Radiology Case Reports 19 (2024) 3301–3307

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

Acute abdomen revealing abdominal tuberculosis complicated by a proximal jejunal perforation: Case report ☆

Ola Messaoud, MD[a,], Manal Jidal, MD[a], Kenza El Ouali, MD[b], Rahal Masrouri, MD, PhD[c], Ismail Boujida, MD[d], Fouad Zouaidia, MD, PhD[d], Fatima Z. Laamrani, MD, PhD[a], Omar El Aoufir, MD, PhD[a], Laila Jroundi, MD, PhD[a]*

[a] *Emergency Radiology Department, University Hospital Ibn Sina, Rabat, Morocco*
[b] *General Surgery C Department, University Hospital Ibn Sina, Rabat, Morocco*
[c] *General Surgery B Department, University Hospital Ibn Sina, Rabat, Morocco*
[d] *Histopathology Department, University Hospital Ibn Sina, Rabat, Morocco*

ARTICLE INFO

Article history:
Received 22 February 2024
Revised 22 April 2024
Accepted 25 April 2024

Keywords:
Abdominal tuberculosis
Intestinal perforation
Peritoneal tuberculosis
Gastro-intestinal tuberculosis
Laparoscopic findings
CT scan

ABSTRACT

Abdominal tuberculosis (TB) remains a significant health concern globally, particularly in regions with high endemicity such as North Africa and Morocco. Despite advances in diagnostic modalities, the nonspecific presentation of abdominal TB poses challenges for timely diagnosis and management. Here, we report a case of abdominal TB in a critically state of a young man from Morocco, presenting with acute abdominal pain and signs of sepsis. Radiological investigations revealed features suggestive of intestinal perforation complicating peritoneal TB. Urgent laparotomy confirmed the diagnosis, yet the patient succumbed to advanced sepsis postoperatively. This case underscores the complexity of abdominal TB diagnosis and management, necessitating a high index of suspicion and multidisciplinary collaboration. With evolving surgical techniques and ongoing research efforts, optimizing strategies for early detection and treatment of abdominal TB remains imperative, particularly in endemic regions.

Introduction

Tuberculosis (TB) remains a persistent public health challenge worldwide, with particular prominence in regions like North Africa and Morocco, where it has an endemic presence. The year 2022 witnessed an estimated TB incidence of 93 per 100,000 individuals, reflecting its enduring impact [1].

The bacterial infection, triggered by Mycobacterium tuberculosis or Mycobacterium bovis, manifests through diverse

☆ Competing Interests: 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.

* Corresponding author.
E-mail address: olamessaou@gmail.com (O. Messaoud).

https://doi.org/10.1016/j.radcr.2024.04.082

routes of transmission, including ingestion of contaminated substances or reactivation in immunosuppressed individuals, infiltrating the gastrointestinal tract through various pathways [2,3]. Abdominal TB presents a diagnostic challenge due to its diverse involvement across gastrointestinal, peritoneal, and lymphatic regions. This disease is characterized by nonspecific symptoms such as fever, weight loss, and abdominal discomfort, making timely recognition difficult [4].

When dealing with patients from an endemic area who present with ambiguous abdominal symptoms, physicians need to be aware of the vast clinical and radiological spectrum of abdominal tuberculosis and maintain a high level of suspicion. The article aims to report a case of abdominal tuberculosis in a critical condition, and to spark discussion in a field of continuing interest [2].

Case report

A young man in his early 30s originally from and living in Morocco, with a history of a hydatid cyst in the liver operated on 16 years ago, and a progressive weight loss, presented to the emergency room with acute abdominal pain, nausea, and a 3-day history of absolute constipation.

Upon examination, the patient exhibited abdominal distension, diffuse tenderness, a tachycardic state (127 beats per minute), a normal blood pressure of 110 mmHg (systolic tension) and 50 mmHg (diastolic tension), and rectal examination found stool in the rectal ampulla.

