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CASE REPORT

A Case Report of Pediatric Abdominal Tuberculosis with Intestinal Perforation Misdiagnosed as Malignancy

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Background: Abdominal tuberculosis (TB) in pediatric patients is a rare but serious condition that can often be misdiagnosed as malignancy or other abdominal disorders. Intestinal perforation is a rare and life-threatening complication that presents significant diagnostic and therapeutic challenges.

Case Report: We report a case of a 13-year-old girl from a TB-endemic region who presented with abdominal distension, weight loss, and vomiting. Initial imaging revealed a multilocular cystic mass in the abdominal cavity, raising suspicion of malignancy. Despite negative results from the tuberculin skin test (TST) and interferon-gamma release assay (IGRA), diagnostic laparoscopy identified severe intestinal adhesions and multiple perforations. Histopathological examination confirmed abdominal TB, and Mycobacterium tuberculosis was detected in peritoneal fluid using Xpert TB-DNA testing. The patient underwent emergency small bowel ostomy and received intravenous antitubercular therapy along with broad-spectrum antibiotics due to concurrent bacterial infection. After clinical improvement, oral anti-TB therapy was initiated, leading to significant resolution of abdominal pathology.

Conclusion: This case highlights the diagnostic complexity of pediatric abdominal TB, particularly when presenting with an abdominal mass complicated by intestinal perforation. Misleading clinical and imaging findings, along with negative immunological tests, may delay diagnosis. Clinicians in TB-endemic regions should maintain a high index of suspicion for TB in cases of unexplained abdominal masses, especially when routine tests fail to provide a clear diagnosis.

Keywords: abdominal tuberculosis, intestinal perforation, pediatrics, misdiagnosis

Abdominal tuberculosis(TB), a chronic infectious disease caused by Mycobacterium tuberculosis, can affect the peritoneum, intestines, and lymph nodes.[1] However, its clinical manifestations are nonspecific, making diagnosis challenging, particularly in cases involving an abdominal mass complicated by intestinal perforation, which is exceedingly rare. Pediatric abdominal TB accounts for only 1–3% of all TB cases and is frequently misdiagnosed as malignancy or other abdominal disorders. In China, childhood TB demonstrated a distinct epidemiological pattern characterized by a higher proportion of extrapulmonary tuberculosis (EPTB), accounting for 15.16% of cases. However, abdominal TB constituted only 5.7% of reported EPTB cases in 2021.[2] Intestinal perforation is a severe complication of abdominal TB, with a mortality rate potentially exceeding 30%.[3]

In clinical practice, the gold standard for diagnosing TB is the identification of Mycobacterium tuberculosis, but the positivity rate of bacteriological tests in children is low. Therefore, the tuberculin skin test (TST) and interferon-gamma release assay (IGRA) are often used as preliminary diagnostic tools. However, immature immune responses or malnutrition in pediatric TB patients may yield false-negative results on both TST and IGRA, significantly complicating the diagnostic process. This report presented a case of pediatric abdominal TB initially presenting with an abdominal mass and complicated by intestinal perforation, in which both TST and IGRA yielded negative results. This case aim to

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underscore the critical importance of maintaining high clinical suspicion for abdominal TB in endemic regions, particularly when evaluating pediatric patients presenting with unexplained abdominal masses or intestinal perforation. Given the potential for false-negative TST and IGRA results, clinicians should consistently include abdominal TB in their differential diagnosis. Early recognition and prompt therapeutic intervention are paramount to reducing complication rates and improving treatment outcomes in pediatric abdominal TB.

A 13-year-old girl was admitted with a two-week history of abdominal distension and a five-day history of abdominal pain, accompanied by vomiting, weight loss, and increased bowel movements. Abdominal ultrasonography revealed a massive multilocular cystic mass in the abdominal cavity, initially suspected to originate from the greater omentum, with a differential consideration of lymphatic malformation or borderline cystadenoma metastasizing to the greater omentum (Figure 1A and B). The patient was from a TB-endemic region but had no definitive history of TB exposure. Laboratory tests showed elevated inflammatory markers, and imaging studies indicated diffuse peritonitis, intestinal adhesions, and partial intestinal obstruction (see Figure 1C–E).

