Impact of the COVID 19 Pandemic on Radiological Imaging in Germany
Auswirkung der COVID-19-Pandemie auf die radiologische Bildgebung in Deutschland

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ABSTRACT

Purpose To analyze the impact of the COVID-19 pandemic in 2020 on the radiological imaging volume in Germany.

Materials and Methods In this retrospective multicenter study, we analyzed CT and MRI examinations of 7 radiology institutes across Germany from January to December 2020. The imaging volume was compared to 2019 (Wilcoxon-Mann-Whitney test). Modality, patient service locations, and examined body parts were assessed in consideration of time periods of the pandemic. In addition, correlation with the incidence of SARS-CoV-2 cases and associated death was performed (Spearman-test).

Results In total, in 2020, imaging volume declined by 4 % (n = 8314) compared with 2019 (p < 0.05). The hard lockdown during the first pandemic wave (calendar week 12–16, March 22 – April 19) revealed the highest decrease with 29 % (n = 894, p < 0.01), with the greatest decrease in CT (36 % vs. MRI 26 %), outpatients (38 %, p < 0.01), and imaging of the spine and extremities (51–72 %, < 0.05 – p < 0.01). Examinations referred from the emergency department (–13 %, p < 0.05) and CT of the chest (–16 %, p < 0.05) were least affected. With the end of the first wave, gradual normalization of the imaging volume was observed and persisted until the end of the observation period. A reduction of imaging volume negatively correlated with the incidence of SARS-CoV-2-positive cases and associated deaths (r = 0.28 and 0.49, p < 0.05 and p < 0.001).

Conclusion The COVID-19 pandemic was associated with a significant temporary decline in imaging volume. After the first lockdown period, a quick recovery was observed with radiologic imaging examinations steadily approaching prior-year figures.

Key points:
- This study assesses the impact of dynamic pandemic activity on radiological imaging in a multicenter analysis in Germany.
- The COVID-19 pandemic was associated with a temporary decline in CT and MRI scans.
- Relaxation of restrictions was associated with fast normalization of imaging volumes to prior-year levels, which persisted until the end of the year.
- Significant catch-up effects were not observed.
Introduction

The outbreak of the severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) in 2020 is considered one of the greatest health policy challenges of the 21st century and it is not over. Extensive strategies were implemented around the world, including in Germany, to mitigate the effects of the pandemic. Large segments of society and the economy were temporarily shut down to achieve a lasting decrease in the number of cases and to prevent overwhelming of the health care system. In addition to the limitations placed on public life, medical facilities had to postpone any elective, non-essential imaging and procedures in order to ensure intensive care capacity and capacity for the treatment of potential COVID-19 patients in hospitals [1]. Moreover, a wide range of adjustments had to be made to workflows, e.g., changed communication and personnel structures and hygiene measures, in order to meet the treatment needs of patients and to ensure employee safety [2].

As a cross-sectional discipline, radiology is a good reflection of the general services provided and the utilization of medical care based on the examinations performed. Analyses of the first half of 2020 showed a significant decrease in radiology services [3]. At the same time, most medical disciplines recorded a dramatic decrease in treatment cases [4]. However, a longer period must be analyzed to be able to better assess possible long-term effects of the COVID-19 pandemic on health care. According to our research, there are hardly any data analyses including all of 2020 in individual disciplines and particularly in radiology.

The goal of this national multicenter study was to systematically and objectively evaluate the impact of the COVID-19 pandemic in 2020 on the radiological imaging volume in Germany in the longitudinal course.

Materials and Methods

This retrospective, multicenter study was performed in collaboration with the Working Group for Gastrointestinal and Abdominal Imaging of the German Radiological Society (DRG). The national distribution of the participating centers providing varying levels of care allows a representative analysis of radiological imaging in Germany. Seven radiology institutes participated: four university hospitals (Hanover Medical School, University Hospital Frankfurt, University Hospital Regensburg, Brandenburg Medical School Theodor Fontane) and three non-university facilities (Clemens-hospital Munster, Evangelical Hospital Dusseldorf, Hospital Konstan). (Table 1). The study was approved by the local ethics committees of the participating centers.