Laboratory test results showed a normal white blood cell count of 9200/mm^3, an elevated C-reactive protein of 311 mg/L, a prothrombin ratio of 40%, alkaline reserve of 10 mEq/L, and alterations in renal function with urea at 15.1 mmol/L and creatinine at 3.5 mg/dL.

Suspecting bowel obstruction, a contrast-enhanced CT scan was conducted, revealing significant pneumoperitoneum mainly located anteriorly and between bowel loops (Figs. 1 and 2), loculated fluid collections (Figs. 2 and 3), peritoneal masses (Fig. 1), regular peritoneal thickening with contrast uptake (Fig. 2), heterogeneous abdominal and pelvic lymphadenopathy (Fig. 3), a significant distension of bowel loops with air-fluid levels, with no evidence of mechanical obstruction, and a parietal defect in the proximal jejunum (Fig. 3). The observed abnormalities strongly indicated the possibility of intestinal perforation complicating 2 potential diagnoses. The first consideration is an infectious etiology, such as abdominal tuberculosis, given the endemic nature of the disease in Morocco and the accompanying progressive weight loss. The second likely diagnosis is peritoneal neoplasms, specifically lymphomatosis, based on the radiological presentation.

The patient underwent an urgent laparotomy due to his severe state of sepsis, revealing multiple peritoneal masses, a friable duodenal mass (Fig. 4), numerous millimetric white nodules in the omentum and the abdominal wall (Fig. 5), loculated ascites, and a proximal jejunal perforation of 4 cm facing the peritoneal mass (Fig. 6), suspecting intestinal and peritoneal tuberculosis. Due to the proximal localization of the jejunal perforation, the surgical team could not perform a jejunostomy and proceeded with primary repair of the perforation, along with abundant peritoneal lavage. Histological examination of the white nodule of the omentum and the duodenal mass showed caseating necrosis, confirming the diagnosis of tuberculosis (Figs. 7 and 8). Unfortunately, the patient passed away 1 day after the surgery due to his critical state of advanced sepsis.

Discussion

Tuberculosis is an endemic pathology in North Africa and especially Morocco, and a public health problem worldwide. The total incidence of tuberculosis was estimated to be 93 per 100,000 in 2022 [1].

The bacterial infection can be caused by ingesting unpasteurized milk contaminated with Mycobacterium bovis or by the reactivation of prior infection by Mycobacterium tuberculosis due to a state of immunosuppression. Ingestion of contaminated mucus, direct transmission from infected adjacent

Fig. 1 – Axial image of an abdominal enhanced CT scan revealing an important pneumoperitoneum (asterisk) and multiples peritoneal masses with a scalloping effect on the liver (white arrow).

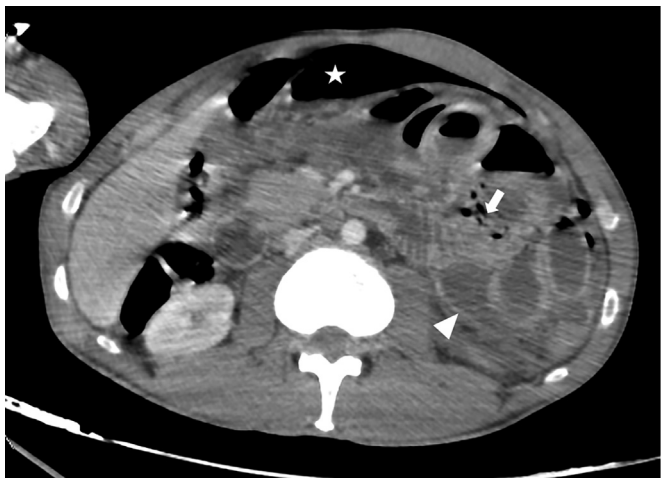

Fig. 2 – Axial image of an abdominal enhanced CT scan revealing an important pneumoperitoneum (asterisk), a parietal defect in the jejunum in favor of a perforation (white arrow), and a thickened peritoneum with loculated ascites (head arrow).

