed to improve the quality of medical education. We address the impact of applying standardized ultrasound teaching to our undergraduates. Material and methods: Medical students received an additional theoretical and practical seminar involving hands-on ultrasound screening during their mandatory practical training week in dermatology. The students’ theoretical knowledge was tested before and after the course. After the course, the students were asked to answer a course evaluation questionnaire. Results: The multiple-choice question scores after the course showed statistically significant improvement (53.4 vs. 87.4%; P = 0.001). The questionnaire revealed that students were satisfied with the course, felt that it increased their ultrasound knowledge, and indicated that they wanted more monographic hands-on training in both dermatology and other medical fields. Conclusion: Using practical, hands-on medical teaching is an emerging method for undergraduate education that should be further evaluated, standardized, and developed.

P3-15  Pitfall at diagnosis: lymphnode tuberculosis as cause of fatigue syndrome and abdominal complaints
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DOI: 10.1055/s-0036-1587933

We report the case of a 23 years old refugee from ethiopia. He was admitted to our hospital because of fatigue syndrome, weight los and abdominal pain. No coughing was reported by the patient. Clinical examination, laboratory tests, abdominal sonography and gastroscopy revealed acute gastritis. Quantitiferon test was positive. The patient was discharged with recommendation for further treatment. Several weeks later the patient was readmitted because of progressive weight loss and fatigue syndrome. Now we performed extensive diagnostics with CT scan and found mediastinal lymph node enlargement. Bronchoscopy with aspiration of bronchial secretion showed multiple bacteria, but no mycobacteria. We performed a transesophageal fine needle aspiration. Cyto logical examination of the fine needle aspirate revealed bacterial overgrowth with multiple grampositive and gramnegative bacteria in the microbial tests plus mycobacteria. But PCR showed mycobacteria other than tuberculosis. We started antimicrobial treatment against the proven microbiologic agents and transferred the patient to a specialised lung clinic for further diagnostics and treatment. Bronchoscopy was repeated there and mycobacterium tuberculosis without resistance against tuberculant agents was secured. Tuberculant treatment was initiated. Two months after the transesophageal fine needle aspiration we got the result of the cultural testing of our this specimen. It showed mycobacterium tuberculosis aswell. Conclusion: 85% of patients with tuberculosis show pulmonary affection as first manifestation. 50% of extrapulmonal manifestation are found in lymph nodes. 20% of the affected lymph nodes are situated in the mediastinum. Diagnosis of tuberculosis in this case was challenging because of the presence of several non tuberculosis mycobacteria in the PCR of our fine needle aspirate. Culture secured tuberculosis. It remains gold standard, but it takes two months time.

P3-16  Ultrasound in the undergraduate medical curriculum: Designing the learning material
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Purpose: During the last decades, ultrasound has been established as an effective diagnostic tool. Medical students learning ultrasound already as undergraduates clearly benefit in terms of understanding anatomy and pathology. Thus systematic training on how to perform clearly defined ultrasound standard views is important early in the undergraduate medical curriculum. However, as organizing practical ultrasound training is resource intensive, suitable learning material for preparation and review can alleviate shortage of practical training possibilities. For demonstrating practical skills videos have been shown to be effective, provided they show relevant aspects. The study describes our process of developing instructional ultrasound videos. Material and methods: Learning materials were designed in an interactive process: (1) define learning goals (2) outline steps to be taken, written documentation (3) outline script for video recording (4) video editing (5) revised with ultrasound experts and students (6) revise video editing. The videos consist of various compositions such as a video of the transducer next to the resulting ultrasound video (split screen). Students’ perception of the material is being surveyed asking about their preferences of learning material and instructional setting together with how the videos helped them to prepare for the upcoming practical ultrasound assessment. Results: 11 concise ultrasound videos were created and implemented in curricular training at our university, which include instructions on a defined examination process, image optimization and 9 standardized ultrasound views. Although our recording system allows us to minimize the need for extensive post video editing by being able to choose the composition of video and audio signals on the fly during the recording process, multiple takes were needed as well as audio and video post processing. By means of an online questionnaire students’ perception of video material is currently being evaluated.

P3-17  Introduction of augmented reality in ultrasound training – The set up for the UppStudy (Ultrasound aPP Study)
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DOI: 10.1055/s-0036-1587935

Purpose: Virtual and augmented reality are upcoming new technical features used in the entertainment industry. Here the first theoretic preparations towards implementing an augmented reality based ultrasound training are presented. 3D objects in a wavefront file format should be visualized like on an ultrasound screen. Implementing the physical laws of reflection, intensity and absorption (Law et al 2011). Material & methods: We developed a raytracing/casting-based rendering method in order to approximate ultrasound propagation in piecewise homogeneous media. In contrast to existing methods, which are based on volume data (like CT images), our scene geometries consist only of surfaces delimiting the volumes inside which the actual ultrasound propagation takes place. This enables interactive volume rendering within the resource constraints of modern smart phones, but also implies that material properties can only be associated with those boundary surfaces. To determine which material properties apply at each position the ray is sampled, we keep track of the currently active volume using a stack of volume IDs, which we accordingly modify on entering/exiting a volume through its surface. After determining the reflected energy at each point along the ray, we also add noise and blur in a post-processing step. Our surface-based rendering method thus requires only a compact 3D scene description, which however must contain only closed, non-overlapping surfaces, similar to our simplified test scene, consisting of a larger sphere (the “body”), enclosing a smaller box, which in turn contains a much denser small sphere. Results: The results enabled a sonographer to imagine the original 3D objects without a problem (graphic 1). Further optimizing of the algorithm is needed to enable a smooth calculation of more complicated objects like internal organs. Conclusion: Augmented/virtual reality simulation may open up more training possibilities for students to learn the motorical skills faster and more efficiently and also enable students to train on various pathological findings.

Fig. 1: demonstration of the US screen of the 3D model

P3-18  Christian Doppler and the Doppler-Effect with a focus on the use in Ultrasound Diagnostic
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DOI: 10.1055/s-0036-1587936

Research on Christian Doppler unveiled new aspects of his life. The Doppler-Effect is used in many physical fields, even several Nobel Prices are associated with the Doppler Effect. Following the path of his observa-
Elastography and Ultrasound I – Clinical Investigations and Case Reports

P4-19
Effectiveness of sonoelastography in differential diagnosis of benign and malignant solid breast lesions
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DOI: 10.1055/s-0036-1587939

Aim: In the current study, we aimed to evaluate effectiveness of ultrasonographic elastography in differential diagnosis of breast lesions which were detected by B-mode ultrasonography, in terms of being malignant and benign.

P4-20
Effectiveness of sonoelastography in differential diagnosis of benign and malignant solid thyroid nodules
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DOI: 10.1055/s-0036-1587940

We aimed to evaluate effectiveness of ultrasonographic elastography in differential diagnosis of thyroid nodules.

P4-21
Point shear wave elastography by acoustic radiation force impulse (ARFI) of rare chronic liver disease such as autoimmune hepatitis (AIH) and overlap-syndrome
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DOI: 10.1055/s-0036-1587941

Purpose: Acoustic radiation force impulse (ARFI) elastography is a non-invasive method for evaluating liver fibrosis. Performance data on rare autoimmune liver diseases like autoimmune hepatitis (AIH) and overlap-syndrome are sparse. Therefore, ARFI shear wave velocities of the liver were ascertained and correlated with histological degree of fibrosis. Material and methods: In a retrospective analysis, a total of 28 patients (21 female, 7 male, mean age 49 years; range: 19 – 74 years) with AIH (n = 19) and overlap-syndrome (n = 9) have been evaluated by use of ARFI elastography and histological degree of fibrosis by Ishak. A minimum of 7 measurements of the right hepatic lobe were obtained. The ARFI shear wave velocities are expressed as meters per second (m/s) and were calculated as the mean ± standard deviation (range). Results: The mean ARFI values of all AIH patients showed 2.11 ± 1.01 m/s (range: 0.92 – 3.98 m/s) and correlated with the histological classification of fibrosis (r = 0.507, p < 0.05). The patients with an overlap-syndrome had an ARFI mean of 2.12 ± 0.74 m/s (range: 1.06 – 2.96 m/s), well correlating with the Ishak score (r = 0.813, p < 0.01). The mean ARFI values of all patients correlated well with the Ishak fibrosis score (r = 0.611, p < 0.01). These shear wave velocities of all patients correlated also with patient age (r = 0.365, p < 0.05) and negatively with platelet count (r = -0.449, p < 0.01). The diagnosis of relevant fibrosis (Ishak ≥ 2) had a cutoff-value of 1.58 m/s with a sensitivity of 82.4% and a specificity of 81.8%. Conclusion: Autoimmune liver diseases like AIH and overlap-syndrome revealed increased ARFI shear wave velocities values of the liver. Hepatic ARFI elastography correlated well with the degree of fibrosis and represents a helpful diagnostic adjuvant.

Implementation of a novel iPhone and Android application for educational and training purposes in prenatal and pelvic ultrasound
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DOI: 10.1055/s-0036-1587938

Purpose: Downloadable applications (apps) are becoming widespread across medical specialties. Recently, the advancement of smartphone technology has provided us with an excellent opportunity for the development of new apps, that may benefit education in obstetrics and gynecology (OB/GYN) globally. The aim of this study was to assess the usefulness of a novel ultrasound app, operating on Android and iPhone mobile platforms, among OB/GYN residents, participating in DEGUM courses. Material and methods: The app (You-Scan) was developed by Geektank Labs, using DICOM-stored ultrasound (US) sweeps, acquired during prenatal and pelvic US, to build an image data bank (US-scan). Multi-touch gestures allow to zoom in and out or to drag the finger swipe across the screen allows to go back and forth through the scans, when enabled. After usage of this app in two separate US courses, 16 (34.0%) residents downloaded the app after the course (iPhone: 7, Android: 4). Conclusion: OB/GYN residents participating in DEGUM courses find the novel ultrasound app a useful aide and endorse its implementation to support their education.