Data acquisition

The examinations were extracted from the particular internal RIS of the participating centers. The aggregated data for CT and MRI examinations from January 1, 2020 to December 27, 2020 was analyzed. A weekly interval was selected for the time interval (calendar weeks, CW). The 53rd calendar week in 2020 due to the leap year was not included in the analysis to ensure comparability with...
2019. The data were compared with the same time period as the previous year to rule out the effect of incidental seasonal effects. The patient service location (outpatient, inpatient, or emergency room) and examined body region (head, neck, thorax, abdomen, spine, extremities, or other) were included in subgroup analyses. The imaging volume was also correlated with the positive SARS-CoV-2 cases and associated deaths published by the Robert Koch Institute [5].

### Pandemic-specific phases

The following time periods were defined to represent the impact of pandemic-specific phases in Germany:
- **Pre-lockdown (PRE):** CW 1–11, first infections, obligation to report, and cancellation of major events.
- **Hard lockdown (HLD):** CW 12–16, national lockdown during the first wave of the pandemic with extensive contact restrictions and sweeping closures.
- **Relaxation period (RP):** CW 17–23, successive easing of contact restrictions and opening of businesses.
- **Post-lockdown (POST):** CW 24–43, extensive lifting of the restrictions listed above.
- **Lockdown light (LLD):** CW 44-end of the year, intensification of regulations and renewed lockdown in Germany with the start of the second wave of the pandemic.

### Statistical analysis

Statistical analysis was performed using GraphPad Prism 9 (GraphPad Software Inc., San Diego, USA). The multicenter data were aggregated for the individual calendar weeks and tested for statistical significance after exclusion of Gaussian normal distribution via the Wilcoxon-Mann-Whitney test (differentiated according to individual body regions and patient service location separately for every modality and for the total volume compared to the entire year or the phase-specific period of the previous year). The correlation between imaging volume and the incidence of SARS-CoV-2-positive cases and associated deaths for the entire year 2020 was determined via the Spearman test. Deviations from the previous year were presented for the total numbers as well as individual parameters as the percentage difference. A probability of error of \( p < 0.05 \) was considered statistically significant.

### Results

#### Total imaging volume

The total number of CT and MRI examinations in 2020 was 186,885 and was only 4% lower than the numbers for the previous year (2019: 195,199; \( p < 0.05 \)). 13,420 examinations were performed during HLD in Germany. This was a decrease of 29% (18,910; \( p < 0.01 \)) compared to the previous year (Table 2 and Fig. 1). The nadir was at the start of April (CW 15) with 2353 MRI and CT examinations. The average number of examinations at that time was 1938 per week compared to 2659 the previous year. With the end of hard lockdown, the number of examinations increased continuously and reached in the second half of the year a level comparable to the previous year (RP: 91 %, POST: 101 % of the imaging volume in 2019). LLD resulted again in a significant (\( p < 0.05 \)) decrease (~2 %, 699 examinations) compared to the previous year. However, the decrease was less significant than the reduction seen during HLD.

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**Table 1** Clinic characteristics of the participating institutions.

<table>
<thead>
<tr>
<th>Institution</th>
<th>Location</th>
<th>Numbers of beds/intensive places</th>
<th>Degree of medical care</th>
<th>Ambulatory healthcare center</th>
<th>Technical upgrade</th>
<th>Averaged regional 7-day incidence of COVID 19 in 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hannover Medical School</td>
<td>Hannover, Lower Saxony</td>
<td>1520/146</td>
<td>maximum</td>
<td>no</td>
<td>no</td>
<td>23.3</td>
</tr>
<tr>
<td>University Hospital Frankfurt</td>
<td>Frankfurt, Hesse</td>
<td>130/112</td>
<td>maximum</td>
<td>no</td>
<td>no</td>
<td>35.4</td>
</tr>
<tr>
<td>University Hospital Regensburg</td>
<td>Regensburg, Bavaria</td>
<td>839/90</td>
<td>maximum</td>
<td>no</td>
<td>Modernisation CT</td>
<td>32.5</td>
</tr>
<tr>
<td>Brandenburg Medical School</td>
<td>Brandenburg a. d. Havel</td>
<td>474/30</td>
<td>specialised medical service</td>
<td>no</td>
<td>no</td>
<td>9.8</td>
</tr>
<tr>
<td>Clemenshospital Münster</td>
<td>Munster, Northrhine-Westphalia</td>
<td>405/16</td>
<td>specialised medical service</td>
<td>no</td>
<td>no</td>
<td>9.0</td>
</tr>
<tr>
<td>Evangelical Hospital Dusseldorf</td>
<td>Dusseldorf, Northrhine-Westphalia</td>
<td>513/14</td>
<td>specialised medical service</td>
<td>no</td>
<td>no</td>
<td>55.4</td>
</tr>
<tr>
<td>Hospital Konstanz</td>
<td>Konstanz, Baden-Wurttemberg</td>
<td>440/24</td>
<td>specialised medical service</td>
<td>no</td>
<td>no</td>
<td>15.9</td>
</tr>
</tbody>
</table>