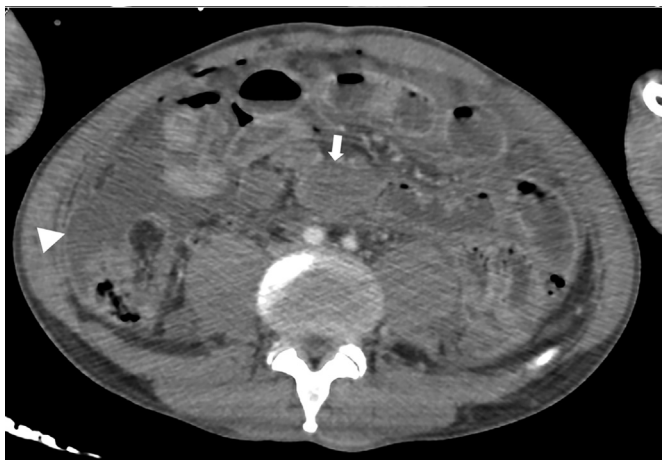

Fig. 3 – Axial image of an abdominal enhanced CT scan revealing pneumoperitoneum, a heterogenous lymphadenopathy with peripheral enhancement and a hypodense center (white arrow), and a thickened peritoneum with loculated ascites (head arrow).

lymph nodes and fallopian tubes, or hematogenous spread are the three ways that tuberculosis bacteria enter the gastrointestinal tract. After passing through the intestinal mucosa's Peyer's patches, ingested bacilli are carried by macrophages via the lymphatics to the mesenteric lymph nodes, where they remain inactive [2].

The peritoneal and intestinal spread of the bacteria can result from the reactivation of disease in these nodes, particularly in immunocompromised individuals with diabetes, renal failure, or cancer. This can affect any area of the digestive system, and the ileo-caecal area is the most involved site (75%), because of the reduced digestive activity, the high density of lymph nodes in the area, and the absorption of fluids and electrolytes. On the other hand, the gastro-duodenal involvement is rare (1%), due to the bactericidal qualities of gastric acid, the dearth of lymphoid tissue in the mucosa, and the quick emptying of the stomach [3].

The lack of specific symptoms makes the diagnosis challenging in many cases and can lead to potential misdiagnosis or oversight of other conditions. The most frequent symptoms encountered are fever, weight loss, night sweats, and anorexia. The symptoms start slowly and progress over time. Abdominal discomfort or distension, nausea and vomiting, diarrhea, and blood in the stool are the most common symptoms localized in the abdomen [4].

Abdominal tuberculosis presents with varied involvement across abdominal organs and tissues. The gastrointestinal tract is most commonly affected, accounting for 43% to 65% of cases, followed by the peritoneum for 20% to 47% of cases, lymph nodes for 4% to 42% of cases, and solid organs such as the liver, spleen, pancreas, or other abdominal organs in 1% to 23% of cases. Possible coexisting pulmonary tuberculosis is found in up to 54% of patients, indicating a significant overlap between abdominal and pulmonary tuberculosis [4].

