



Misdiagnosed periappendiceal and intestinal tuberculosis during the COVID-19 pandemic

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Introduction and importance: The coronavirus disease 2019 (COVID-19) was first reported in Wuhan, Hubei Province, China. It mainly involves the respiratory system, causing fever, cough, chest tightness, and other symptoms. However, when combined with other common or rare diseases, such as appendicitis and intestinal tuberculosis (TB), it can cause other systemic lesions, thus making the original disease lose its specific clinical manifestations. This case highlights the importance of early identification and clinical precision medicine diagnosis and treatment.

Case presentation: A young woman presented with intermittent pain and discomfort in the right lower quadrant. Ultrasonography suggested appendicitis with a peripheral abscess. The nucleic acid test of COVID-19 was positive, and the chest computed tomography scan showed pulmonary involvement. She was sent for surgery. Postoperative body temperature increased regularly, and the TB T-cell test was positive.

Clinical discussion: Multiple infections caused by common bacteria, pandemic virus, and specific mycobacterium TB cause a series of nonspecific clinical manifestations, which brings challenges to clinical diagnosis and treatment. Therefore, when facing a complex infection case, the authors should consider the possibility of multiple infections and give targeted treatment for the pathogens.

Conclusions: During the epidemic of COVID-19, the incidence of intestinal TB is relatively low, which is easy to be overlooked and misdiagnosed, especially in the case of appendicitis. Therefore, clinicians must be highly vigilant in the diagnosis process to avoid missed diagnosis or misdiagnosis, so as to provide the best diagnosis and treatment plan.

Keywords: appendicitis, case report, COVID-19, intestinal tuberculosis, multiple infection

Introduction

Tuberculosis (TB) is an infectious disease caused by the mycobacterium TB. It can be transmitted by the respiratory tract, the digestive tract, and other means. TB remains a worldwide health care challenge, with high incidence and mortality, especially in developing countries^[1]. According to the WHO Global Tuberculosis Report 2021, there were an estimated 10 million TB patients in 2020, of whom 1.5 million died from TB. Extrapulmonary TB has become more prevalent since the emergence of HIV infection, and intestinal TB is the sixth most

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HIGHLIGHTS

- The case occurred during the COVID-19 pandemic.
- Multiple infections pose diagnostic and treatment challenges.
- Intestinal tuberculosis is relatively rare, with subtle and atypical symptoms.

common site of extrapulmonary infection^[2] with a relatively rare occurrence, accounting for ~2% of TB cases worldwide^[3]. Intestinal TB may be a primary or secondary infection, it can affect any part of the gastrointestinal tract from the mouth to the anus, most commonly the ileocecal region, probably due to the abundance of lymphoid tissue in this area, the presence of physiological stagnation, increased fluid content, and low digestive activity^[4]. Due to the lack of specific clinical manifestations, intestinal TB shares a high degree of homogeneity with malignant tumors or other inflammatory bowel diseases, making its diagnosis relatively challenging. Even in countries where TB is endemic, the rate of misdiagnosis is 50–70%^[5]. Therefore, in the context of the coronavirus disease 2019 (COVID-19) epidemic, multiple infections may increase the difficulty of diagnosis.

Case report

A young female patient presented with intermittent pain and discomfort in the right lower abdomen for unknown reasons a week ago, without nausea, vomiting, fever, and other symptoms. The patient's symptoms improved after taking cefixime orally, but now the symptoms worsened, so she came to the hospital for

treatment. Physical examination upon admission: vital signs were stable, and there were no abnormalities detected upon cardiac and pulmonary auscultation. There was tenderness in the right lower abdomen, particularly pronounced at McBurney's point. A round mass with a size of about 5×4 cm was palpated in the right lower abdomen, and the mobility was slightly poor. The patient had a history of good health, without any chronic illnesses or infectious diseases, and had received three doses of the COVID-19 vaccine. Ultrasound of the abdomen showed a mixed mass in the right lower abdomen from the umbilicus to the appendix area, considering a periappendiceal abscess, measuring approximately 65×37 mm (Fig. 1A). The diagnosis was: periappendiceal abscess and acute appendicitis. After 15 days of antibiotic therapy, ultrasound showed that the abscess shrank to about 28×21 mm (Fig. 1B), but the temperature still fluctuated irregularly and repeatedly between 38°C and 39°C , and symptoms such as cough, chills, and chest tightness were observed. Considering the possibility of virus infection, the nucleic acid test of COVID-19 was positive. Chest computed tomography (CT) showed scattered infection foci in both lungs, which was considered as viral infection (Fig. 1D). A repeat ultrasound showed an abscess measuring $\sim 88 \times 36$ mm (Fig. 1C), and after 10 days of antiviral and other treatment, chest CT showed that the original scattered foci of infection in both lungs had disappeared (Fig. 1E).