Facing the Ultrasound education: Establishment of an unified and well-structured curriculum
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Purpose: The role of medical ultrasound (US) is steadily increasing. Ultrasound is an inexpensive and readily available diagnostic method. Therefore ultrasound becomes even in medical schools more and more important in theoretical as well as in practical teaching. Following this development many medical schools offer now a basic training in ultrasound. The concepts varies both in time, scope, content and availability of capabilities. Material and Methods: The working group students in the DEGUM (German Society for Ultrasound in Medicine) has developed a catalogue of learning objectives, which is to represent the content minimum requirement and shall aid for a uniform and high-quality ultrasound training program. The basic principle for the development of this catalogue was the evaluation of various US-training concepts of medical universities in Germany, performed in 2014. Furthermore, the already existing concepts and topics for US-courses, established by DEGUM and the European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB) has been considered. Results: From the viewpoint of the working group, this catalogue of learning objectives, separated into theoretical and practical skills, contains the minimum requirements for learning abdominal ultrasound in medical studies and can be valuable for medical schools to establish an ultrasound training for students. Conclusion: The catalogue could make an important contribution to a unified and well-structured curriculum of US training and assure. Beyond, it could be the prospective basis for new course concepts.

Point shear wave elastography by acoustic radiation force impulse (ARFI) of rare chronic liver disease such as autoimmune hepatitis (AIH) and overlap-syndrome
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DOI: 10.1055/s-0036-1587941

Purpose: Acoustic radiation force impulse (ARFI) elastography is a non-invasive method for evaluating liver fibrosis. Performance data on rare autoimmune liver diseases like autoimmune hepatitis (AIH) and overlap-syndrome are sparse. Therefore, ARFI shear wave velocities of the liver were ascertained and correlated with histological degree of fibrosis. Material and methods: In a retrospective analysis, a total of 28 patients (21 female, 7 male, mean age 49 years; range: 19 – 74 years) with AIH (n = 19) and overlap-syndrome (n = 9) have been evaluated by use of ARFI elastography and histological degree of fibrosis by Ishak. A minimum of 7 measurements of the right hepatic lobe were obtained. The ARFI shear wave velocities are expressed as meters per second (m/s) and were calculated as the mean ± standard deviation (range). Results: The mean ARFI values of all AIH patients showed 2.11 ± 1.01 m/s (range: 0.92 – 3.98 m/s) and correlated with the histological classification of fibrosis (r = 0.507, p < 0.05). The patients with an overlap-syndrome had an ARFI mean of 2.12 ± 0.74 m/s (range: 1.06 – 2.96 m/s), well correlating with the Ishak score (r = 0.813, p < 0.01). The mean ARFI values of all patients correlated well with the Ishak fibrosis score (r = 0.611, p < 0.01). These shear wave velocities of all patients correlated also with patient age (r = 0.365, p < 0.05) and negatively with platelet count (r = -0.449, p < 0.01). The diagnosis of relevant fibrosis (Ishak ≥ 2) had a cutoff-value of 1.58 m/s with a sensitivity of 82.4% and a specificity of 81.8%. Conclusion: Autoimmune liver diseases like AIH and overlap-syndrome revealed increased ARFI shear wave velocities values of the liver. Hepatic ARFI elastography correlated well with the degree of fibrosis and represents a helpful diagnostic adjuvant.
Ultrasound evaluation of coexistent thyroid and parathyroid lesions in end stage renal disease cases
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Preliminary: the incidence of thyroid disease in cases operated for hyperparathyroidism is 2.5 – 17.6%. The current study is evaluating the series of secondary and tertiary hyperparathyroidism with thyroid and parathyroid lesions. Material: From series of 44 operated cases with renal secondary and tertiary hyperparathyroidism, with 10/44 associated thyroid nodules. Method: 2 B ultrasound, Power Doppler, and real time elastography with qualitative (Rango criteria) and computer assisted quantitative measurement of tissue elasticity with high accuracy linear probe, Hitachi Preirus Device, Hitachi Inc., Japan. Histopathology evaluation was performed in all cases. FNAB was performed in cases with associated thyroid nodules. Results: Pathology evaluation confirmed the association of thyroid carcinoma (papillary carcinoma) and parathyroid nodular hyperplasia in 4 cases. The other 6/10 cases were classified as benign thyroid pathology: 2 follicular adenoma, 2 autoimmune thyr- oiditis and 1 Hurtle cell adenoma. The thyroid cancer cases consist of 3 women (aged 57 and 61), and two men (40 and 42 years). Preoperative imaging showed proper localization of the hypertrophic/hyperplasic parathyroid glands but also proper description on the thyroid nodular disease. Ueno score 3 and 4 was observed in all four cases of thyroid cancer. The qualitative suspicion was confirmed by an increased strain ratio in suspicious thyroid nodules, compared with unsuspicuous thyroid and parathyroid nodules. FNAB was impossible in 1 case (para-carotidian nodular position). Cytological results: 2 Bethesda 4, 1 unclear diagnostic. Total thyroidectomy was proposed in all the 4 cases. From the 6 benign nodular position). Cytological results: 2 Bethesda 4, 1 unclear diagnostic.

Quality control of elastography measurements – influencing factors and pitfalls
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Purpose: To evaluate the correctness of shear wave measurements of different vendors and scanheads. Material and methods: For comparing different US machines and scan heads we used the 2nd generation elastography phantom of CIRS (039) with 4 different stiffness values from 3.5 kPa (1), 10 kPa (2), 25 kPa (3) and 45 kPa (4) simulating the range from normal liver to severe fibrosis. 3 US machines with up to three scan heads (4 MHz, 6 MHz and 9 MHz) were compared (Siemens S2000 and S3000 with 4C 1, 6C 1, and 9L 4 scan head, Toshiba Applio 500 with 6C 1 scan head). In every phantom 5 measurements are done in 2, 4, 6 and 8 cm depth. Additionally the pressure of the scan head was modified. Results: The best correlation was seen at 2 cm with the 4C1 scan head of the S2000 (3.63 kPa, 9.61 kPa, 22.69 kPa, 42.19 kPa) and with the Apio 500 in single shot technique (3.2 kPa, 9.7 kPa, 20.4 kPa, 41.2 kPa). With the 9L4 comparable results are only achievable in phantom 1 and 2 with significant underestimation of the stiffer phantoms. All machines and scan heads showed an increasing underestimation of the kPa values with depth.

Non-invasive assessment of liver fibrosis by means of Transient Elastography and Fibrotest in patients with HCV compensated liver cirrhosis
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DOI: 10.1055/s-0036-1587944

Purpose: The severity of liver disease should be assessed prior to therapy. The purpose of the study was to evaluate the accuracy of FibroTest and Transient Elastography (TE) for predicting HCV liver cirrhosis (LC), in naïve or treatment-experienced patients, with compensated liver disease. Material and methods: The study included 104 consecutive patients previously diagnosed with compensated HCV LC based on clinical, biologic, ultrasonographic, morphologic, laparoscopic or endoscopic (esophageal varices) criterias, who were considered for interferon free treatment (Viekira/Exviera). Liver fibrosis was assessed during a two week period by means of TE (using M or XL probe) and by FibroTest. For TE reliable measurements were defined as median value of 10 liver stiffness measurements, with a SR>60% and an IQR< 30%. For diagnosing cirrhosis by means of TE we used a cut-off value 12.5 kPa [1] and for FibroTest a value of 0.75. Results: Out of 104 patients, reliable measurements by TE were obtained in 93.3%, so that the final analysis included 98 patients (having valid TE and FibroTest). According to FibroTest cut-off 74.5% (73/98) patients were correctly classified, while according to TE cut-off – 91.8% (90/98) patients (p = 0.002). Out of the 98 cirrhotics, 4.1% were misclassified by TE as having significant fibrosis (F2) and 4.1% with severe fibrosis (F3). When we evaluated the performance of FibroTest – 92.9% of patients with LC were misclassified as having F2, 13.3% as having F3 and 3% as having F3/F4. Conclusions: The accuracy of FibroTest for predicting HCV liver cirrhosis in naïve or treatment-experienced patients, with compensated liver disease was significantly lower than of TE (74.5 vs. 91.8%; p< 0.002). Reference: [1] Castera Let al. Prospective comparison of transient elastography, FibroMax, APRI, and liverbiopsy for the assessment of fibrosis in chronic hepatitis C. Gastroenterology 2005; 128: 343 – 350.
P4-25

The prevalence of liver steatosis, streathepatitis and inflammation activity in a cohort of compensated HCV liver cirrhosis patients, according to FibroMax

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DOI: 10.1055/s-0036-1587945

Background: The diagnosis of liver cirrhosis is based on clinical evidence of liver disease, laboratory abnormalities, liver stiffness assessed by non-invasive techniques such as elastography based techniques and biological tests. Aim: The aim of this study was to evaluate the prevalence of liver steatosis, fibrosis, streathepatitis and inflammation activity as assessed by FibroMax in a cohort of compensated HCV liver cirrhosis. Material and methods: We performed a prospective study, including 109 patients diagnosed with HCV liver cirrhosis by means of elastography techniques, by clinical, biologic or endoscopic criteria. Using FibroMax test, fibrosis was staged as F0, F1, F2, F3, F4, steatosis as S0, S1, S2, S3, nonalcoholic steatohepatitis as N0, N1, N2, alcoholic steatohepatitis as H0, H1, H2, H3 and inflammatory activity as A0, A1, A2, A3. Results: Even if all patients had liver cirrhosis, false negative results of mild fibrosis (F=2) were present in 4/109 cases (3.6%), and of significant fibrosis (F=3) in 20/109 cases (18.4%), while cirrhosis (F=4) was correctly diagnosed in 85/109 (78%). Without steatosis we found 14/109 (12.9%) cases, with mild steatosis (S=2) 29/109 cases (26.7%), moderate steatosis (S=2) was observed in 32/109 (29.3%) and severe steatosis (S3) in 34/109 cases (31.1%). Minimal alcoholic steatohepatitis (H1) was found in 6/109 cases (5.5%), moderate (H2) in 1.8% and 101/109 had no alcoholic steatohepatitis (H0). The distribution of nonalcoholic steatohepatitis was: NO: 47/109 (43.1%), N1: 12/109 (11.0%), N2: 50/109 (45.8%). Regarding activity: A0-A1 was found in 10% of cases, A2 in 31/109 cases (28.4%), A3 in 66/109 cases (60.7%). Conclusions: A high percentage of reliable measurements when using both VTQ and 2D-SWE GE (90%). We found no significant differences between VTQ and 2D-SWE GE across study groups, as well: obese (1.36 ± 0.67 m/s vs. 1.19 ± 0.16 m/s, p = 0.8), children with hepatopathies (1.5 ± 0.02 m/s vs. 1.3 ± 0.11 m/s, p = 0.1) and normal weight children without liver disease (1.11 ± 0.15 m/s vs. 1.11 ± 0.19 m/s, p = 0.7). Conclusion: Both VTQ and 2D-SWE GE performed excellent in obtaining reliable measurements of liver stiffness in children. Similar values were obtained when using either VTQ or 2D-SWE GE, even in obese and children with hepatopathies.