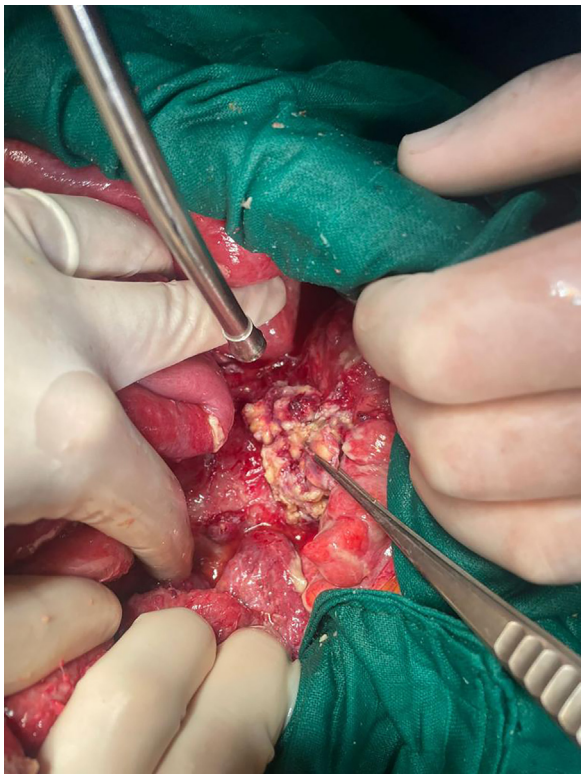

Fig. 4 – Image shows macroscopic laparotomy findings of duodenal mass with hyperemic and thickened peritoneum.

Fig. 5 – Image shows macroscopic laparotomy findings of peritoneal tuberculosis with a thickened peritoneum and numerous millimetric white nodules in the omentum and the abdominal wall.

Additionally, up to 33% of cases exhibit involvement of multiple abdominal locations simultaneously. This diversity underscores the complex nature of abdominal tuberculosis, with potential implications for diagnosis and treatment [4].

Gastrointestinal tract involvement includes tuberculosis that affects the esophagus, the middle and lower gastrointestinal tracts, and the anus. After entering the submucosa through the intestinal mucosa, the mycobacterium causes a granulomatous inflammatory reaction that involves vasculitis and thickening of the submucosa and serosa. This can result in ulceration that can rupture or heal through fibrosis. Pathological intestinal tuberculosis can present in fibrotic, ulcerative, hypertrophic, or ulcero-hypertrophic types. These many enteritis types can lead to complications, which manifest as lumen stenosis responsible for bowel obstruction, perforations, such as fistulas, and rarely, hemorrhagic enteritis [4].

During physical examination, over half of the patients describe abdominal distention and discomfort, although only 6% to 19% of patients report having a palpable abdominal mass. Between 10% and 35% of cases have ascites; it is still unclear if this is a core symptom of gastrointestinal tuberculosis or if it is related to tuberculosis of the surrounding organs. Acute abdominal and peritonitis symptoms are observed in around one-third of patients from high-burden disease locations [4,5]. While perianal diseases like fistulas or abscesses are uncommon, concurrent involvement of adjacent viscera with tuberculosis may result in infrequent presentations of lymphadenopathy and abdominal organomegaly. Severe complications such as intestinal obstruction, perforation, fistula formation, intra-abdominal collections, and gastrointestinal bleeding can result from tuberculosis of the gastrointestinal tract [4,5].

The most frequent radiological finding is mural thickness involving the ileocecal region. This thickening can be restricted to the terminal ileum or cecum, or more frequently, both segments at the same time and be linked to pericaecal fat stranding. Bowel wall thickening can range in severity from mild at first to severe at later stages, which can cause acute obstruction. A soft tissue mass focused around the ileocecal junction may be formed in more advanced disease states by a combination of adherent loops, massive lymphatic nodes, mesenteric thickening, and wall thickening. Additionally, fibrosis may cause a pulled-up cecum. The thickened wall may show possible hypodense patches in CT scans, which are most likely to be necrosis [6].

Small bowel loops may exhibit skip regions of concentric mural thickening, which often impact the ileal loops. Moreover, these segments may have proximal dilatation or luminal stenosis. In these situations where acute intestinal blockage is ruled out, some authors use oral contrast to gauge the amount of intestine thickness and mucosal irregularity [7].