Laparoscopic appendiceal abscess drainage was performed 5 days later. During the operation, it was found that the appendix was mildly swollen, the anatomy of the ileocecal structure was clear, with mild edema and adhesion of the appendix to the surrounding tissues. According to the intraoperative situation, we decided to perform 'laparoscopic appendectomy' (Fig. 1F, G), and the postoperative pathology showed chronic appendicitis. Postoperative MRI of the middle and lower abdomen showed postoperative changes in the appendix, and a small amount of fluid was collected in the right abdominal intestinal space and the lower edge of the liver (Fig. 1H). The patient's body temperature was monitored and found to be elevated in the afternoon, between 14:00 and 18:00, usually around 38°C . To exclude TB infection, TB infection T-cell testing was performed, which came back positive. Subsequently, the patient sought care at a specialized TB hospital, where they received regular oral administration of anti-TB drugs (isoniazid, rifampicin, ethambutol, and pyrazinamide). The patient's clinical symptoms significantly improved, and they were discharged after 1 week. One month later, the patient was followed up and reported no abnormalities, the clinical symptoms disappeared, and the related treatment was effective. Re-examination of the abdominal CT showed that the lesion size was significantly reduced (Fig. 1I).

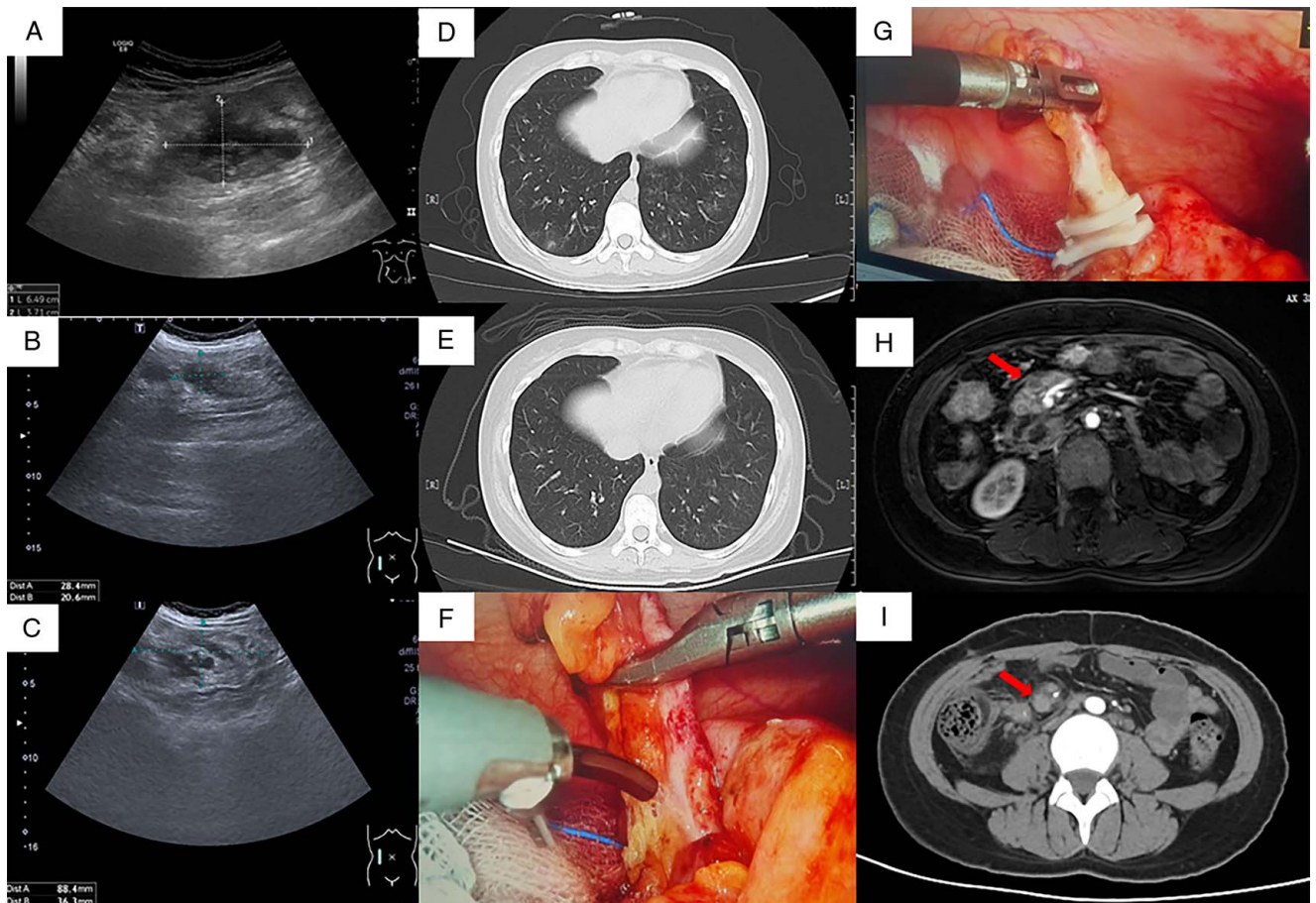


Figure 1. A is the ultrasound findings of the patient on admission, B is after antibiotic treatment and C is after infection with COVID-19. D is CT of the chest with COVID-19 infection, and E is after treatment. F, G. The patient is undergoing a laparoscopic appendectomy. H is the upper abdominal MRI before anti-TB treatment, and I is after anti-TB treatment, showing a significant reduction in the extent of the lesion (red arrow).

Discussion

Intestinal TB lacks specific clinical manifestations and may present with fever, abdominal pain, abdominal mass, and other symptoms. In a study involving 85 patients with intestinal TB, it was found that only 20% of the patients were initially correctly diagnosed with intestinal TB, while 80% of the patients were misdiagnosed with other intestinal disorders such as Crohn's disease or appendicitis^[6]. The supplementary diagnostic investigations for intestinal TB include acid-fast bacilli staining, TB skin test (Mantoux test), colonoscopy, CT, and others. Currently, there are some new diagnostic methods available^[7], such as GeneXpert, interferon-gamma release assay (IGRA), PCR, which can aid clinicians in making a diagnosis. For histopathological features, including caseous granulomas and caseous necrosis, it is considered the gold standard for the diagnosis of intestinal TB. Early diagnosis of intestinal TB is very important. Misdiagnosis and inappropriate treatment can lead to high mortality and serious complications, such as intestinal obstruction, perforation, and bleeding.