Modalities
The decrease in MRI examinations during HLD (decrease of 36%, 2318, p < 0.01) was greater than the decrease in CT examinations (decrease of 26%, 3172, p < 0.01) compared to the previous year (▶ Table 2). With the end of HLD, the number of examinations for both modalities increased continuously until reaching in the second half of the year a level comparable to the prior year. The number of CT examinations normalized faster and remained stable with the start of LLD. At the end of the year, the number of CT examinations was 3% lower compared to the previous year (3414 examinations, p = 0.28). The number of MRI examinations decreased again at the start of LLD by 6% compared to the previous year (643 examinations, p < 0.05) and at the end of the year was still 7% lower than the previous year.

Patient service location
Cumulatively fewer inpatient cases were recorded in 2020 compared to the previous year with a difference of 5947 examinations (–7%; p < 0.0001 (▶ Table 3)). The number of examinations performed in outpatient care was 5% lower than in 2019, with MRI (–8% (p < 0.05)) seeing a greater decrease than CT (–2%, (p = 0.84)). During HLD, a decrease in imaging volume was seen in all areas compared to the previous year. Outpatient examinations decreased by 38% (2771 examinations, p < 0.05), followed by inpatient examinations (–27% (2260 examinations, p < 0.01) and emergency room examinations (–14% (429 examinations, p < 0.05). MRI was impacted in every case more than CT. The decrease in outpatient CT examinations was 4% and was associated with a relative increase in emergency room examinations. The decrease in outpatient MRI examinations resulted in a relative increase particularly in inpatient examinations (+4%, p < 0.05) (▶ Fig. 2). While the number of inpatient examinations remained lower over the course of the year compared to 2019, an imaging volume comparable to the previous year was reached in outpatient cases by the end of the year even during LLD (–5%, p = 0.28).

Body region
During HLD, examinations of all body regions decreased compared to the previous year (▶ Table 4). CT and MRI examinations of the spine (–33% and –59%, respectively, p < 0.05 and p < 0.01, respectively), followed by CT examinations of the neck (–33%, p = 0.15), CT examinations of the extremities (–28%, p < 0.01), MRI examinations of the extremities (–42%, p < 0.01), and MRI examinations of the abdomen (–41%, p < 0.05) were impacted most significantly. Although a significant decrease was also seen with respect to CT examinations of the chest (–16%, p < 0.05), it was

### Table 2  Imaging volume in 2019 and 2020 of seven radiological institutions in Germany according to modality.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>27 630</td>
<td>26 857</td>
<td>16 924</td>
<td>49 231</td>
<td>21 215</td>
<td>127 437</td>
</tr>
<tr>
<td>MRI</td>
<td>14 628</td>
<td>14 507</td>
<td>8841</td>
<td>26 147</td>
<td>11 673</td>
<td>67 762</td>
</tr>
<tr>
<td>p</td>
<td>0.30</td>
<td>0.69</td>
<td>0.07</td>
<td>0.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>total</td>
<td>42 258</td>
<td>41 364</td>
<td>25 765</td>
<td>75 378</td>
<td>32 888</td>
<td>195 199</td>
</tr>
</tbody>
</table>