As for peritoneal tuberculosis, it typically manifests as a gradual progression of ascites-related distention (40%-73%) and abdominal pain (50%-100%). There may also be some general symptoms associated, such as fever (13%-59%), night

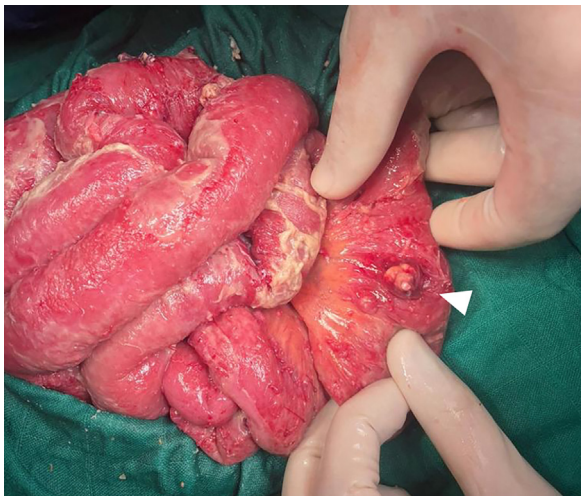

Fig. 6 – Image shows macroscopic laparotomy findings of a jejunal perforation (head arrow) associated to peritoneal tuberculosis with a thickened peritoneum and tubercules.

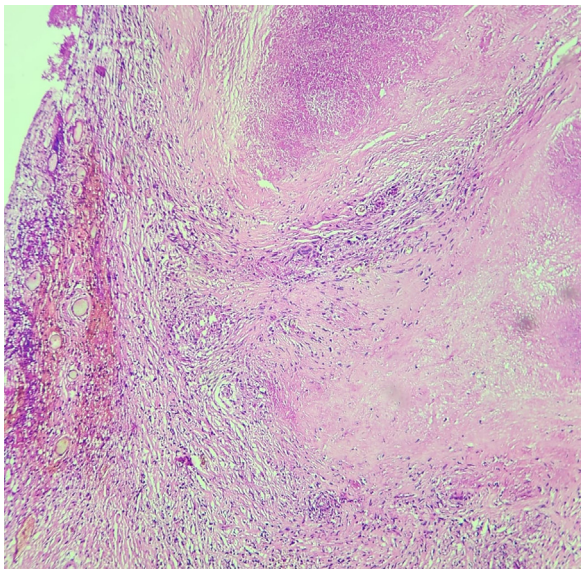

Fig. 7 – Microscopic histopathology image (x100): HE stained section showing areas of caseous necrosis associated with poorly formed epithelioid granulomas with multinucleated giant cells.

sweats (6%), and weight loss (50%-61%). Patients may have subtle progression of symptoms for months prior to seeking medical attention. A number of factors, including malignancy, peritoneal dialysis, HIV infection, and anti-tumor necrosis factor (TNF) therapy, significantly increase the chance of developing peritoneal tuberculosis. This is because these factors weaken the immune system's ability to mount a defense [7].

Three forms of peritoneal TB are often distinguished [8]:

- "Wet" with loculated or free ascites, floating membranes in the fluid, and strands of tiny adhesions.

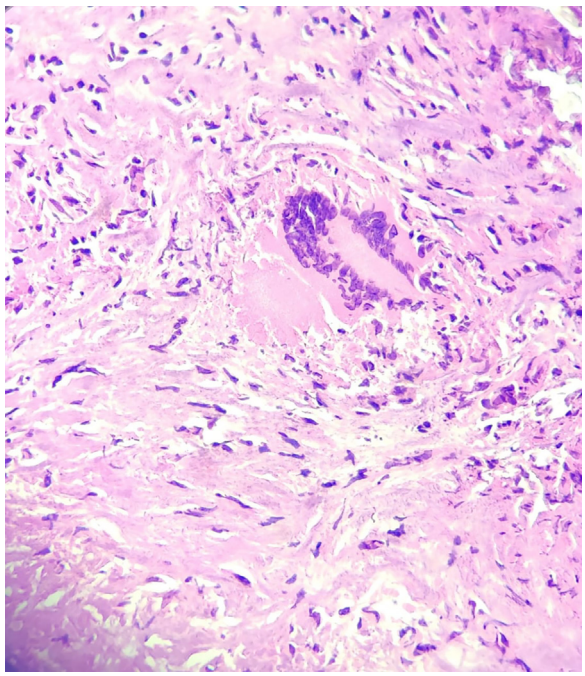

Fig. 8 – Microscopic histopathology image (x400): HE stained section of poorly formed granuloma with Langhans type multinucleated giant.