Due to the suspicion of malignancy, diagnostic laparoscopy was performed, revealing severe intestinal adhesions and multiple perforations. Pathological examination demonstrated caseating granulomas with acid-fast bacilli, confirming abdominal TB (see Figure 1F). Analysis of peritoneal fluid revealed the presence of Mycobacterium tuberculosis, Klebsiella pneumoniae, and Escherichia coli. The Xpert TB-DNA test for peritoneal fluid was positive, with rifampin sensitivity. However, both direct acid-fast staining of sputum and sputum TB-DNA Polymerase Chain Reaction (PCR) were negative. Notably, the patient's TST and IGRA were also negative.

During surgery, the patient underwent a small bowel ostomy, and therefore, antitubercular therapy was primarily administered via intravenous infusion. Postoperatively, the patient received intravenous antitubercular treatment comprising isoniazid (10 mg/kg qd), rifampin (15 mg/kg qd), levofloxacin (10 mg/kg qd), and linezolid (10 mg/kg q8h), alongside broad-spectrum antibiotics (meropenem). After one month of intravenous antitubercular therapy, follow-up results indicated a significant reduction in inflammatory markers, and there was progressive healing of the

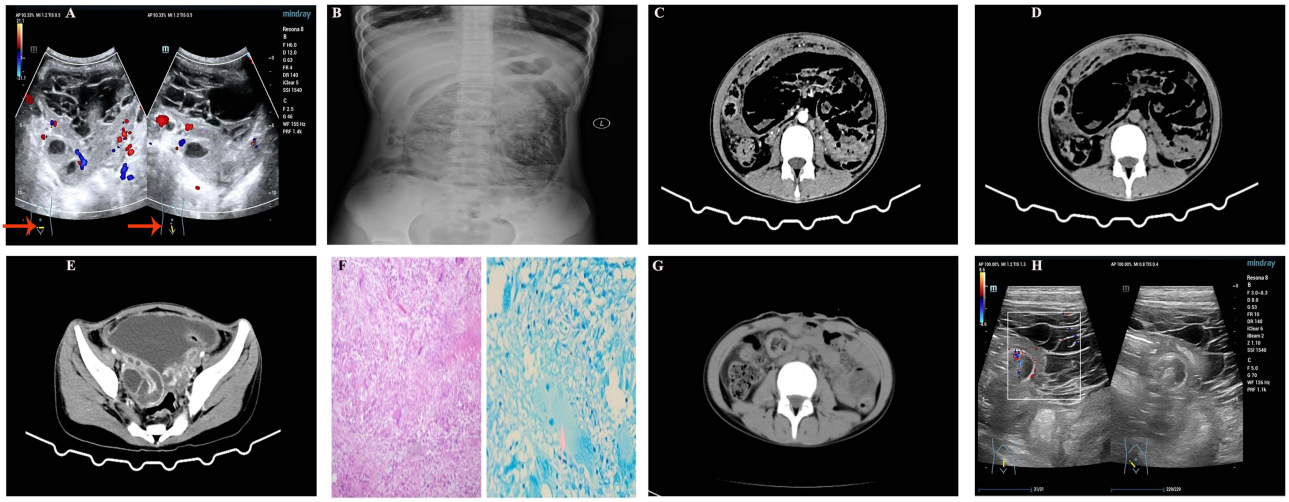

Figure 1 (**A**) B-ultrasound imaging reveals a massive multilocular cystic mass with hypoechoic characteristics, clear acoustic transmission within the cystic cavities, no significant blood flow signals, and a small amount of ascitic fluid. The yellow mark indicated by the red arrow in the image represents the detection site for abdominal ultrasound. (**B**) Abdominal X-ray indicates right pleural thickening and adhesion, with a small amount of pleural effusion; localized left pleural thickening with mild pleural effusion; and an occupying lesion in the middle and lower abdomen. (**C**) and (**D**): Contrast-enhanced abdominal CT demonstrates the presence of ascitic fluid with low-density imaging, peritoneal thickening with irregular nodular changes, and some areas exhibiting a band-like appearance; intestinal wall thickening with partial intestinal adhesion. (**E**) Axial pelvic CT reveals an irregular cystic lesion in the pelvic cavity with heterogeneous ring-like enhancement, along with a small amount of pelvic effusion. (**F**) Pathological examination shows characteristic tuberculous granuloma formation with pronounced caseous necrosis. H&E-stained section (left image): Histological features: Typical granuloma formation with prominent aggregation of epithelioid cells and significant lymphocytic infiltration. Cytological findings: Presence of multinucleated giant cells and marked inflammatory cell infiltration. Acid-fast staining section (right image): Staining characteristics: Displays a characteristic blue background, with acid-fast bacilli appearing as red-stained structures. Pathogen features: Dispersed acid-fast bacilli are observed. (**G**) Follow-up abdominal CT after treatment shows a reduction in peritoneal exudation compared to the previous scan, mild thickening of the intestinal wall, improved intestinal adhesion, and decreased abdominal effusion. (**H**) Abdominal ultrasound reveals significant thickening of the pleura and mesentery.

enterocutaneous fistula. As a result, the antitubercular therapy was adjusted to an oral regimen of HRZE (isoniazid, rifampin, pyrazinamide, and ethambutol) to continue treatment.