Absolute imaging volume and percentage of previous year control period are given. *p < 0.001, **p < 0.01, ***p < 0.05. PRE, Before Lockdown; HLD, Hard Lockdown; RP, Relaxation period; POST, Post Lockdown; LLD, Lockdown Light.
<table>
<thead>
<tr>
<th>Location</th>
<th>CT 2019</th>
<th>CT 2020</th>
<th>Δ (%)</th>
<th>p</th>
<th>MRI 2019</th>
<th>MRI 2020</th>
<th>Δ (%)</th>
<th>p</th>
<th>Total 2019</th>
<th>Total 2020</th>
<th>Δ (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full year</td>
<td>29,990</td>
<td>31,231</td>
<td>+4</td>
<td>0.06</td>
<td>33,14</td>
<td>32,08</td>
<td>−3</td>
<td>0.39</td>
<td>33,304</td>
<td>34,439</td>
<td>+3</td>
<td>0.08</td>
</tr>
<tr>
<td>PRE</td>
<td>62,48</td>
<td>61,37</td>
<td>−2</td>
<td>0.53</td>
<td>679</td>
<td>732</td>
<td>+8</td>
<td>0.12</td>
<td>6927</td>
<td>6869</td>
<td>−1</td>
<td>1.0</td>
</tr>
<tr>
<td>HLD</td>
<td>28,10</td>
<td>24,57</td>
<td>−13</td>
<td>****</td>
<td>335</td>
<td>259</td>
<td>−23</td>
<td>****</td>
<td>3145</td>
<td>2716</td>
<td>−13</td>
<td>****</td>
</tr>
<tr>
<td>RP</td>
<td>39,78</td>
<td>42,10</td>
<td>+6</td>
<td>0.46</td>
<td>440</td>
<td>445</td>
<td>+1</td>
<td>0.78</td>
<td>4418</td>
<td>4655</td>
<td>+5</td>
<td>0.44</td>
</tr>
<tr>
<td>POST</td>
<td>11,904</td>
<td>13,221</td>
<td>+11</td>
<td>**</td>
<td>12,75</td>
<td>12,74</td>
<td>0</td>
<td>0.77</td>
<td>13,179</td>
<td>14,495</td>
<td>+10</td>
<td>**</td>
</tr>
<tr>
<td>LLD</td>
<td>50,50</td>
<td>52,06</td>
<td>+3</td>
<td>0.35</td>
<td>585</td>
<td>498</td>
<td>−15</td>
<td>0.13</td>
<td>5635</td>
<td>5704</td>
<td>+1</td>
<td>0.59</td>
</tr>
</tbody>
</table>

Absolute imaging volume and percentage difference (Δ) are given. *p<0.0001, **p<0.001, ***p<0.01, ****p<0.05. O, outpatients; I, inpatients; E, emergency department. PRE, Before Lockdown; HLD, Hard Lockdown; RP, Relaxation period; POST, Post Lockdown; LLD, Lockdown Light.
Correlation of the number of examinations with incidence and number of deaths

The decreasing incidence of SARS-CoV-2-positive cases and a decrease in associated deaths resulted in a recovery phase with successive normalization of the imaging volume (Fig. 4). A weak, negative correlation for the weekly incidence ($r = -0.28, p < 0.05$) and a moderate, negative correlation with SARS-CoV-2 case numbers and associated deaths ($r = -0.49, p < 0.001$) was seen.

Discussion

Using CT and MRI examinations as examples, the present multicenter study reflects the dynamics of radiology examinations performed in Germany during the pandemic year 2020.

The start of the COVID-19 pandemic resulted in a decrease in health care services in almost all disciplines. The timing of the decrease in the number of cases is closely associated with the mandated contact restrictions and the requirements for medical facilities. The present study further substantiates this. Outpatient services were particularly impacted (~38%). This observation coincides with an analysis of medical services covered by mandatory health insurance performed by the Zentralinstitut für kassenärztliche Versorgung in Germany, which showed a significant decrease in outpatient treatment cases in all areas (imaging ~39.6%) [4]. Also, the lower number of inpatient treatment cases [6] in 2020 in Germany is reflected in our data by the consistently lower number of examinations. As expected, the smallest decrease (14%) was seen with respect to emergency examinations with referral from the emergency room. However, this decrease was still significant compared to the previous year [7, 8]. It is not clear whether this decrease in the utilization of medical services by the population was due to the general uncertainty, fear of infection, or restrictions regarding activities and mobility. However, the significant decrease in musculoskeletal imaging, which was greater than the decrease in examinations of other body regions, could be an indication that the restrictions regarding activities played a role. This assumption is supported by the decrease in case numbers specifically in orthopedics and trauma surgery with the greatest decreases in treatment cases [9].

Although the decrease in the annual volume of CT and MRI examinations over the year correlated negatively with the SARS-CoV-2 case numbers and associated deaths in Germany, a noticeable stabilization of examination numbers was observed even at the start of the second wave and LLD. Although the incidence rates during this study period quickly became four times greater than those from the spring, no corresponding decrease in the number of examinations could be observed. This development shows that public perception and the utilization of medical services by patients could have played a greater role in the decrease in examinations and treatments than the reduction in medical services according to data from the German Federal Ministry of Health [10].