- "Dry plastic," characterized by mesenteric thickness, caseous lymph nodes, and fibrous adhesions.
- "Fibrotic fixed," characterized by mass omentum development, matting of bowel loops, and, in certain situations, cocooning.

On CT, there is significant overlap between the 3 categories.

The primary way that peritoneal tuberculosis appears on CT is via different levels of mesenteric and/or omental infiltration, associated (wet) or not (dry) with ascites.

Micro and macronodular infiltration are observed within the mesentery and are characteristic of mesenteric alterations. It is possible to observe edema, a widespread rise in fat density as a result of infiltration, and thickening of the mesentery with different appearances depending on the degree of mesentery involvement. A small number of advanced cases may have mesentery soft tissue density lumps that cause neighboring mesenteric leaves to adhere [8].

When tuberculosis is present, ascites typically has a high density that ranges from 25 to 45 HU. The substantial protein and cellular debris content in tuberculous exudate explain the high density. Water density, however, can also be observed as a result of an immunological response.

Peritoneal contrast uptake is usually associated with smooth uniform thickening of the peritoneum with scattered nodules noted in some cases. However, nodular implants with irregular thickening should also raise the suspicion of peritoneal carcinomatosis in the appropriate clinical setting [8].

Lymphadenopathy is the most prevalent sign of abdominal tuberculosis, occurring in 25%-93% of patients. The lymphatic drainage from the primary infection sites such as the small intestine, ileocecum, right side of the colon, liver, and spleen,

explains why the mesenteric, omental, peripancreatic, and upper paraaortic lymph nodes are commonly affected. Rarely, involvement of the lower paraaortic lymph nodes occurs unless there is direct dissemination from the reproductive organs or when there is systemic hematogenous spread [8].

Pombo et al. have described 4 types of contrast patterns on contrast-uptake CT of lymphadenopathy in individuals with abdominal tuberculosis: enhancement of the peripheral rim with a hypodense center, nonenhancing nodes, inhomogeneous and homogeneous enhancement. They concluded that while neither the nodal attenuation values nor the patterns of enhancement are typical of tuberculosis, in the right clinical circumstances, an adenopathy exhibiting peripheral rim enhancement with relatively low attenuation centers can imply a tuberculosis diagnosis.

Additional radiological findings involve cluster lymph node masses containing necrotic patches brought on by perinodal inflammation, an increase in the number of homogeneously dense, normal-sized, or slightly larger mesenteric nodes (>3 in a single CT segment), and calcified lymphatic nodes. The most prevalent group consisted of lymph nodes with hypodense centers and peripheral enhancement caused by caseous and/or liquefactive necrosis [9].

Laparoscopic findings observed in patients with peritoneal tuberculosis in a study conducted by Bhargava et al. [10] involving 87 patients with high protein ascites, 38 of whom were diagnosed with tuberculosis, showed that visual appearances were more useful than histology, culture, or guinea pig inoculation, with respective sensitivities of 82%, 3%, and 37.5%. Caseating granulomas were detected in 85%-90% of the biopsies.

Three categories apply to the laparoscopic findings in peritoneal tuberculosis:

- Thickened peritoneum with tubercles: The parietal peritoneum contains numerous uniformly sized, yellowish-white tubercles that are dispersed unevenly and measure around 4-5 mm. The peritoneum also seems thicker, hyperemic, and dull instead of glossy as normal. It is also possible to see tubercles on the spleen, liver, and omentum.
- Thickened peritoneum without tubercles.
- Fibroadhesive peritonitis characterized by many thick adhesions fixing the viscera and a noticeably thickened peritoneum [3].

