EMERGENCY SURGICAL CARE FOR PATIENTS WITH COVID-19 AND TUBERCULOSIS COINFECTION AT MULTISPECIALTY HOSPITAL

Reshetnikov MN, Plotkin DV, Zuban ON, Bogorodskaya EM
Moscow Research and Clinical Center for TB Control, Moscow, Russia

The double burden of the novel coronavirus infection and tuberculosis (TB) is a global challenge. The aspects of emergency surgical care for patients with COVID-19 and TB coinfection remain understudied. The aim of this study was to assess treatment outcomes in acute surgical patients with COVID-19 and preexisting TB coinfection. In 2020, our Center delivered surgical care to 465 patients with COVID-19 and preexisting TB; a total of 64 emergency surgeries were performed on 36 (6.8%) patients, of whom 16 had HIV. Thirteen patients (36.1%) were diagnosed with pulmonary TB; 23 patients (63.9%) had disseminated TB. Chest CT scans showed >25% lung involvement in 61.9% of the patients with COVID-19 pneumonia, 25–50% lung involvement in 30.6% of the patients, and 50–75% lung involvement in 5.6% of the patients. By performing abdominal CT, we were able to detect abdominal TB complications, including perforated tuberculous ulcers of the intestine, intestinal obstruction and tuberculous peritonitis, as well as tuberculous spondylitis complicated by psoas abscesses. Of all surgical interventions, 28.2% were abdominal, 23.2% were thoracic, 15.6% were surgeries for soft tissue infection, and 32.8% were other types of surgery. Postoperative mortality was 22.2%. We conclude that COVID-19 did not contribute significantly to postoperative mortality among acute surgical patients with TB.

Keywords: COVID-19, tuberculosis, HIV, emergency surgery

Author contribution: Reshetnikov MN proposed the concept, collected patient data and wrote the manuscript; Plotkin DV analyzed and interpreted the obtained data, prepared the manuscript and photos for publication; Zuban ON proposed the concept and edited the manuscript; Bogorodskaya EM edited the manuscript and prepared its final version.

Compliance with ethical standards: the study was approved by the Ethics Committee of Moscow Research and Clinical Center for TB Control (Protocol № 10 dated December 17, 2020). Informed consent was obtained from all study participants.

Mихаил Николаевич Решетников  —  Д. В. Плоткин  —  О. Н. Зубань  —  Е. М. Богородская

Ул. Барболина, д. 3, Москва, 107014; taxol@bk.ru

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The COVID-19 pandemic put tremendous strain on public health services, overwhelmed hospital capacities and dramatically increased the workload for healthcare workers. Elective surgeries were postponed due to the implementation of containment measures and hospital repurposing for patients with COVID-19. At the same time, hospitals for infectious diseases were admitting COVID-19 patients with acute surgical conditions, a urologic or gynecologic emergency or trauma [1–4]. During the pandemic, protecting healthcare workers against occupational exposure to the virus became a top priority. SARS-CoV-2 actively replicates in the respiratory and gastrointestinal tracts; this increases the risk of infection through aerosol transmission during respiratory tract surgery [5, 6]. The diagnosis and treatment of the novel coronavirus infection are complicated by misleading symptoms and difficulty implementing international guidelines on operating room practices during the COVID-19 pandemic [7–10].
Significant challenges arise when delivering surgical care to patients with COVID-19 and comorbidities, such as tuberculosis [11–14].

The aim of this study was to assess treatment outcomes among acute surgical patients with the novel coronavirus infection and preexisting tuberculosis.

METHODS

A center for COVID-19 opened at Moscow Research and Clinical Center for Tuberculosis Control of Moscow Healthcare Department on April 16, 2020. The Center has a pulmonary care unit № 4 for COVID-19 patients with TB, as well as radiology, endoscopy, surgical and intensive care units with anesthesiology and critical care experts. In 2020, the Center delivered medical care to 465 patients with TB and COVID-19 coinfection. Of them 36 (5.6%) patients underwent emergency surgery.