P4-26

Non-invasive liver fibrosis assessment in children: Two Dimensional Shear Wave Elastography and point Shear Wave Elastography

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Aim: To compare the feasibility and performance of two ultrasonic methods involving ultrasound shear waves in children: two dimensional shear wave elastography (2D-SWE) and point shear wave elastography (point SWE). Material and methods: We conducted a prospective study in children. Elastographic measurements of liver stiffness were performed using point SWE – Virtual Touch Tissue Quantification (VTQ) (Acuson RS 80A SWE, USA) and 2D-SWE GE Healthcare, Chalfont St Giles-UK). Reliable measurements were defined as a median value of 10 liver stiffness measurements with a success rate ≥60% and an interquartile range interval <30%. Our study population consisted of 30 children (mean age 11.4 ± 3.9, 23.3% girls, mean BMI 22.5 ± 7.3 kg/m²) divided into 3 groups: obese (n = 13), children with hepatopathies (cystic fibrosis associated liver disease, chronic autoimmune hepatitis, n = 4) and a group of normal weight children without liver disease (n = 13). Results: We obtained a high percentage of reliable measurements when using both VTQ and 2D-SWE GE (90%). We found no significant differences between VTQ and 2D-SWE GE (1.3 ± 0.51 m/s vs. 1.17 ± 0.18 m/s, p = 0.8) in our study population. No significant differences were found between VTQ and 2D-SWE GE across study groups, as well: obese (1.36 ± 0.67 m/s vs. 1.19 ± 0.16 m/s, p = 0.8), children with hepatopathies (1.5 ± 0.02 m/s vs. 1.3 ± 0.11 m/s, p = 0.1) and normal weight children without liver disease (1.11 ± 0.15 m/s vs. 1.11 ± 0.19 m/s, p = 0.7). Conclusion: Both VTQ and 2D-SWE GE performed excellent in obtaining reliable measurements of liver fibrosis in children. Similar values were obtained when using either VTQ or 2D-SWE GE, even in obese and children with hepatopathies.

P4-27

Quantification of tissue elasticity using three shear wave elastography platforms on liver fibrosis phantoms

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Purpose: To assess the reproducibility of quantitative shear-wave elastography measurements, on four tissue-mimicking liver fibrosis phantoms with known Young’s modulus, on three elastographic techniques and methods. We tested three different shear wave elastography platforms: GE Logiq E9 SWE, Philips IU22 XM ARFI and Samsung RS80A. Both linear (frequency-9 MHz) and curvilinear (frequency: 7 – 1 MHz) probes were applied. The objects were four separate tissue mimicking liver fibrosis phantoms with different Young’s modulus within the range of biological soft tissue (2.7 kPa, 11.5 kPa, 24.8 kPa, 46.3 kPa). Two investigators performed all measurements in parallel. Each investigator made 10 separate measurements of each phantom. The results were evaluated for inter- and intraobserver variability, coefficient of variation, ICC and Bland-Altman analysis for the median value for each platform. Statistical analysis was performed with SPSS.

Results: All three elastography platforms showed excellent intraobserver agreement (ICC: 0.987 – 1.000) and interobserver agreement (ICC: 0.9981 – 1.000). All four liver fibrosis phantoms could be differentiated by quantitative elastography, by all platforms (p < 0.001). In the Bland-Altman analysis the differences in measurements were larger for the phantom with higher Young’s modulus. All platforms had a coefficient of variation in the range 0.00 – 0.21 for all four phants, equivalent to low variance and high reproducibility (Table 1). Median (min-max) elasticity measurements performed with three elastography platforms on liver fibrosis phantoms.

Tab. 1

<table>
<thead>
<tr>
<th>Elastography system</th>
<th>Probe Observer</th>
<th>Phantom 1</th>
<th>Phantom 2</th>
<th>Phantom 3</th>
<th>Phantom 4</th>
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<tr>
<td>Philips IU22 XM ARFI</td>
<td>A 1.99 kPa</td>
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<td>A+B 1.99 kPa</td>
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<td>Samsung RS80A SWE</td>
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Conclusion: All systems used in this study obtained high reproducibility in quantitative measurements in a liver fibrosis phantom and excellent interclass correlations.

Gynaecological Ultrasound I – Clinical Investigations and Case Reports

P5-15

Fetal acauses resulted by intraabdominal bleeding and secondary fetal anemia treated by intravenale blood transfusion (IUT) in the gestational age of 28 weeks

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Purpose: Fetal acauses refers to the accumulation of free fluid in the fetal abdomen. After the recognition of anemia in antenatal ultrasound, it is essential to establish whether this is an isolated fetal anemia or associated with hydrops. Methods: A 30-year-old woman (G II P 0, 27 + 4 GSW) was admitted for generalised pruritus and sonographically diagnosed
isolated fetal ascites. Results: The mother was blood group A and Rh positive. The prenatal organ screening was without pathological findings. Further we diagnosed a intrahepatic cholestasis of pregnancy (ICP) with an enormously level of bile acids (160 μmol/l). Antenatal TORCH, HIV, Treponema and Hepatitis screening were all normal. Fetal MRI detected no other organic abnormalities. The isolated intraabdominal ascites can be caused by blood or meconium. Intermittently the peak systolic velocity of the MCA was pathological. In the further course the fetus presents a suspect fetal heart rate. In a gestational age of 29 weeks, under the suspicion of intraabdominal bleeding we admitted the patient to the UKH for intrauterin blood transfusion (IUT). The concentration of foetal haemoglobin was determined in umbilical cord blood before (9 g/dl) and after (15.8 g/dl) the IUT. 105 ml of red blood cell concentrate were transfused. In the gestational age of 37 weeks our patient was born by secondary lower segment Cesarean section due to fetal distress (APGAR 8 – 8, 9, pHUA 7.29, 2750 g, 45 cm). Under suspicion of ileus one day after birth the explorative laparotomy was performed. Intraoperative the newborn developed a pulmonary hypertension, the operation had to interrupted. In a second look laparotomy an atresia of jejunum with perforation and meconium peritonitis were detected. Conclusion: Fetal ascites can result from many different aetiologies, including gastrointestinal and genitourinary anomalies. Chromosomal abnormalities and viral aetiologies must also be considered.

A case of antenatal-suspected thanatophoric dysplasia type 1 turning out as rather osteogenesis imperfecta type 2
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Results: After exclusion of other organic abnormalities with short limbs and ribs, a hypochogenic clefterskull, a narrow chest encasing hypoplastic lungs, gyration anomalies and rocker-bottom feet typical for thanatophoric dysplasia. The amniotic fluid index, umbilical artery doppler and fetal echocardiography were normal. After exessive interdisciplinary counselling, the patient opted for a fetocide. The praenatal organ screening was without pathological findings, as it consists exclusively of case-reports. Material and methods: Case report, literature review. Results: Pregnant refugee from Syria was referred because of pleural effusion @ 33 weeks. Ultrasound scan revealed a female fetuses with isolated hydrothorax, polyhydramnios and the absence of hydrops (Fig. 1).

Data from literature review is given comparing survival with and without pleuroamniotic shunting. Conclusion: In this present case noninvasive management of isolated fetal hydrothorax seems to have been justified.

Noninvasive management of isolated bilateral fetal hydrothorax
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Purpose: Conjoined twins is a rare phenomenon, the occurrence is estimated to range from 1 in 50,000 births to 1 in 200,000 births. Approximately 40% are stillborn, the overall survival rate is about 20%. The condition is more frequently found among females, with a ratio of 3:1. Conjoined twins is a rare phenomenon, the occurrence is estimated to range from 1 in 50,000 births to 1 in 200,000 births. Approximately 40% are stillborn, the overall survival rate is about 20%. The condition is more frequently found among females, with a ratio of 3:1. The most famous pair of conjoined twins was Chang and Eng Bunker (1811 – 1874), Thai brothers born in Siam. As a crowd puller in a circus they were billed as the famous Siamese Twins for many years. Hence the term “Siamese twins” came to be used as a synonym for conjoined twins.
Material and methods: Case report and literature review. Results: A 30-year-old gravida 3, para 2 presented for her first antenatal visit at 15+4 weeks of gestation. Ultrasound showed a non-viable monochorial monoamniotic twin pregnancy with the signs of a hydrops fetalis. Further a polyhydramnion was present. The fetuses were not distinguished from one another at the thoracic-abdominal level. Ultrasound imaging was limited due to advanced state of fetal maceration. (Fig 1 – 3). Autopsy findings after induced abortion: the two female bodies fused at the lower chest, only sharing the liver with a conjoined umbilical cord, no further organ system was involved (Fig 4).

Conclusion: Although the advanced state of fetal maceration limited ultrasound its results were still consistent with autopsy.

