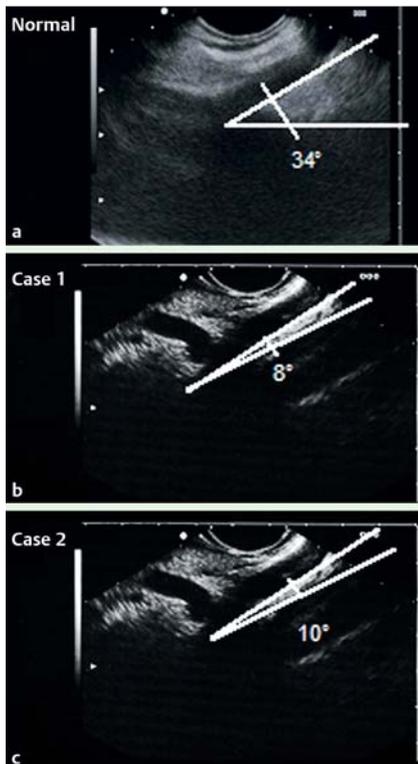
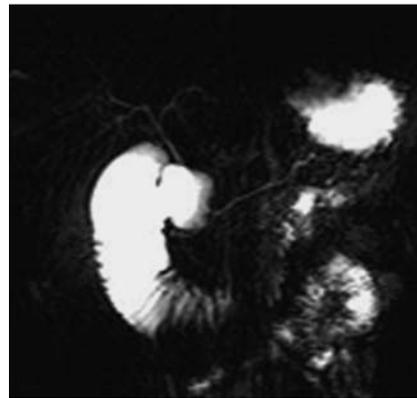


## Superior mesenteric artery syndrome diagnosed with linear endoscopic ultrasound



**Fig. 1** **a** Normal endoscopic ultrasound (EUS) angle ( $> 30^{\circ}$ – $60^{\circ}$ ) between the superior mesenteric artery (SMA) and the abdominal aorta (AA). **b, c** The reduced angle between the SMA and AA in cases 1 and 2, respectively. Because of the anatomical contiguity between duodenum and these vessels, the reduction in the angle between the two vessels can cause duodenal obstruction.

We present two cases of superior mesenteric artery (SMA) syndrome, which were diagnosed with the aid of linear endoscopic ultrasound (EUS). A 20-year-old man (case 1) presented with a 3-month history of right upper



**Fig. 2** T2-weighted sequence: a thick coronal section showing progressive dilation of D1, D2, and the proximal tract of D3, which seems to be interrupted abruptly; there was delayed filling of the jejunum (remaining parts of D3 and D4 are not shown).

quadrant pain, postprandial vomiting, and weight loss of 4 kg. Laboratory tests revealed a serum alkaline phosphatase (ALP) level of 127 U/L (normal range 34–104 IU/L) and an amylase level of 62 U/L (normal range 0–54 U/L).

A 25-year-old woman (case 2) with a body mass index (BMI) of 17.8 kg/m<sup>2</sup> presented 1 month after undergoing laparoscopic cholecystectomy. She had a 12-month history of epigastric and right upper quadrant pain, with daily postprandial projectile vomiting since the past 2 months. She had lost 50 kg in weight in 1 year. On physical examination she had an asthenic habitus and bowel sounds were present in the upper abdomen. Laboratory tests revealed hemoglobin 11.8 g/dL, mean cell hemoglobin (MCH) 26.7 pg,  $\gamma$ -glutamyl transferase (GGT) 56 U/L (normal range 5–55 U/L), aspartate aminotransferase

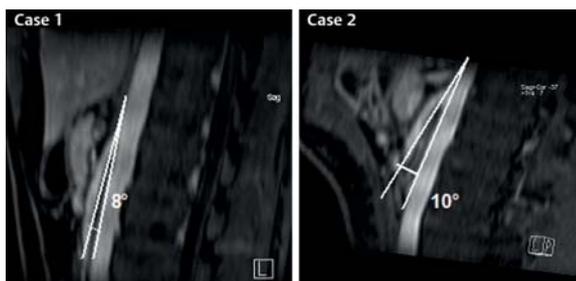
64 U/L (normal range 10–31 U/L), and alanine aminotransferase 85 U/L (normal range 10–31 U/L).

On the basis of the clinical and laboratory findings we carried out further investigations including linear EUS (Pentax EG-3830UT; Pentax Europe GmbH, Hamburg, Germany) and secretin-enhanced magnetic resonance cholangiopancreatography (S-MRCP; Siemens Magnetom Avanto 1.5 T; Secrelux Sanochemia, Neuss, Germany). The EUS examination did not show any major signs of chronic pancreatitis, biliary sludge, or stones in the common bile duct in both cases. However, the SMA was seen to be running almost parallel to the abdominal aorta, with an angle between the two vessels of 8° in the patient in case 1 and 10° in the patient in case 2 (● Fig. 1).

On S-MRCP, in both patients, progressive dilation of the proximal duodenum was seen with a sudden interruption (● Fig. 2), and, in the sagittal plane, the angle between the abdominal aorta and the SMA was reduced (● Fig. 3). The patient in case 1 became asymptomatic after gaining weight, without any treatment. The patient in case 2 underwent partial gastrectomy, with Roux-en-Y gastrojejunostomy and Roux-en-Y duodenojejunostomy.

SMA syndrome is typically caused by a decrease in the angle between the SMA and the abdominal aorta to 6–25° [1]; often this is because of loss of the mesenteric fat pad [2]. To our knowledge, the role of EUS in the diagnosis of SMA syndrome as reported in literature has been limited to the use of a radial miniprobe and in the pediatric population [3]. No posture-dependent differences have been reported in the values of the angles seen on EUS with the patient in lateral decubitus and supine positions [4]. Therefore, although neither EUS nor S-MRCP are included in classic diagnostic algorithms [5] they can be useful tools in young patients with symptoms of high intestinal obstruction accompanied by rapid weight loss.

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**Fig. 3** Three-dimensional postcontrast T1-weighted sequence acquired in the axial plane and subsequently reformatted in the sagittal plane, showing an angle of 8° in the patient in case 1 and 10° in the patient in case 2, between the superior mesenteric artery (SMA) and the abdominal aorta (AA).

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