Those 36 patients were included in the study. The following inclusion criterion was applied: patients with COVID-19. TB was confined to the lungs in 13 (36.1%) patients, of whom 8 (61.5%) had extensive pulmonary TB, 2 (15.4%) had infiltrative pulmonary TB, 2 (15.4%) had fibrocavernous TB, and 1 (7.7%) had caseous pneumonia. Three patients in this subgroup (23.1%) had HIV coinfection. Disseminated TB involving the lungs and other organs was diagnosed in 23 of 36 patients (63.9%). In this subgroup, 4 (17.4%) patients had abdominal TB, 3 (13.0%) had genitourinary TB; peripheral lymph nodes were involved in 2 (8.7%) cases, 2 more patients (8.7%) had bone and joint TB. Multi-organ involvement (> 2) was observed in 12 (52.2%) patients. In the disseminated TB subgroup, HIV coinfection was detected in 13 (56.5%) patients.

Therapeutic interventions for COVID-19 were conducted following the COVID-19 Treatment Protocol for patients undergoing treatment at healthcare facilities of Moscow Healthcare Department (Moscow, 2020). TB treatment protocols complied with the Federal Clinical Guidelines on TB treatment in adults (Moscow, 2020).

A total of 64 emergency surgeries were performed on 36 patients; 12 patients required repeat surgery (Table 2).

Abdominal surgery was the most common surgical intervention: a total of 18 (28.2%) abdominal surgeries were performed on 8 patients. Five patients underwent surgery for abdominal TB complications: 4 of them had a perforated tuberculous ulcer of the ileum. One patient had retroperitoneal abscess due to the retroperitoneal perforation of a tuberculous ulcer in the cecum. One patient had dilated bowel loops resulting from acute intestinal obstruction. Abdominal lymphadenopathy and encysted tuberculous peritonitis were observed in 2 patients. One patient had tense ascites and another one had tuberculous spondylitis complicated by psoas abscess. Two patients with strangulated hernia had no abdominal pathology.

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<table>
<thead>
<tr>
<th>Severity of viral pneumonia on chest CT (lung involvement score)</th>
<th>Number of patients</th>
<th>SARS-CoV-2 RNA detected</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Abs.</td>
<td>%</td>
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<tr>
<td>1 (&lt; 25%)</td>
<td>23</td>
<td>61.9</td>
</tr>
<tr>
<td>2 (25-50%)</td>
<td>11</td>
<td>30.6</td>
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<tr>
<td>3 (50-75%)</td>
<td>2</td>
<td>5.6</td>
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<tr>
<td>Total</td>
<td>36</td>
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tuberculosis of abdominal lymph nodes and another had tuberculous peritonitis resulting from the spread of the disease from the lungs to other organs. Intraoperatively, multiple miliary lesions of the peritoneum, bowel loops, liver and spleen, abdominal lymphadenopathy, and peritoneal effusion were observed. In both cases, abdominal tuberculosis was confirmed by the histopathologic examination of the biopsied abdominal lymph nodes and peritoneal specimens.

Thoracic surgery was performed on 10 patients with COVID-19 and preexisting TB; of them 5 had to undergo repeat surgery. All thoracic patients received pleural drains (6 patients required drains due to pneumothorax, the rest 4 had pleuritis or pleural empyema; see Figure). Bronchial blocker placement during rigid bronchoscopy and mechanical ventilation was performed on 4 patients. Of them, 2 had fibrocavernous TB and developed pulmonary hemorrhage. Two other patients had a bronchopleural fistula, a collapsed lung and were unresponsive to pleural drainage. Tracheostomy was performed on 7 patients in intensive care requiring long-term mechanical ventilation.

There were 8 (22.2%) postoperative deaths. Of them, 4 patients with COVID-19/TB and respiratory failure were put on a ventilator and so underwent only one surgical intervention (tracheostomy). In their case, the immediate cause of death was COVID-19 and TB coinfection. Of those 4 patients, 2 had extensive pulmonary TB and COVID-19 coinfection (lung involvement score: 3); the other 2 patients had disseminated TB and COVID-19 coinfection (lung involvement score: 1 and 3, respectively).

Two patients died after multiple surgical interventions for abdominal TB complications, perforated tuberculous ulcers of the intestine accompanied by peritonitis. One patient, who underwent diagnostic laparoscopy for TB peritonitis, died of disseminated TB. Another death was due to decompensated liver cirrhosis and disseminated TB; this patient had tight ascites and had to undergo abdominal paracentesis. Four (50%) of the deceased patients had triple infection: COVID-19/HIV/TB; of them 2 also had hepatitis C.