Asymptomatic rupture of the uterine scar – diagnosis during routine ultrasound check

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DOI: 10.1055/s-0036-1587952

Purpose: Asymptomatic ruptures of uterine scars after previous Caesarian Section (CS) are of utmost clinical importance even more so if a vaginal birth after CS (VBAC) is planned. Ultrasound is commonly used in pregnancy and widely available. The routine measurement of the lower uterine segment (LUS) could help detecting patients who should by no means attempt a VBAC as our case suggests. Case: A 38-year-old G4P3 was referred to our unit at 35 weeks and 2 days due to fetal renal pyelectasis seen in the second trimester ultrasound. In all previous pregnancies the children were delivered by CS using a longitudinal incision in India.

The ultrasound showed a viable appropriately grown fetus in cephalic presentation showing a discrete bilateral pyelectasia. Our routine check of the uterine scar however, revealed an asymptomatic rupture of the anterior uterine wall with bulging of the amniotic membrane. The patient was admitted for observation. Four days later she developed local pain close to the uterine scar associated with contractions of the uterus. The CS was performed and a healthy male baby was born weighing 2650 g. The uterine scar showed a complete rupture with bulging amniotic membranes according to the sonographic findings measuring approximately 6 × 3 cm. The patient recovered normally. Mother and baby could be discharged 5 days after CS.

Conclusion: Routine ultrasound which should include the measurement of the LUS after CS is able to provide reliable data which are important in risk management after CS.

Repetitive circumvallate placenta as a cause for early preterm rupture of membranes? Presentation of a rare case

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DOI: 10.1055/s-0036-1587953

Purpose: Circumvallate placenta is a rare abnormality of placental development, which can cause severe perinatal complications. Prenatal diagnosis is difficult and includes sonographic and clinical features. Here we present a case of suspected repetitive circumvallate placenta. Materials and methods: A 32-year old patient IVG IP with a history of one spontaneous delivery and two cases of rupture of membranes in 18 weeks of gestation and consecutive loss of pregnancy presented at our department at 11 weeks of gestational age. Sonography revealed a massive retroamnial hematoma surrounding the amniotic sac with an otherwise unsuspicious fetus. In further course of pregnancy the hematoma disappeared slowly, mostly by vaginal bleeding. At 31 weeks of pregnancy PPROM and consecutive vaginal bleeding led to suspicion of placental abruption and cesarian section. Placental examination after birth revealed the diagnosis of circumvallate placenta. Results: Reevaluation of the previous cases of loss of pregnancy in second trimester revealed similar sonographic findings of extensive hematoma in first trimester with consecutive loss of pregnancy due to rupture of membranes at 18 and 20 weeks of pregnancy. However reevaluation of the sonographic images of the most recent pregnancy did not show definite signs of the latter diagnosed circumvallate placenta. Parameters for hemostaseology appeared slowly, mostly by vaginal bleeding. At 31 weeks of pregnancy PPROM and consecutive vaginal bleeding led to suspicion of placental abruption and cesarian section. Placental examination after birth revealed the diagnosis of circumvallate placenta. Results: Reevaluation of the previous cases of loss of pregnancy in second trimester revealed similar sonographic findings of extensive hematoma in first trimester with consecutive loss of pregnancy due to rupture of membranes at 18 and 20 weeks of pregnancy. However reevaluation of the sonographic images of the most recent pregnancy did not show definite signs of the latter diagnosed circumvallate placenta. Parameters for hemostaseology were within normal limits. Discussion: Though circumvallate placenta is a rare condition and prenatal diagnosis is demanding, anamnestic and clinical findings like early preterm rupture of membranes and first trimester vaginal bleeding must be suspicious for this diagnosis. So far only very few cases of repetitive circumvallate placenta have been described and further studies are necessary to elucidate the etiology of this suspected repetitive abnormal placenta development.

Fig. 1: Hematoma in first trimester
Idiopathic polyhydramnios and fetal gender

**Purpose:** To determine the relationship between idiopathic polyhydramnios and fetal gender in the absence of fetal or maternal abnormalities.

**Materials and methods:** This was a retrospective population-based register study. 295 women with singleton pregnancies complicated by idiopathic polyhydramnios (amniotic fluid index (AFI) higher than 24 cm²) who were delivered at our institution from January 2002 till December 2012 were included. Only pregnancies with an uncomplicated outcome were accepted in this study. The incidence of the male to female fetuses was compared with the one in the general population. **Results:** Among pregnancies complicated by idiopathic polyhydramnios, the following gender distribution was found: 72.9% male and 37.1% female. The distribution in the general population was 51.5% female and 48.5% male. The mean AFI was significantly increased in male fetuses (p < 0.001). The gender distribution was found: 72.9% male and 37.1% female. The distribution in the general population was 51.5% female and 48.5% male. The mean AFI was significantly increased in male fetuses (p < 0.001). The increased AFI did not correlate with gestation age, fetal head circumference or estimated fetal weight. **Conclusions:** Idiopathic polyhydramnios is more frequent in male normal fetuses than in female ones.

Outcome of fetuses with gastrochisis after modification of prenatal management strategies

**Purpose:** Several studies have been performed to evaluate prenatal predictors to improve the outcome of fetuses with gastrochisis. There are no standards in prenatal care since there are different guidelines. In our study we evaluated the outcome of fetuses with gastrochisis after modification of prenatal management strategies at the Department of Obstetrics and Gynecology of the University Hospital Münster. **Methods:** In this explorative retrospective study of 39 fetuses with gastrochisis, we compared the clinical outcome between two management groups. In the first group (1, n = 14) prenatal indication for delivery was confirmed by a subjective evaluation of the small bowel diameter and the wall thickness without established cut-off values for these parameters. In the second group (2, n = 25) certain limits for the small bowel diameter (25 mm) and the wall thickness (2.5 mm) were used for fetal surveillance. **Results:** No noticeable differences between the two groups regarding birth weight, weight centile, arterial pH, small bowel diameter, wall thickness, adverse bowel condition and re-operations could be observed. **Conclusion:** To avoid adverse prenatal complications we recommend the close observation of fetuses with gastrochisis by sonographic monitoring of the small bowel diameter and the wall thickness.

First trimester screening for Preeclampsia (PE) using FMF-London-Algorithm with placenta associated plasma protein-a (PAPP-A) and placental growth factor (PIGF)

**Purpose:** To investigate the pregnancy outcomes of the high risk population after screening and off-label use of acetylsalicylic acid (ASA) 100 mg/day. Among these patients, 5 patients (19%) developed late-onset PE, 1 patient (4%) early-onset PE, 3 patients (12%) with intrauterine fetal growth retardation (IUGR) before 34 weeks and 2 patients (8%) with IUGR after 3 weeks. **Conclusion:** The results of the multicenter ASPIRE-Study need to be awaited to correlate our local results.

**Interesting Case Reports of all Disciplines**

Bedside Ultrasound in emergency department to a patient with recurrent abdominal pain

**Purpose:** Gallbladder cancer (GC), is the most common biliary tract malignancy, representing 3% of malignant tumors, and has a high mortality, mainly related regional spread. Early detection remains difficult, and is often casual. We present a case of GC, diagnosed at emergency department, through the use of ultrasound scanning used by emergency physicians.

**Methods:** A patient with abdominal pain, with a final diagnosis of a GC. **Results:** 81 year old woman, was admitted to the emergency room after several consultations at its health center by right upper quadrant pain of several weeks duration, accompanied by fatigue, weight loss and a feeling of abdominal distention. On examination he had preserved the vital signs and had only found tenderness in the right upper quadrant, without signs of peritoneal irritation. Analytical emergency were unremarkable. The presence of pain the emergency physician made an ultrasound scanning observing a large mass occupying the gallbladder bed, hypoechogenic lesions in liver parenchyma, and perihepatic free fluid. **Conclusion:** Most are adenocarcinoma (85–98%). The histological type with better survival is papillary adenocarcinoma. Produce liver metastases from expansion angiolymphatic own areas of direct hepatic infiltration. The presenting symptoms are non-specific and difficult to differentiate from other more prevalent diseases such as biliary colic or chronic cholecystitis. The most common symptom is pain in right upper quadrant dull and aching. When symptoms such as jaundice or other constitutional symptoms usually appear advanced. Ultrasongraphy is the method of initial diagnosis image, and when it is diagnosed in early stages is usually discovered incidentally by ultrasound for another reason, which can observe a large mass occupying the gallbladder bed with wall thickening. Furthermore, ultrasound is very sensitive for detecting dilatation of intra/extrahepatic bile duct and the presence of hepatic metastatic lesions or direct infiltration of the parenchyma.

Bedside ultrasound in a Jaundice patient by emergency physicians

**Purpose:** Abdominal ultrasound has proven to be a useful, safe, versatile, with appropriate experience, help earlier diagnosis and comprehensive management of patients seen in the emergency department. We present a case of jaundice by biliary stent obstruction in patient with pancreatic neoplasia, through a bedside ultrasound by Emergency Physicians. **Materials and methods:** We report the case of a patient of 64 years with pancreatic neoplasia bearer of 8 French plastic stent by ERCP for biliary drainage for 6 days as palliative treatment, admitted in Emergency Room by jaundice and abdominal pain in epigastrium. **Results:** On arrival had malaise, was hypotensive, febrile, tachycardic and jaundice universal. The analyzes highlighted a bilirubin of 9.52 at the expense of direct fraction (8.60 mg/dl), and 22.500 leukocytes with neutrophilia. She underwent a bedside abdominal ultrasound where we found a central hyperchoic endoprosthetic image with acoustic shadowing, compatible with biliary litis. The patient was derived for urgent endoscopic retrograde cho- langiopancreatography, sphincterotomy, removal of protrusion, washing and placement 10 French prostheses, allowing a favorable evolution of the patient discharged within 72 hours without complications. **Conclusion:** The use of stents as temporary drainage of the bile duct as palliative treatment for pancreatic head tumors is an effective, safe and effective, it also represents a decrease in short-term mortality in these patients, and survival increased disease-free. The use of ultrasound in...
emergency allows us greater agility and speed in the diagnosis of prothromtic obstructions, allowing a more integrated management of the same. As shown in the case that concerns us a bedside ultrasound by Emergency Physicians favored a quick and agile diagnosis of bilateral sepsis patient suffering, allowing prompt treatment and an early solution to the problem.