In spite of the partly temporary increase in the number of examinations in the second half of the year, we did not observe any significant catch-up effect. With the end of HLD and the first data regarding the decrease in medical services in almost all disciplines, some studies postulated a significant additional workload for the subsequent time in order to catch up on the services that were not performed or had been postponed. For example, based on the radiological examinations not performed during the first wave of the COVID-19 pandemic in the spring of 2020, Fleckenstein et al. calculated a significant increase in workload of up to 22% for the second half of the year [3]. This development cannot be substantiated by our data. Instead, the imaging volume normalized to the level of the previous year so that the imaging volume for the entire year was only ~4% less than the numbers for the previous year. The absence of a compensation effect may be
Table 4 Imaging volume in 2019 and 2020 of seven radiological institutions in Germany according to body region.

<table>
<thead>
<tr>
<th></th>
<th>PRE</th>
<th></th>
<th>HLD</th>
<th></th>
<th>RP</th>
<th></th>
<th>POST</th>
<th></th>
<th>LLD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CT</td>
<td>MRI</td>
<td>CT</td>
<td>MRI</td>
<td>CT</td>
<td>MRI</td>
<td>CT</td>
<td>MRI</td>
<td>CT</td>
</tr>
<tr>
<td>head</td>
<td>2019</td>
<td>4112</td>
<td>2839</td>
<td>1848</td>
<td>1228</td>
<td>2607</td>
<td>1698</td>
<td>7516</td>
<td>5005</td>
</tr>
<tr>
<td></td>
<td>2020</td>
<td>3962 (96 %)</td>
<td>2726 (96 %)</td>
<td>1345 (73 %)</td>
<td>886 (72 %)</td>
<td>2421 (93 %)</td>
<td>1593 (94 %)</td>
<td>7700 (102 %)</td>
<td>5073 (101 %)</td>
</tr>
<tr>
<td>neck</td>
<td>2019</td>
<td>507</td>
<td>217</td>
<td>240</td>
<td>106</td>
<td>322</td>
<td>140</td>
<td>895</td>
<td>363</td>
</tr>
<tr>
<td></td>
<td>2020</td>
<td>506 (100 %)</td>
<td>180 (83 %)</td>
<td>68 (64 %)</td>
<td>355 (110 %)</td>
<td>98 (70 %)</td>
<td>903 (101 %)</td>
<td>291 (80 %)</td>
<td>405 (104 %)</td>
</tr>
<tr>
<td>chest</td>
<td>2019</td>
<td>3812</td>
<td>240</td>
<td>1746</td>
<td>104</td>
<td>2343</td>
<td>153</td>
<td>6472</td>
<td>383</td>
</tr>
<tr>
<td></td>
<td>2020</td>
<td>3694 (97 %)</td>
<td>223 (93 %)</td>
<td>64 (62 %)</td>
<td>2417 (103 %)</td>
<td>131 (86 %)</td>
<td>7132 (110 %)</td>
<td>427 (111 %)</td>
<td>3202 (106 %)</td>
</tr>
<tr>
<td>abdomen</td>
<td>2019</td>
<td>3107</td>
<td>1310</td>
<td>1368</td>
<td>621</td>
<td>1799</td>
<td>745</td>
<td>5299</td>
<td>2255</td>
</tr>
<tr>
<td></td>
<td>2020</td>
<td>2801 (90 %)</td>
<td>1254 (96 %)</td>
<td>366 (59 %)</td>
<td>1619 (90 %)</td>
<td>651 (87 %)</td>
<td>5447 (103 %)</td>
<td>2422 (107 %)</td>
<td>2285 (103 %)</td>
</tr>
<tr>
<td>spine</td>
<td>2019</td>
<td>1062</td>
<td>1019</td>
<td>493</td>
<td>436</td>
<td>573</td>
<td>671</td>
<td>1752</td>
<td>793</td>
</tr>
<tr>
<td></td>
<td>2020</td>
<td>996 (94 %)</td>
<td>1021 (100 %)</td>
<td>221 (67 %)</td>
<td>620 (108 %)</td>
<td>506 (75 %)</td>
<td>2106 (120 %)</td>
<td>1782 (96 %)</td>
<td>775 (89 %)</td>
</tr>
<tr>
<td>extremities</td>
<td>2019</td>
<td>998</td>
<td>749</td>
<td>461</td>
<td>439</td>
<td>633</td>
<td>430</td>
<td>2111</td>
<td>1450</td>
</tr>
<tr>
<td>others</td>
<td>2020</td>
<td>1187 (119 %)</td>
<td>827 (110 %)</td>
<td>254 (58 %)</td>
<td>735 (116 %)</td>
<td>385 (90 %)</td>
<td>2620 (124 %)</td>
<td>1462 (101 %)</td>
<td>929 (102 %)</td>
</tr>
<tr>
<td>p</td>
<td>0.40</td>
<td>0.29</td>
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<td>0.37</td>
<td>0.61</td>
<td>0.62</td>
<td>0.12</td>
<td>0.12</td>
</tr>
</tbody>
</table>
| absolute imaging volume and percentage of previous year control period are given. *p < 0.0001, **p < 0.001, ***p < 0.01, ****p < 0.05. PRE, Before Lockdown; HLD, Hard Lockdown; RP, Relaxation period; POST, Post Lockdown; LLD, Lockdown Light.
able to be explained by the prioritization of chronically ill patients and oncology patients, whose care was largely maintained even during the worst phase of the pandemic. In spite of the quick rebound effect, it can be assumed that particularly preventative and follow-up examinations were not performed [4]. The workload in radiology departments is generally already high so that free capacity particularly for time-intensive examinations like MRI is already limited in the clinical routine. Even though efficiency can be increased to a certain extent by process optimization, e.g., the selection of shorter imaging protocols, this is not in proportion to pandemic-specific restrictions. Therefore, the increased time needed for hygiene measures, the reduced contact time, and the social distancing rules with separation of patients in waiting rooms make it difficult to expand examination capacities. Personnel resources were presumably exhausted after the lockdown phase due to postponed vacation time.