This case occurred during the epidemic period of the novel coronavirus (COVID-19), which greatly affected the diagnosis and treatment of the original disease. COVID-19 was first reported in Wuhan, China, in December 2019. It is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2)^[8]. The primary source of transmission for COVID-19 is individuals infected with the virus, primarily through respiratory droplets, and can also occur through aerosol transmission in relatively enclosed environments. The disease exhibits a high susceptibility among the population, and its clinical manifestations are mainly characterized by fever, cough, and fatigue. Some epidemiological studies have suggested an association between appendicitis and viral respiratory infections^[9,10]. COVID-19 may potentially weaken the immune system function of patients^[11,12], leading to a decreased overall immune response in the body. In a state of weakened immunity, the body becomes more susceptible to invasion and infection by bacteria and other pathogens. The patient's appendiceal abscess improved with antibiotic treatment but later contracted COVID-19. A subsequent ultrasound examination revealed a significant increase compared to the previous scan. We suspect that this may be associated with the infection of the COVID-19. In a multicenter cohort study conducted by Chaves *et al.*^[13] involving 1468 patients, it was found that during the COVID-19 pandemic, there was an increased proportion of appendiceal perforation and localized peritonitis, leading to a higher risk of complicated appendicitis. Furthermore, studies have indicated that patients with COVID-19 may experience gastrointestinal symptoms^[14], including nausea, vomiting, and diarrhea, which can disrupt the gut microbiota and potentially increase the risk of appendicitis.

The patient underwent laparoscopic appendectomy, and the postoperative pathology suggested chronic appendicitis, which further misled our judgment and the direction of the diagnosis and treatment of intestinal TB. The clinical presentation of appendicitis is often similar to that of other diseases, especially intestinal TB infection. Therefore, we consider that for such patients with relatively complex clinical symptoms and possible concurrent infection, preoperative TB screening and intraoperative sampling of the appendix and surrounding lymph nodes for pathological examination are more helpful to make the correct diagnosis and accurate treatment of the patient's condition as early as possible. However, abundant cases and further studies are still needed to

confirm our opinion. In conclusion, in clinical practice we need to comprehensively consider the patient's clinical manifestations, medical history, laboratory tests, and other aspects of information, so as to better protect the health and quality of life of patients.

Ethical approval

Ethics approval was not required for case reports under our institutional review board guidelines.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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None.

Author contribution

S.Z.: conceived and designed the study; Z.C. and Y.L.: contributed to obtaining the data; H.L. and L.F.: coordinated data collection; Z.C. and Y.L.: compiled the data and edited the manuscript; S.Z.: critically reviewed the manuscript. All authors contributed to the final submitted version.

Conflicts of interest disclosures

The authors have no conflicts of interest to declare.

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