**DISCUSSION**

There are a few important aspects to diagnosing and treating acute surgical patients with COVID-19 and TB coinfection. Before the COVID-19 pandemic, an abdominal ultrasound examination was the preferred diagnostic modality for patients with acute abdomen [15]. Now, considering the spread of the novel coronavirus infection, it is essential to assess the extent of lung damage caused not only by TB but also by rapidly progressing COVID-19 pneumonia [16]. We think that performing both chest and abdomen CT in patients with coinfection helps to clarify the underlying cause of abdominal pathology and detect an abdominal catastrophe if presenting symptoms are unobvious. Our opinion is consistent with the opinion of other researchers [17, 18].

However, some authors report that abdominal CT examinations are being decreasingly performed on patients with acute abdomen because CT facilities are overwhelmed during the pandemic; such reports promote laparoscopy as a...
diagnostic modality for patients with acute abdomen [19, 20]. However, patients mentioned in these publications do not have TB. It is well known that abdominal CT can clarify the need for laparoscopy as it is capable of detecting free gas in the peritoneum and fluid accumulation in bowel loops. In other words, abdominal CT can noninvasively detect complications of abdominal TB, including perforated tuberculous ulcers and acute intestinal obstruction. Therefore, we think it reasonable to perform an abdominal CT scan on patients with suspected acute surgical pathology and COVID-19/TB coinfection. In our study, only 2 patients, whose CT scans were inconclusive, were subjected to diagnostic laparoscopy. But the overarching surgical treatment strategy for our patients with abdominal TB complications was unchanged [21, 22].

Pulmonary TB is a common cause of spontaneous pneumothorax. The rate of this complication varies between 0.6% and 1.4% [23]. In patients with TB, spontaneous pneumothorax develops due to ruptured pleural blebs or bullae compromising visceral pleura integrity. However, spontaneous pneumothorax is not always associated with TB in TB patients. For example, it can be linked to bullous emphysema which developed independently of TB. Recent publications report spontaneous pneumothorax in patients with COVID-19 who did not have TB and/or any other preexisting lung disease. Almost all of them were on mechanical ventilation, i.e. they might have sustained injury to the trachea during intubation. Their mortality rate was very high (72.7%) [24–26]. In our study, 6 of 7 patients with pneumothorax underwent pleural drainage. All of them had active pulmonary TB. One of them died: he had a past history of multiple surgeries for abdominal TB complications and pneumothorax.

The analysis of surgical interventions performed in April through December 2019 vs. the same period in 2020 reveals a rise in the total share of tracheostomies from 0.6% (12 of 234 emergency surgeries) in 2019 to 10.9% in 2020, which can be explained by the need for long-term mechanical ventilation in patients with COVID-19.

The analysis of postoperative mortality shows that abdominal TB complications (perforated tuberculous ulcer leading to peritonitis in patients with disseminated TB) was the primary cause of death in 50% of patients in 2019 and 2020. A multicenter cohort study reports an increase in postoperative mortality to 15.9% among COVID-19 patients requiring emergency surgical care, in comparison with patients without the novel coronavirus infection [27].

In our study, there was no reliable increase in postoperative mortality: 16.5% in 2019 vs. 22.2% in 2020 ($\chi^2 = 0.46; p = 0.49$). Therefore, we conclude that COVID-19 did contribute significantly to postoperative mortality in acute surgical patients with TB. According to the literature, hospital mortality from COVID-19 varies from 6% to 25% [28]. Previously, we reported that overall hospital mortality among patients with COVID-19 and TB coinfection was 10.2%, whereas postoperative mortality in this cohort of patients was more than twice as high (22.2%) [14].

One of the limitations of this study is its small sample size due to the specific character of our patient cohort (triple COVID-19/HIV/TB infection). Another limitation is the short follow-up period, which did not allow us to analyze the long-term outcomes of the performed surgical interventions.

CONCLUSION

At our specialized TB hospital providing a wide range of health services to TB patients, emergency surgery was most commonly performed on patients with disseminated TB and COVID-19 coinfection (63.9%); patients with pulmonary TB required emergency surgical care less often (36.1%). Almost half of our
patients admitted during the pandemic for surgical emergency (44.4%) had triple infection (COVID-19/HIV/TB). Abdominal surgery (28.2%) was the most commonly performed procedure among patients with COVID-19/TB, followed by thoracic surgery (23.4%) and surgery for soft tissue infection (15.6%). The highest postoperative mortality (50%) was observed in the small group of 8 patients operated for abdominal conditions. Of all the patients who died in the postoperative period, 2 (50%) had COVID-19 and TB, and another 2 (50%) had quadruple infection with COVID-19, HIV, TB and hepatitis C.

References


Литература