Three months later, the treatment was further modified to HRE (isoniazid, rifampin, and ethambutol). A follow-up abdominal Computed Tomography (CT) scan performed five months postoperatively revealed a marked reduction in the irregular cystic lesions in the pelvis, decreased peritoneal exudation, alleviated bowel adhesions, and a notable reduction in ascitic fluid (Figure 1G), showing a significant improvement compared to pre-treatment imaging.

Discussion

The incidence of abdominal TB in children is low, and there is a lack of clinical experience in its diagnosis and treatment. Furthermore, the clinical manifestations of abdominal TB are nonspecific, and due to the difficulty children face in accurately describing their symptoms, the diagnosis is particularly challenging. It is often misdiagnosed as other abdominal diseases, such as malignant tumors or Crohn's disease.

In this case, the child initially presented with abdominal pain and bloating, along with symptoms of excessive sweating and weight loss. Imaging revealed a large abdominal mass, and as the patient was a female, the clinical presentation and imaging findings were similar to those of other abdominal conditions, such as ovarian malignancy,[4] which made the diagnosis highly misleading. The child came from a TB-endemic area and denied any history of TB exposure, further complicating the diagnosis. Additionally, the child was found to have a concurrent bacterial infection, and bacterial peritonitis can also present with abdominal pain and bloating, potentially masking the characteristic features of TB and making the latent abdominal TB even more difficult to detect. Moreover, in the initial ultrasound, thickening of the peritoneum and mesentery was clearly observed (Figure 1H), which is not typically seen in abdominal TB but can occur in cases of severe infection, thus further hindering the physician's ability to diagnose the condition.

In clinical practice, the gold standard for TB is the identification of Mycobacterium tuberculosis. However, the bacterial culture test often has a low positive rate. Therefore, TST and IGRA are typically used for preliminary assessment.[5] The sensitivity and specificity of IGRA are higher than those of TST.[6] The IGRA works by stimulating CD4+ and CD8+ T cells through tuberculin, triggering an immune response,[7] leading to a positive result. However, an unusual finding in this case is that although the child's TB diagnosis was confirmed, the IGRA result was negative. A review of the child's lymphocyte subset results showed that only CD19+ cells were slightly elevated, while CD4+ and CD8+ counts were within the normal range, suggesting that the immune status was initially normal.

After reviewing the literature, we found that elevated C-reactive protein)(CRP)and hypoalbuminemia could also lead to a "false-negative" or indeterminate IGRA result.[8] Furthermore, the immune systems of children are not fully developed, potentially resulting in compromised T-cell mediated immunity.[9] This immunological immaturity may lead to inadequate immune responses to Mycobacterium tuberculosis infection, consequently reducing the sensitivity of IGRA).Additionally, certain immunosuppressive agents, such as TNF-α inhibitors, can suppress T-cell mediated immune responses, further diminishing IGRA detection sensitivity. Concurrent co-infections may also impair adaptive immune responses, potentially compromising IGRA accuracy.[10] This indicated that when IGRA is negative, TB infection cannot be completely ruled out, and it is necessary to integrate other inflammatory markers and clinical symptoms for a comprehensive evaluation.