Interestingly, during HLD, a relative increase followed by an absolute increase in the number of examinations compared to the previous year was only seen in the case of chest CT examinations. Radiology clearly plays an important role in the management of suspected cases of COVID-19 and COVID-19 patients. In particular, CT was an important additional diagnostic method [11] at the start of the pandemic and also provided decisive information about the course of the disease and subsequent damage [12, 13]. In light of the novel respiratory disease, the increase in chest imaging seems plausible and also supports the high relevance of the Radiological Cooperative Network for the COVID-19 pandemic (RACOON, https://www.netzwerk-universitaetsmedizin.de/projekte/racoons) as part of the University Medicine National Research Network on COVID-19, which was used to create a national infrastructure for the systematic and structured collection of radiological data regarding COVID-19 cases.

Our study has a number of limitations. The evaluation is based on an aggregated set of data. It is probable that regional and time variations over the course of the pandemic resulted in varying degrees of changes in imaging volume in the individual facilities. Therefore, not only varying incidence rates within the states in Germany but also local outbreaks in the form of individual hotspots that presumably had a temporary effect on the services of the hospitals in the respective area were observed. Internal hospital outbreaks and varying levels of strictness of the measures implemented by the different facilities were also not taken into consideration. Our observations only relate to CT and MRI examinations. X-ray, ultrasound, and radiological interventions were not taken into consideration. It can be assumed that particularly in the case of X-rays as a basic examination but also in the case of ultrasound examinations and interventions requiring direct patient contact there would be an even greater reduction in the number of cases [3]. Specific screening examinations, particularly mammography, was probably greatly impacted by the restrictions [14, 15].

Conclusion

Our analysis shows that the number of services performed in 2020 quickly returned to the level of the previous year after a temporary decrease during HLD. In spite of the continuation of the pandemic and an increase in restrictions at the end of the year, CT and MRI imaging volumes largely comparable to the previous year were able to be achieved and mark an important element of adequate medical care.

Fig. 4 Correlation between imaging volume and severity of the COVID-19 pandemic. Correlation between imaging volume with incidence of SARS-CoV-2-positive cases a and associated deaths b is shown.
CLINICAL RELEVANCE OF THE STUDY

- Services performed in radiology reflect the utilization of medical services and the services provided by other medical disciplines.
- The results of this study help to illustrate the impact of the current COVID-19 pandemic on medical care.
- Long-term analyses can be helpful for better adaptation of measures to be implemented in future pandemic situations.

Conflict of Interest

The authors declare that they have no conflict of interest.

Literatur