P6-12 Axillary vein cannulation for central venous access in critical care
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DOI: 10.1055/s-0036-1587959

Purpose: The central veins that are usually cannulated are the jugular, subclavian and femoral. As we know ultrasound guidance can reduce complication rates and increase the success of cannulation. We present a case of ultrasound-guided axillary vein placement catheter by Emergency Physicians. This approach is not widely used among emergency physicians. We set an objective to spread this technique among emergency physicians because of its safety features for the patient. Material and methods: A patient addicted to parenteral drugs, was admitted to the ER in septic shock condition. Results: 52 year old woman addicted to parenteral drugs, stage C3 HIV with 2 weeks duration fever. On arrival had malaise, hypotensive, febrile, tachycardic... it was not possible to catheterize a peripheral vein we performed a central line cannulation; ultrasound-guided infraclavicular axillary vein. Less arterio-venous overlap and a greater distance between artery and vein from vein to rib cage should provide an increased margin of safety for central venous cannulation. We will describe step by step, accompanied by images, the steps necessary to achieve infraclavicular axillary vein cannulation. Conclusions: Ultrasound-guided axillary approach offers a number of potential advantages over others central line cannulation. The anatomy favors ultrasound guidance and less complications. Manual compression of the axillary artery or surgical access is possible if arterial damage is caused. The puncture site is further away from potential sources of infection in patients with tracheostomy, central chest wall burns or stertic obstructions. Once mastered, this is a safe, useful, and reliable technique for central venous access, so the axillary vein is an alternative for central venous cannulation, as can be seen in the case presented, an effective alternative to US-guided IJV and SCV cannulation.

P6-13 Septic shock patient and ultrasound in the emergency room
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DOI: 10.1055/s-0036-1587960

Purpose: Pyonephrosis (PN) is an uncommon disease that is associated with suppurative destruction of the renal parenchyma in adults. Obstruction and upper urinary tract infection play a role in its etiology. Fever, shivering, and flank pain are frequent clinical symptoms. Septic shock and death can occur if the disorder is not treated with urgent surgery. In this context percutaneous open nephrostomy or retrograde ureteral catheter insertion is appropriate, so it is a very serious disease and emergency physicians (EP) have a very important role in early diagnosis to start antibiotic treatment and early referral to surgery. Material and methods: A patient with fever, right flank pain and septic condition, with a final diagnosis of a calculus PN, through the use of US scanning used by EP. Results: 56 year old male, was admitted to the emergency room by right flank pain and fever. On arrival had malaise, hypotensive, febrile, tachycardic... in septic shock condition. Bedside emergency abdominal US was performed by EP, demonstrating right moderate to severe pelvocaliectasis due to a distal right ureteral stone. The patient was started on empirical antibiotics and a retrograde ureteral internal stents was placed by urologist. Results: 56 year old patient suffering, allowing prompt treatment and an early solution to the problem.

P6-14 Bedside echocardiography by emergency physicians in acute myocardial infarction
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DOI: 10.1055/s-0036-1587961

Purpose: Echocardiography is a non invasive diagnostic technique that uses ultrasound waves to create images of the heart. It is comprised in training programs in ultrasound medical emergency of prestigious international scientific societies, such as WINFOCUS (World Interactive Network Focused on Critical Ultrasound), and the American College of Emergency Physicians (ACEP). The current scientific evidence supports the use of echocardiography by emergency physicians for its speed, agility and safety for the patient. Material and method: Case study of the diagnosis of an interventricular communication as mechanical complication of anterior septal myocardial infarction, using echocardiography performed by Emergency Physician. We used a Sonosite M-Turbo, P21 probe of between 1 and 5 MHz, and echocardiography software. Results: 85 year old female, obese, hypertensive and diabetic, with poor quality of life, attended at emergency room for oppressive chest pain with several days of evolution, presenting sickness, sweating, tachycardia and severe hypotension (70/30). Showing an ECG with ST segment elevation with Q wave formation in the precordial leads (V1-V6). The EP performed a bedside echocardiography, observing a discontinuity at the level of apical interventricular septum with left-right shunt and dyskinesia at medium-apical septum and anterior papillary muscle, fully compatible with the anterior myocardial evolved, with break septal... a postinfarct interventricular communication. Given this findings and her quality of life, the patient was sent to have an urgent catheterization, starting with sedation and analgesia. she finally died after 24 hours of arrival at the hospital. Conclusions: Incorporating emergency echocardiography lowers the overall service time, since the emergency physician can be more effective, efficient and dynamic when handling "time-dependent" emergencies, providing greater clinical patient safety. Unfortunately, in this case the patient could not benefit from curative treatment, but avoided echocardiography to undergo unnecessary interventionism, which would not have prevented the fatal outcome.

P6-15 Emergency physicians and clinical abdominal ultrasound in emergency room
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Purpose: Abdominal pain is one of the symptoms which most often brings patients to the Emergency Room, being nearly 10% of cases. The delay in diagnosis and negative treatment influences the prognosis. Abdominal ultrasound is a fast, portable, repeatable, cheap and non-invasive method, that can provide abundant information to the emergency physicians. Materials & Methods: Case study of the diagnosis of a splenic infarction using an ultrasound scan performed by the emergency physician. Results: 56 years old male, former drug injecting addict, fully weaned for years, with HIV infection stage C3, with co-HCV infection, good adherence of antiretroviral therapy, maintaining undetectable viral load and CD4 count of 142 cells/ul, attended the emergency room with abdominal pain on the left side, initially labelled as renal colic. The patient was clinically stable, the laboratory results and radiography were normal, but the patient did not respond adequately to analgesic treatment, so the emergency physician performed a point-of-care ultrasound scan, observed a triangular image with peripheral base, hypoechogenic inside, in spleen, this data was compatible with spleen infarction, the patient was left in observation and anticoagulated. The evolution was favorable without further complications and he was discharged from the hospital a few days after admission. Conclusions: Ultrasound in the Emergency Room is a powerful tool, which together with its low cost and the absence of any adverse effects, is essential in our daily clinical practice. This is not to discuss the indications, in an urgent context of a classical ultrasound that requires high professional qualifications that must be performed by an experienced sonographer and involves the use of a high-end equipment; but we firmly believe in this resource as an extension of the emergency physician hand and it would be very beneficial to integrate the ultrasound in the medical process of determining diagnosis for urgent diseases.
**P6-16**

**Portal venous gas detected by bedside ultrasonography by emergency physicians**

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**Purpose:** Intestinal pneumatosis (IP) defined as presence of gas within the bowel wall and the presence of gas in the portalomesenteric vein complex, a rare clinical condition that are typically associated with intestinal ischemia (II) and a fatal outcome. We present a case of IP, diagnosed at emergency room, through the use of US scanning by emergency physicians (EP).

**Material and methods:** A patient with abdominal pain, with a final diagnosis of a IP assessing US, performed by EP.

**Results:** 82 years old woman, with abdominal pain from 12 hours. The patient presented malaise, affected by pain, hypotensive and tachycardic. The EP made a bedside abdominal ultrasound scan that showed many small echogenic mobile pictures that moved through the portal vein and its branches, and in the left hepatic lobe level we saw also multiple linear echogenic pictures in the portal branches with posterior acoustic shadow. Suspecting IP and gas in the abdominal venous complex portomesenteric urgent contrast CT was made, which confirmed the diagnosis.

**Conclusion:** CT and US are the most commonly used imaging modalities in patients with acute abdomen and even if CT represents the gold standard in the evaluation of patients with II. However, there are some disadvantages associated with this technique, such as radiation exposure, potential nephrotoxicity and the risk of an allergic reaction to the contrast agents. Thus, not all patients with suspected bowel ischaemia can be subjected to these examinations. Despite its limitations, bedside ultrasound performed by EP could constitute a good imaging method as first examination in acute settings of suspected mesenteric ischemia. Ultrasonography by EP, can be a useful tool in cases with serious diseases.

**P6-18**

**Clinical ultrasound in emergency room to a septic patient**

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**Purpose:** Emphysematous cholecystitis (EC) is an entity with high morbidity and mortality, and therefore require a diagnosis agile and dynamic, allowing appropriate management to avoid complications. The emergency ultrasound (US) allows a versatile and comprehensive management, improving the prognosis of this disease in the majority of cases.

**Material and methods:** A patient with abdominal pain, with a final diagnosis of an EC assessing US performed by EP.

**Results:** We report the case of a 72 year old patient with prior stroke without sequelae and hypertensive, with abdominal pain of 7 days duration, high fever and bilious vomiting, and clinical condition of septic shock. The emergency physician performed a bedside ultrasound that showed a thickened gallbladder wall (8 mm), well-circumscribed, oval, distended and gas in the same wall, compatible with emphysematous cholecystitis. Support measures were initiated, antibiotics and emergency surgery was indicated.

**Conclusion:** EC is a rare entity that represents 1% of all cholecystitis, clinically indistinguishable, but with a worse prognosis (25% mortality) and more complications. Here debut comes as poorly controlled diabetes. The use of abdominal US in ER allows for both a rapid and versatile, with proper treatment start, this being vital to good patient outcomes. Incorporate Emergency ultrasound may facilitate the early diagnosis of acute cholecystitis, preventing its severe clinical complications and providing greater patient safety. Therefore, the authors believe that the use of abdominal ultrasound in the emergency should be extended to all because it allows us a quick and versatile diagnosis, appropriate treatment with early onset with severe patients, as in the case presented, this being vital for a better prognosis and a good outcome for our patients.

**P6-19**

**Autoimmune nonpuerperal mastitis**

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**Purpose:** To share our experiences with this rare disorder.

**Material and methods:** We want to present three cases of rare autoimmune mastitis nonpuerperalis, the clinical picture, the ultrasound findings, therapy options and a comparison with the literature.