These findings provide valuable insights into the laparoscopic presentation of peritoneal tuberculosis, aiding in its diagnosis and management.

In the assessment of abdominal tuberculosis, a comprehensive understanding of its radiological presentation is crucial for accurate diagnosis, considering the myriad conditions that share similar imaging characteristics. In particular, differentiating jejunal and ileal tuberculosis from other infectious etiologies such as amebiasis, Salmonella, and Yersinia infections is paramount. Additionally, inflammatory conditions like Crohn's disease and ulcerative colitis, which can manifest as backwash ileitis, present further challenges in the diagnostic process. Moreover, the possibility of malignancy, notably primary cecal malignancy, necessitates thorough evaluation [11].

Regarding peritoneal tuberculosis, the radiological differential diagnosis encompasses neoplastic entities such as carcinomatosis and lymphomatosis, as well as malignant mesothelioma and non-tuberculous peritonitis. Distinguishing peritoneal tuberculosis from carcinomatosis and lymphomatosis can pose considerable difficulty, often requiring histological confirmation for definitive diagnosis. Notably, extension of inflammation through the peritoneum into the extraperitoneal compartment serves as a hallmark of tuberculosis and aids in differentiation [11].

Peritoneal lymphomatosis, albeit rare, shares radiological similarities with tuberculosis, including omental nodular thickening, homogeneous masses, ascites, and smooth peritoneal thickening. However, key distinctions, such as the diffuse distribution of enlarged lymph nodes and their proximity to the primary tumor in peritoneal carcinomatosis, offer valuable diagnostic clues. Thus, meticulous evaluation of radiological findings, coupled with clinical correlation, is indispensable in elucidating the underlying pathology and guiding appropriate management strategies [12].

Treatment of abdominal tuberculosis includes medical and surgical methods. Conventional antitubercular therapy, including the first 2 months of rifampicin, isoniazid, pyrazinamide, and ethambutol, should be administered to all patients for a minimum of 6 months. Nonetheless, many doctors decide to prolong the course of treatment to 12 or 18 months [3].

There have been 3 stages in the surgical treatment of intestinal TB [13]: when effective antitubercular medications were not available, enterostomy or ileotransverse colostomy was used to bypass the stenosed segment since any resectional surgery was deemed dangerous in the presence of active illness. However, this procedure resulted in blind loop syndrome, and the remaining segments frequently had fistulae and recurring obstruction. More drastic methods of trying to eliminate the illness locally gained popularity, once antituberculous medications were developed. These included large bowel resections and right hemicolectomy, with or without substantial excision of the lymph nodes that drain the body. The undernourished patient frequently had trouble enduring these treatments. Additionally, the lesions are frequently widely apart and should not be removed. Today, cautious surgical techniques are advised. Preoperative medication treatment is debatable.

Strictureplasty is used to treat lumen stenosis that results in proximal hypertrophy or dilatation and that decreases the lumen by half or more. This entails a transversely closed, 2-layered incision that is 5-6 cm long along the antimesenteric side. Resection may be warranted in a section of the colon with many strictures or one long tubular stricture. Segmental resection is performed, leaving a 5 cm margin [13].

The majority of tubercular perforations are ileal and are linked to distal strictures. Since simple closure of the lesions is linked to a high rate of leak and fistula development, resection, and anastomosis are preferable [3].

According to two investigations [14,15], obstructive intestinal lesions may resolve without surgery when treated just with antitubercular medications. Even in individuals with subacute intestinal obstruction, authors observed that phar-

macological treatment was able to resolve tuberculous strictures both clinically and radiologically. They used medicinal treatment to treat 39 individuals who had obstructive symptoms. After a year, 91% of patients had improved clinically, 70% had full radiological resolution, and only 3% of cases required surgery. Multiple regions of involvement and lengthy strictures (>12 cm) were predictive of the need for surgery.