Moreover, imaging plays a crucial role in TB diagnosis, as different forms of TB present distinct imaging features.[11] Abdominal ultrasound is the first-choice imaging modality; however, it has limitations in TB diagnosis. For example, in this case, the child's pre-admission abdominal ultrasound revealed a large mass in the greater omentum, significantly affecting the omentum. The ultrasound suggested two possible diagnoses: large lymphatic malformation or borderline cystadenoma metastasizing to the greater omentum. Both conditions can cause abdominal pain, bloating, and other significant gastrointestinal discomforts.[12] Similarly, malignant ovarian tumors in girls can exhibit imaging features similar to TB,[4] making differential diagnosis challenging. Pediatric abdominal tumors often show solid or complex cystic-solid masses with irregular borders, internal septations, or calcifications, while TB-related lesions may present as ill-defined, hypoechoic areas with ascites and lymphadenopathy. This demonstrated that imaging findings of abdominal TB, particularly when presenting as an omental mass, are often nonspecific. More sensitive imaging techniques, such as

magnetic resonance imaging (MRI), may be needed to aid diagnosis.[13] In certain cases, surgical intervention may be required to confirm TB infection.

Moreover, Xpert assumes critical diagnostic importance in EPTB. A recent Cochrane systematic review demonstrated substantial variability in its diagnostic performance across different specimen types, with cerebrospinal fluid showing 71.1% sensitivity and 96.9% specificity, pleural fluid exhibiting 49.5% sensitivity and 98.9% specificity, and lymph node aspirates demonstrating 81.6% sensitivity with 96.4% specificity. Limited data exist for peritoneal fluid, but its diagnostic characteristics resemble pleural fluid, suggesting similar sensitivity limitations. Compared to conventional culture (time-consuming with reduced sensitivity in paucibacillary specimens) and more invasive histopathology, Xpert provides rapid, highly specific testing—though sensitivity varies by site. These findings highlight the need to correlate molecular results with clinical and radiological findings. The treatment strategy for this pediatric patient warrants careful consideration. The first-line therapeutic regimen for TB typically consists of a four-drug combination, a regimen substantiated by extensive clinical research and practice, demonstrating efficacy in eradicating Mycobacterium tuberculosis and inhibiting its proliferation to achieve anti-tubercular effects. However, this patient presents with a highly atypical condition, as intraoperative findings revealed intestinal perforation, necessitating enterostomy. The stoma was located near the proximal small intestine, and the resultant compromised intestinal function precluded the absorption of orally administered medications, rendering oral therapy unfeasible. Consequently, intravenous administration was the only viable option.

Among the available anti-tubercular agents, most are primarily available in oral formulations, with injectable alternatives being relatively uncommon. Given the patient's inability to tolerate oral medications, intravenous administration was ultimately selected to ensure maximal therapeutic efficacy. Furthermore, the patient developed a mixed infection, which at one point progressed to septic shock. The selection of antimicrobial agents was guided by the dual objectives of rapidly controlling the infection while effectively targeting both Mycobacterium tuberculosis and the concomitant bacterial pathogens. A multi-drug regimen was implemented to achieve comprehensive pathogen coverage and facilitate rapid infection control.

This case highlights the diagnostic complexity of pediatric abdominal TB, particularly when its clinical and imaging features mimic malignancy. The negative results of both the TST and IGRA further complicated the diagnosis. Surgical intervention played a crucial role in confirming the diagnosis and managing complications, such as intestinal perforation and obstruction. Additionally, the presence of mixed bacterial infection necessitated a tailored antimicrobial regimen based on sensitivity testing. This case underscores the importance of considering TB in the differential diagnosis of abdominal masses in children, especially in TB-endemic regions.

Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee of Kunming Children's Hospital. Institutional approval for the publication of anonymized clinical details was obtained from Kunming Children's Hospital in accordance with local regulations and ethical guidelines. Written informed consent was obtained from the patient's parents for the publication of clinical images and the case description.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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