**Results:** All three patients stayed breast-conserving. One patient developed a contralateral breast cancer. **Conclusion:** It is a rare illness, often recurrent. Most commonly a cortisone therapy is done, smoking cessation seems necessary and complementary medicine an accompanying option. Individual treatment strategies similar to already described forms of therapy should be made.

**P6-20**

**Usefulness of bedside ultrasonography in the emergency room**

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**Purpose:** Bedside emergency renal ultrasonography (BERU) performed and interpreted by emergency physicians with limited training and experience is increasing in use and gaining acceptance. BERU concentrates on the focused presence or absence of hydronephrosis as is often seen in patients with acute flank pain secondary to renal colic. ED visit rates for urolithiasis increased from 178 to 340 visits per 100,000 individuals from 1992 – 2009. Therefore, it is a common condition in the ED. In many patients, BERU may obviate the need for further diagnostic workup and speed the diagnosis and treatment of an emergency patient. We present a case of patient admitted at ED with right flank pain and hematuria, the typical presentation of renal colic.

**Material and methods:** We want to share the cases of three rare autoimmune mastitis nonpuerperalis, the clinical picture, the ultrasound findings, therapy options and a comparison with the literature.

**Results:** 53 year old male, was admitted to the ER by right flank pain and hematuria. Bedside emergency ultrasonography initially performed to look for hydronephrosis, showed a large right renal mass, and prompted further workup with CT of abdomen and pelvis. While ultra-
Severe intracranial haemorrhage with cerebral parenchymal necrosis in fetal alloimmune thrombocytopenia – a case report

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Purpose: In fetal/neonatal alloimmune thrombocytopenia (FNAIT) maternal alloantibodies destroy fetal platelets, which harbour the paternal inherited agent (in 80% HPA-1a). The frequency is approximately 1:1000, but FNAIT is supposedly highly underdiagnosed. In contrast to rhesus incompatibility, this disease may already occur in the first pregnancy. Since screening is not available, FNAIT is currently not diagnosed before the occurrence of intracranial haemorrhage that may result in lifelong disability or death. Our case report intends to emphasize the importance of FNAIT, especially with respect to future options in prevention and prophylaxis. Materials and methods: We report on a 29-year-old pregnant woman, IIRG/OP, who was referred to us in week 30 with suspected hydrocephalus. The ultrasound showed an apparently developed fetus with isolated unilateral hydrocephalus. Hyperechoic intraventricular formations raised the suspicion of intraventricular haemorrhage. Additionally, the cerebral cortex was narrow (9 mm), 3rd and 4th ventricle and the other brain structures were unremarkable. Results: Maternal antibodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets. Fetal cMRI confirmed intracranial haemorrhage and revealed cerebral necrosis throughout the mid-diencephalon territory. Due to the poor prognosis and maternal cranial haemorrhage and revealed cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets. Fetal cMRI confirmed intracranial haemorrhage and revealed cerebral necrosis throughout the mid-diencephalon territory. Due to the poor prognosis and maternal cranial haemorrhage and cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets. Fetal cMRI confirmed intracranial haemorrhage and revealed cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets. Fetal cMRI confirmed intracranial haemorrhage and revealed cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets.

Severe thrombocytopenia (11/µl). Conclusion: The desire the fetal demise was induced. At this time, the child presented a lateral cerebral artery territory. Due to the poor prognosis and maternal cranial haemorrhage and revealed cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets. Fetal cMRI confirmed intracranial haemorrhage and revealed cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets. Fetal cMRI confirmed intracranial haemorrhage and revealed cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets. Fetal cMRI confirmed intracranial haemorrhage and revealed cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets. Fetal cMRI confirmed intracranial haemorrhage and revealed cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets. Fetal cMRI confirmed intracranial haemorrhage and revealed cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets. Fetal cMRI confirmed intracranial haemorrhage and revealed cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets. Fetal cMRI confirmed intracranial haemorrhage and revealed cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets. Fetal cMRI confirmed intracranial haemorrhage and revealed cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets. Fetal cMRI confirmed intracranial haemorrhage and revealed cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets. Fetal cMRI confirmed intracranial haemorrhage and revealed cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen on fetal platelets. Fetal cMRI confirmed intracranial haemorrhage and revealed cerebral necrosis throughout the mid-bodies against HPA-1a were detected and human platelet antigen genotyping of DNA extracted from the amniotic fluid verified the inherited paternal HPA-1a antigen.
P8-11

The sonographic diagnosis of the tumoral calcinosis

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Purpose: Tumoral calcinosis shows a typical sonographic appearance but it is also a very rare disease with a high risk of misdiagnosis and an inadequate therapy. Sonography is an important imaging modality in the diagnostic procedure. The presentation of characteristic sonographic criteria for tumoral calcinosis increases the certainty of diagnosis and is the basis of a quick and proper therapy. Method: We present typical clinical aspects of this disease in connection with characteristic imaging findings especially sonography. Results: Typical sonographic signs of tumoral calcinosis are massive extraosseous hyperechoic lesions of soft tissues with an acoustic shadowing phenomenon. The own demonstrated case impressively illustrates the possible manifestation during childhood. Conclusion: The sonographic examination is an essential pillar in the diagnosis of tumoral calcinosis syndrome. In adults but also in children the emergence of massive tumour-like calcium deposits in soft tissues is possible.

P8-12

Ultrasound examination of musculoskeletal adverse side effects after vaccination in babies

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Purpose: The aim of this study was to evaluate the usefulness of ultrasound in follow-up of adverse side effects in musculoskeletal system after vaccination in babies. Material and methods: Patients were babies aged 0 – 12 months, who were referred for ultrasound screening for DDH. Inclusion criteria for US examination of both lower legs in a prospective trial, were babies with suspect of nodules or diffuse enlargement of muscles where the shot was given. The examination was carried out with a 7.5 MHz real-time linear probe using the apparatus SONOLINE Versa Ultrasound Imaging System, SIEMENS AG, Erlangen, BRD. X-ray and blood tests were performed in three babies with suspect of cellullities of thigh and osteomyelitis of femur. Clinical and ultrasound examination were performed by orthopaedic surgeons experienced in musculoskeletal ultrasound. Results: Redness, swelling, soreness and tenderness where the shots were given, were seen in most of the patients. Decreased range of leg movements were associated in 3 patients with cellullities of thigh muscles and in one patient with osteomyelitis of femur. US examination showed nodules of different sizes and echogenicity or diffuse soft tissue enlargements in gluteal or anterolateral thigh region. Periosteal reaction of femur was also detected with US. Examinaion was used in follow-up of those patients on regular time interval or according to clinical signs. Conclusion: Ultrasound is useful and safe method in diagnosis and follow-up of musculoskeletal adverse side effects of vaccination in babies.

P9-15

Continuous amniinfusion via a subcutaneously implanted port system with PPROM and anhydramnios < 28+0 weeks of gestation: an international prospective randomized trial

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Mid-trimester PPROM occurs in 1% of pregnancies leading to a high neonatal mortality and morbidity rate, causing extreme preterm birth combined with the “fetal inflammatory response syndrome” (FIRS), thus inducing lung hypoplasia. Purpose: The evaluation of continuous amniininfusion therapy joining a 7 day lasting antibiotic treatment with PPROM and oligo-anhydramnios (SDP* single deepest pocket <2 cm) between 22+0 until 27+6 weeks of gestation compared to the antibiotic therapy appropriate to national guidelines is the objective of this prospective randomized trial. Material and methods: 48 patients will participate in this study, divided into an intervention or control goup, each containing 24 women. Entry criteria: Singleton pregnancies, classic PPROM and proven oligo-/anhydramnios between 22+0 to 27+6 weeks of gestation. Exclusion criteria: fetal chromosomal aberrations, malformations, high PPROM, AIS, premature labour. The comparison of both groups regarding the PPROM-delivery-latency in days and appearance of PFIW will be the primary endpoint of this investigation. The ultrasound-based subcutaneous implantation of the port system is conducted in local anaesthesia. A hypotonic amniotic fluid-like solution (100 ml/l) is used for permanent amniinfusion (J Perinat Med 2013;41:657 – 63). Results: An earlier retrospective analysis showed a significant prolongation of the PPROM-delivery-interval for 49 days and a better neonatal outcome without lung hypoplasia or contractures, applying continuous amniinfusion with 2.4 litres/day (“flush-out”). Conclusion: Flushing-out bacteria and inflammatory products out of the amniotic cavity could extend pregnancy, prevent lung hypoplasia and improve neonatal outcome clearly. This assumption is to be verified in this study. Patient recruitment shall be completed by the end of 2017. Several physicians from 5 countries have been instructed in the method of port implantation at the Center of Fetal Surgery, University Clinic of Obstetrics and Prenatal Medicine, Martin-Luther-University Halle-Wittenberg. Sponsoring: Center of Fetal Surgery, University Hospital Halle (Saale) and Russian Science Foundation, Grant- Nr. 15 – 15 – 00137.

P9-16

Prenatal diagnosis of renal cysts and diabetes syndrome (RCAD) managed by continuation of pregnancy and adapted perinatal comfort care

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Purpose: Urogenital dysplasia is the third most common of all congenital malformations and can be detected by ultrasound at an early stage. If renal function is present the termination of pregnancy would be recommended. This can lead to versatile mental, social, and also healthy problems. Continuation of pregnancy and vaginal delivery with specialized perinatal palliation may be an appropriate option. For this reason we present a case of prenatally diagnosed complex renal dysplasia with fatal prognosis. Material and methods: After the cystic dysplastic kidney (CDK) was detected by ultrasound in the 18+5 week of gestation the patient (inconspicuous medical history) was closely followed up. A midwife, specialized on psychologic antenatal care, and neonatologists were involved in patient-centered care early. Amniocentesis and postmortem fetal examination of the urogenital tract were carried out.