Conclusion

In conclusion, the presented case illustrates the intricate nature of abdominal tuberculosis diagnosis and management, particularly in regions with high endemicity. Despite advancements in diagnostic imaging and tools, nonspecific symptoms and diverse manifestations often delay diagnosis and exacerbate outcomes. The case underscores the importance of considering tuberculosis in patients with acute abdominal symptoms, highlighting gastrointestinal tract involvement as common but challenging due to its varied presentations. Peritoneal tuberculosis presents diagnostic hurdles due to overlapping features with other conditions, necessitating multidisciplinary approaches. Evolving surgical techniques emphasize conservative approaches, yet timely interventions remain critical, particularly in severe cases like intestinal perforation. Further research is needed to enhance early detection and optimize management strategies for this complex disease, particularly in high-burden regions.

Ethics approval

Our institution does not require ethical approval for reporting individual cases or case series.

Patient consent

Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

REFERENCES

[1] TB country, regional and global profiles. https://worldhealthorg.shinyapps.io/tb_profiles/?_inputs_&entity_type=%22country%22&iso2=%22MA%22&lan=%22EN%22.

[2] Weledji EP, Pokam BT. Abdominal tuberculosis: is there a role for surgery? World J Gastrointest Surg 2017;9(8):174–81.

[3] Sharma MP, Bhatia V. Abdominal tuberculosis. Indian J Med Res 2004;120:305–15.

[4] Al-Zanbagi Adnan B, Shariff MK. Gastrointestinal tuberculosis: a systematic review of epidemiology, presentation, diagnosis and treatment. Saudi J Gastroenterol 2021;27(5):261–74. doi:10.4103/sjg.sjg_148_21.

[5] Cheng W, Zhang S, Li Y, Wang J, Li J. Intestinal tuberculosis: clinico-pathological profile and the importance of a high degree of suspicion. Trop Med Int Health 2019;24:81–90.

[6] Suri S, Gupta S, Suri R. Computed tomography in abdominal tuberculosis. Br J Radiol 1999;72(853):92–8.

[7] Koff A, Azar MM. Diagnosing peritoneal tuberculosis. BMJ Case Rep 2020;13(2):e233131. doi:10.1136/bcr-2019-233131.

[8] Joshi AR, Basantani AS, Patel TC. Role of CT and MRI in abdominal tuberculosis. Curr Radiol Rep 2014;2:66. doi:10.1007/s40134-014-0066-8.

[9] Pombo F, DiazCandamio M, Rodriguez E, Pombo S. Pancreatic tuberculosis: CT findings. Abdom Imaging 1998;23(4):394–7.

[10] Bhargava DK, Shriniwas Chopra P, Nijhawan S, Dasarathy S, Kushwaha AK. Peritoneal tuberculosis: laparoscopic patterns and its diagnostic accuracy. Am J Gastroenterol 1992;87:109–12.

[11] Ladumor H, Al-Mohannadi S, Ameerudeen FS, Ladumor S, Fadl S. TB or not TB: a comprehensive review of imaging manifestations of abdominal tuberculosis and its mimics. Clin Imaging 2021;76:130–43. doi:10.1016/j.clinimag.2021.02.012.

[12] Cabral FC, Krajewski KM, Kim KW, Ramaiya NH, Jagannathan JP. Peritoneal lymphomatosis: CT and PET/CT findings and how to differentiate between carcinomatosis and sarcomatosis. Cancer Imaging 2013;13(2):162–70. doi:10.1102/1470-7330.2013.0018.

[13] Pujari BD. Modified surgical procedures in intestinal tuberculosis. Br J Surg 1979;66:180–1.

[14] Anand BS, Nanda R, Sachdev GK. Response of tuberculous stricture to antituberculous treatment. Gut 1988;29:62–9.

[15] Balasubramanian R, Ramachandran R, Joseph PE, Nagarajan M, Thiruvengadam KV, Tripathy SP, et al. Interim results of a clinical study of abdominal tuberculosis. Indian J Tuberc 1989;36:117–21.