Fig. 1: Ultrasound of RCAD

Results: Ultrasound images showed a dystopic CDK in pelvic area and absence of bladder fillings. There was increasing oligohydramnion and restricted fetal growth during the entire period of gestation. Amniocentesis confirmed lack of renal function but no chromosomal aberrances. After stillbirth with 33 weeks of gestation the histopathological examination revealed dextral dystopic CDK combined with sinalter kidney

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ageneis, retre ageneis, and unilateral paraganglioma in the abdomen and retroperitoneum*. The patient evaluated the pregnancy-continuation and the postpartum farewell to be positive. Conclusion: For some women with lethal fetal malformations performance of vaginal delivery and support of specific perinatal comfort care may be more favorable and ethical than pregnancy termination. Some genetic assays are pending and will be brought to the convention.

Young Investigators

**E9-01**

**Primary liver tumors and percutaneous ablative treatment: an 18-year Bulgarian experience**

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Introduction: Prevalence of primary liver tumors (PLT), treatment options and agressive decisions for better results has grown for the last decades in Bulgaria. We introduce our experience in one-shot-large-volumetric ablation of PLT. Purpose: To compare different techniques in terms of technical effectiveness, oncolgic results and safety in the treatment of PLT. Methods: In 1997 – 2015 327 patients (80.4% male), aged 26 – 84 (mean 64.2), were diagnosed, using CEUS/CEPT, histology/immuno- staining/with, with PEI (80.4% HCC, 9.3% cholangiocarcinoma, 0.7% mixed HCC/CC), and coexisted cirrhosis (Child A 59.7%; B 35.4%, 81.6% viral infection: HBV 53.3%; HCV 32.4%, solitary lesion 69.4%, 52.6%±5 cm, BCLC: A1-2.7%; B-38.5%; C-32.2%, D-7.7%. RFA (monopolar/multipolar/expandable) was used in 40.1%, MWA-6.4%, shot-PEI-17.2%. 39% of RFA-treated lesions were ≥5 cm, half of MWA-treated were large and/or diffuse/locally. Results: Follow-up was 1 – 72 months (mean 13), Complete destruction was achieved in 61.9%/59.5%/43% for mean 10 months. Median survival was 59 months. 12-, 24-, 36-months survival were obtained in 93.8% (181/193) by means of TE and in 98.4% (190/193) with MWA. Conclusion: MWA is equal to RFA in terms of technical and oncologic effectiveness, offering advantage in difficult/risky locations. Expandable RFA could benefit from ablation-based treatment.

**E9-02**

**The Value of ElastPQ for the Evaluation of Liver Fibrosis in Patients with B and C Chronic Hepatopathies**

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Purpose: The aim of this study was to evaluate the diagnostic performance of a point shear wave elastography using ARFI technique- ElastPQ, in patients with B and C chronic hepatopathies, using Transient Elastography (TE) as the reference method, since it is a validated method for liver fibrosis assessment. Methods: The study included 193 consecutive subjects with chronic hepatopathies (32.6% HBV, 67.4% HCV) from whom 42.5% had liver cirrhosis. Liver stiffness (LS) was evaluated in the same session by means of 2 elastographic methods: TE (Fibroscan, Echosens) and ElastPQ (Philips, Affinity) techniques. Reliable LS measurements were defined as follows: for TE – the median value of 10 LS measurements with a success rate60% and an interquartile range<30%. For ElastPQ- the median value of 10 LS measurements in the liver parenchyma, at least 1 cm below the capsule, using large vessels. For TE M and XL probes were used. For differentiating between stages of liver fibrosis we used the following cut-off values for TE – mild fibrosis (F1)-6.1 kPa, moderate fibrosis (F2)- 7.2 kPa, severe fibrosis (F3)-9.6 kPa and for liver cirrhosis (F4)-14.5kPa (1). Results: Reliable liver stiffness measurements were obtained in 93.8% (181/193) by means of TE and in 98.4% (190/ 193) with ElastPQ. In our cohort the ElastPQ values ranged from 2.32 to 44.07 kPa (median = 8.37 kPa). Based on TE cut-off values we divided our cohort into 4 groups: F1: 69/181 (38.1%); F2: 10/181 (5.5%); F3: 29/181 (16.1%); F4: 73/181 (40.3%). The areas under the receiver operating characteristic curve were: 0.88±0.02 for patients with mild fibrosis (F1), 0.93±0.02 for moderate fibrosis (F2), 0.95±0.01 for severe fibrosis (F3) and 0.95±0.01 for cirrhosis. The best cut-off values for discriminating mild, moderate, severe fibrosis and cirrhosis were 6.5, 7.2, 8.6 and 9.9 kPa respectively. Conclusion: ElastPQ is a method that seems to be good for the diagnosis of all stages of liver fibrosis with good diagnostic accuracy.

**E9-03**

**Abstract title: Elastography and diffusion-weighted MRI in patients with normal, testicular microlithiasis and testicular cancer**

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Purpose: Today a combination of ultrasonography and elastography is becoming more and more applicable, and both techniques can help to improve an early detection of testicular cancer. Recently, studies have showed higher velocity stiffness in testicular tumours compared with normal testicular tissue. Ultrasound is the primary modality when investigating scrotum, however other modalities and techniques such as diffusion-weighted MRI can be a useful tool in evaluating testicular malignancies. The relationship between velocity stiffness and MRI diffusion is not well established. Our aim was to compare shear wave elastography with MRI and diffusion weighted images in patients with normal testicular tissue and testicular tumours. Methods: In total we performed 126 patients with both ultrasound including a shear wave elastography (Acoustic Radiation Force Impulse) and a MRI diffusion examination of the scrotum. We performed three ARFI measurements in each testicle, and we measured the MRI ADC values in each testicle in three different images. All MRI images were evaluated using an Easy Vis Impax PACS workstation. The patients were divided into three groups: 52 men with normal testicular tissue, 21 men with testicular cancer, and 53 men with testicular microlithiasis. Histology reports from the 21 men with testicular tumours showed 10 seminomas, 9 non- seminoma and 2 of unknown origin. The ADC values were measured in three different images with a region of interest of 3.0 mm, and by freehand whole testicular volume. Results: The mean age from the three groups was 46.8 years. The mean tumour elasticity was 2.1 m/s (SD: 0.91) and the mean ADC with a Region of interest of 3.0 mm was 0.801 mm²/s (SD: 0.23), and with ADC freehand 0.851 (SD 0.22). Conclusion: Typically a high measured elastography value indicates increased testicular stiffness, and a low MRI ADC indicates increased testicular stiffness in tumours. But there are exceptions.

**E9-04**

**Role of transperineal ultrasonography (TPUS) in follow up of IBD patients with perianal disease**

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Introduction: The assessment of perianal disease is very important in IBD patients. In clinical practice, the outcome of medical or surgical treatment is evaluated mainly on the basis of physicians’ subjective judgment. However, some objective scores for evaluating the efficacy of treatment have been proposed such as the Fistula Drainage Assessment (FDA) and the Perianal Disease Activity Index (PDAI). Specifically, FDA focuses on fistula drainage: a significant clinical improvement is present when at least 50% of fistulae is cured whereas complete remission is achieved when all fistulae are closed at the digital pressure in two consecutive
visits. However, both FDA and PDAI give no information on the anatomical evolution of fistulae during medical treatment. Moreover, clinical examination of the perineum is generally unable to differentiate between simple and complex fistulae according to the AGA classification although this information is crucial to assess the relationship between fistulae and anal sphincters and to determine the clinical outcome of IBD patients with perianal disease. Nowadays, clinical evaluation combined with MRI findings is considered the gold standard method to evaluate the treatment outcome of the perianal disease. In fact, several studies have shown that MRI is useful in the pre-operative setting to determine the severity of fistulating disease and could be used to study how fistulae evolve during medical treatment (1–3). Nevertheless, the use of MRI seems to be unfeasible in clinical practice especially during long term antibiotic therapy for active perianal disease. Recently, TPUS has been recognized as an accurate and safe tool not only in diagnosing, staging the perianal disease (4.5), but also in predicting the outcome of the disease during infliximab treatment (6).

**Conclusion:** All systems used in this study provided a high reproducibility in quantitative measurements in a liver fibrosis phantom and excellent inter- and intraclas correlations. The GE Logiq E9 SWE had the best inter-and intraclass correlation, whilst Philips IU22 MX ARFI and Samsung RS80A provided elasticity measurements closest to the elasticity values provided by the manufacturer of the phantom.

**Methods:** All IBD patients with active perianal disease referred to our IBD unit for starting antibiotic treatment between January 2014 and December 2015 were included in this study. All enrolled patients underwent both gastroenterological and surgical evaluation. PDAI and FDA scores were calculated. According to Present’s study (7), a cut-off value of PDAI ≤ 5 was chosen to establish the clinical remission after medical treatment. TPUS was performed by an experienced operator. All patients were re-evaluated with the same protocol 30 days after the antibiotic treatment introduction. A Fleiss Kappa test was used to evaluate the agreement between FDA, PDAI and TPUS evaluations.

**Results:** All IBD patients with active perianal disease referred to our IBD unit for starting antibiotic treatment between January 2014 and December 2015 were included in this study. All enrolled patients underwent both gastroenterological and surgical evaluation. PDAI and FDA scores were calculated. According to Present’s study (7), a cut-off value of PDAI ≤ 5 was chosen to establish the clinical remission after medical treatment. TPUS was performed by an experienced operator. All patients were re-evaluated with the same protocol 30 days after the antibiotic treatment introduction. A Fleiss Kappa test was used to evaluate the agreement between FDA, PDAI and TPUS evaluations. **Conclusions:** TPUS is an accurate and safe tool not only in diagnosing staging the perianal disease (4.5), but also in predicting the outcome of the disease during antibiotic treatment. In the future we need to elaborate and validate a score useful for a more objective evaluation of TPUS findings in order to standardize the operators’ findings between the IBD units.

**In vitro quantification of tissue elasticity using three shear wave elastography platforms on liver fibrosis phantoms**

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**Introduction:** To assess and validate the reproducibility of quantitative elastography measurements, using shear-wave methods on four individual tissue-mimicking liver fibrosis phantoms with known Young’s modulus. **Methods:** We used three different shear wave elastography platforms: GE Logiq E9 SWE, Philips IU22 XM ARFI and Samsung RS80A. Both linear (high frequency) and curvilinear (low-frequency) probes were applied. The objects were four individual tissue mimicking liver fibrosis phantoms with different Young’s modulus within the range of soft biological tissue (2.7kPa, 11.5kPa, 24.8kPa, 46.3kPa). Two individual investigators performed all measurements in parallel. Each investigator made ten non-continued measurements of each phantom. The platforms were evaluated for inter- and intraobserver variability, coefficient of variation, ICC and Bland-Altman using the median value. Statistical analysis was performed with SPSS. **Results:** All three elastography platforms showed excellent intra- and interobserver agreement (interclass corrolation 0.981 – 1.000 and intraclass corrolation 0.987 – 1.000). All four liver fibrosis phantoms could be differentiated by quantitative elastography, by all platforms (p <0.001). In the Bland-Altman analysis the differences in measurements were larger for the phantoms with higher Young’s modulus. All platforms detected almost twofold expansion in the range 0.00 – 0.21 for all four phantoms, equivalent to low variance and high reproducibility (see table 1).

**Conclusion:** All systems used in this study provided a high reproducibility in quantitative measurements in a liver fibrosis phantom and excellent inter- and intraclas correlations. The GE Logiq E9 SWE had the best inter-and intraclass correlation, whilst Philips IU22 XM ARFI and Samsung RS80A provided elasticity measurements closest to the elasticity values provided by the manufacturer of the phantom.

**Echogenic Material in fetal gallbladder: Is there any association with dietary Na+ and Ca++ uptake?**

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**Purpose:** To determine the prevalence of echogenic material in the fetal gallbladder, to analyse its association with perinatal factors such as maternal dietary Na+, Ca ingestion and to present its sonographic findings and postnatal outcomes. **Methods:** We performed a prospective study with 5893 pregnant patients. Maternal and umbilical cord blood were taken after delivery in examined group and Na, Ca, PTH, calcium, vitamin D

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**Table 1: Median (min-max) elasticity measurements performed with three elastography platforms on liver fibrosis phantoms**

<table>
<thead>
<tr>
<th>Elastography system</th>
<th>Probe shape</th>
<th>Observer</th>
<th>Phantom 1</th>
<th>Phantom 2</th>
<th>Phantom 3</th>
<th>Phantom 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.7 kPa ± 5.5</td>
<td>11.5 kPa ± 5.5</td>
<td>24.8 kPa ± 5.5</td>
<td>46.3 kPa ± 5.5</td>
</tr>
<tr>
<td>Philips IU22 XM ARFI</td>
<td>curvilinear</td>
<td>A</td>
<td>1.95 kPa (1.15–2.72)</td>
<td>8.29 kPa (7.21–9.46)</td>
<td>20.64 kPa (18.23–24.80)</td>
<td>47.09 kPa (38.26–57.17)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>1.80 kPa (1.18–2.07)</td>
<td>7.71 kPa (6.73–8.92)</td>
<td>19.68 kPa (18.88–23.50)</td>
<td>44.74 kPa (35.37–54.60)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A + B</td>
<td>1.9 kPa (1.16–2.33)</td>
<td>7.82 kPa (6.73–9.46)</td>
<td>20.70 kPa (18.34–24.88)</td>
<td>45.15 kPa (36.57–56.80)</td>
</tr>
<tr>
<td>Samsung RS80A SWE</td>
<td>curvilinear</td>
<td>A</td>
<td>2.1 kPa (2.0–2.5)</td>
<td>7.69 kPa (6.73–8.92)</td>
<td>18.40 kPa (17.35–21.77)</td>
<td>43.85 kPa (34.65–54.8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>2.1 kPa (2.1–2.7)</td>
<td>7.85 kPa (6.73–9.46)</td>
<td>18.51 kPa (17.35–21.77)</td>
<td>43.65 kPa (34.65–54.8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A + B</td>
<td>2.1 kPa (2.0–2.7)</td>
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<td>18.51 kPa (17.35–21.77)</td>
<td>43.65 kPa (34.65–54.8)</td>
</tr>
<tr>
<td>GE E9-05 Logiq SWE</td>
<td>linear</td>
<td>A</td>
<td>1.9 kPa (1.85–2.98)</td>
<td>7.98 kPa (6.73–9.46)</td>
<td>17.06 kPa (15.7–18.71)</td>
<td>35.37 kPa (26.37–46.24)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>1.9 kPa (1.95–2.05)</td>
<td>7.98 kPa (6.73–9.46)</td>
<td>17.06 kPa (15.7–18.71)</td>
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<td>17.06 kPa (15.7–18.71)</td>
<td>35.37 kPa (26.37–46.24)</td>
</tr>
</tbody>
</table>

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levels in both maternal and cord blood were determined. All of the placentas were sent for pathological examination. Perinatal data (antibiotic usage, maternal diseases, amount of dietary Na/Ca uptake) was obtained from all of the patients. Postnatal ultrasonography was performed in identified cases. **Results:** There was no echogenic material in fetal gallbladder before 29 weeks. In the subgroup of 1983 fetuses (29–42 gestational weeks), 13 fetuses were found to have echogenic contents in gallbladder with a prevalence of 0.6%. It was shown that all of the examined group was drinking the same water, a kind of well water. The analyses of the drinking water revealed a relatively higher Na+ ratio than the ordinary drinking waters (Ca++ level: 16 mg/L, and Na: 7.043 mg/L). Postnatal follow-up was carried out in all of the examined group and the echogenic material in the gallbladder was resolved in all of them within one month. **Conclusion:** Na+/Ca++ exchanger which is found in plasma membrane of hepatocytes and placenta are mainly responsible of Ca++ extrusion, which is a prolithogenic factor. Therefore it may be postulated that increased Na+ uptake by drinking water causes Ca++ efflux to fetal gallbladder by Na+/Ca++ channels. Further experimental studies may reveal the exact mechanism of fetal gallbladder sludge/stone formation in fetuses with excess maternal intake of Na.

### E9-08

**Patient-Specific Mechanical Characterization Of Abdominal Aortic Aneurysms Using 4D Ultrasound**

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**Introduction:** Abdominal aortic aneurysms (AAA) are silent killers and the 13th cause of death in Western society. In this study, methods for wall stress analysis (WSA) and elastography (EL) were developed using 4D ultrasound (US) to determine patient-specific wall stresses and material properties. These techniques were introduced in the clinic and tested in a subgroup of patients in an ongoing study with 300 patients in follow-up.  

**Methods:** In forty patients (AAA diameter 27–52 mm), 4D-US data were measured using a Philips iU22 (X6–1 transducer). The brachial blood pressure was measured using an arm cuff. The US data were manually segmented. The patient-specific geometry was tracked over time to estimate its displacement field using 3D speckle tracking. Subsequently the diastolic geometry was converted into a finite element model. WSA was performed assuming a neo-Hookean material model. The model was optimized by iteratively adapting the material properties until the model output matched the 3D displacements. For seven patients, computed tomography (CT) data were available and used to compare the US-based geometries and wall stresses.  

**Results:** The 4D-US based 99th percentile wall stress ranged between 198 to 390 kPa, and the patient-specific material property (C_{min}) had a median of 1.1 MPa (IQR: 0.7–1.4 MPa). Geometry based on US data showed good similarity indices (0.90–0.96) with CT, and the 25th to 95th percentile wall stresses were in good agreement. Small aneurysms revealed stresses similar to those in large AAAs. Furthermore, the arterial stiffness increased with respect to AAA diameter.  

**Conclusion:** This study shows that 4D US-based WSA and EL of abdominal aortic aneurysms (AAA) is feasible and has the potential to aid in AAA rupture risk assessment by identifying patients at risk, and to monitor patients over time by detecting changes in wall stress and material properties. Ongoing work includes a novel automatic segmentation and registration algorithm and long-term follow-up.

**Fig. 1:** a) Segmentation obtained from CT-data (blue) and US-data (red) with a similarity index of 0.96; b) The Von-Mises wall stress distribution is shown for a typical AAA geometry; c) The shear modulus (G_{min}) is equally divided in three groups with respect to the anterior-posterior (A-P) diameter. The AAAs with a large diameter reveal a significant increase in wall stiffness compared to the small AAAs.

### E9-09

**Relations between ultrasonographic, elastographic and electromyoneurographic parameters in patients with carpal tunnel syndrome**  
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DOI: 10.1055/s-0036-1587984

**Introduction:** To test the new proposed ultrasonographic (US) diagnostic algorithm for carpal tunnel syndrome (CTS) (Goldberg G, 2016), to compare cross-sectional area (CSA), wrist-to-forearm CSA ratio (WFR) and the elasticity of the median nerve (MN) between 2 groups: healthy volunteers and patients with electrodiagnostically proven CTS.  

**Methods:** 10 patients with CTS (20 hands) and 12 healthy volunteers (24 hands) underwent US of the MN. The CSA and MN strain was measured (MN strain was measured three times) by a radiologist (with 30 years of experience) and by medical resident. Examiners were blinded to the diagnosis of CTS and US measurements made by each other. The mean value was used for the analysis. Patients having had a prior wrist trauma, operation or rheumatic diseases were excluded.  

**Results:** Both hands in 10 patients diagnosed with CTS at the EMG service (9 women and 1 men, mean ± SD age 62.3 ± 5.3 years, range 56–72 years, 15 hands with mild, 2 moderate, 2 severe CTS) and in 12 healthy volunteers (8 women and 4 men, mean ± SD age 60.6 ± 8.7 years, range 51–82 years) were studied. CSA and WFR in the patients with CTS were significantly higher than those in the healthy volunteers (p < 0.05) according to both examiners. The MN strain in the patients with CTS were not significantly higher than those in the healthy volunteers (p > 0.05) according to both examiners.  

**Conclusion:** US can provide improvement in patients’ selection for the EMG examination. Yet our study suggests that selection criteria (CSA and WFR values) should be reconsidered separately by each clinic performing the examination. Elastography may not be helpful for diagnosing mild CTS.
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