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Case Report

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Laparoscopic peritoneal biopsy in the diagnosis of pediatric primary tuberculous peritonitis

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Abstract

This study aimed to share our experiences with children who have primary tuberculous peritonitis, which is difficult to diagnose, who underwent diagnostic laparoscopy. The study included two boys (8 and 9 years of age) and two girls (10 and 14 years of age). Three of the patients had complaints of abdominal pain for 1-2 months, and one patient had a mass lesion in the epigastric region for 3 months. All patients' tuberculosis skin tests were negative. Acid-fast bacilli were not detected in throat, sputum, or tissue cultures. Peritoneal thickening was detected on abdominal computed tomography in all patients. Laparoscopic peritoneal biopsy was performed in all patients. Pathology results revealed chronic granulomatous inflammation in the patients. During postoperative follow-up, subileus findings were observed in one patient, and proximal jejunal perforation developed in one patient. Diagnostic laparoscopy is thought to be a useful diagnostic tool for both sampling and morphological identification of lesions in tuberculous peritonitis.

Keywords: child, tuberculous peritonitis, laparoscopy, diagnosis

1. Introduction

The incidence of tuberculosis ranges between 18 and 43 people per 100000 population, depending on regional socioeconomic characteristics (1). Tuberculous peritonitis accounts for 0.1-0.7% of all tuberculosis cases (1). In children, 3.5% of tuberculous peritonitis cases are accompanied by pulmonary tuberculosis (2). Although it is associated with cirrhosis and HIV/AIDS in adults, conditions such as diabetes mellitus and hematological diseases that cause immunodeficiency are reported to be predisposing factors for tuberculous peritonitis in children (3). Therefore, the diagnosis and treatment of primary tuberculous peritonitis in children requires a multidisciplinary approach (4).

Mortality can reach 60% in adults with tuberculous peritonitis if diagnosis and medical treatment are delayed (5). Because tuberculous peritonitis causes atypical clinical findings such as acute abdomen, intestinal obstruction, mass, and massive ascites, it is more challenging to diagnose than pulmonary tuberculosis (6). This is mainly attributed to the difficulty in obtaining specific findings in radiological, biochemical, histopathological, and microbiological diagnosis (7). In addition, medical control of the ongoing active inflammation in patients with tuberculous peritonitis can be both slow and problematic (4). Therefore, considering the possible complications at the diagnosis stage, the role of surgical interventions remains controversial (4).

This study aimed to contribute to the related literature by sharing our clinical experience with pediatric patients who underwent laparoscopic peritoneal biopsy during the diagnosis of primary tuberculous peritonitis.

2. Case Report

The study included two boys (8 and 9 years of age) and two girls (10 and 14 years of age). Three of the patients had a history of abdominal pain for approximately 1-2 months, and one patient had a palpable mass lesion and weight loss in the epigastric region for 3 months. QuantiFERON tuberculosis tests were positive in all patients, while tuberculin skin tests were negative and throat and sputum cultures yielded no acid-fast bacilli. Plasma immunoglobulin values were within normal limits and viral disease panel tests were also negative. No signs of pulmonary or solid organ tuberculosis were detected on abdominopelvic ultrasound or chest computed tomography (CT). On abdominal CT, peritoneal thickening was observed in all four patients, while diffuse fluid was present in only one patient (Fig. 1).

All patients underwent diagnostic laparoscopy. During the procedure, diffuse granulomatous lesions on the parietal and visceral peritoneal surfaces and intraperitoneal fluid were observed in all four patients. Laparoscopic peritoneal biopsy and intraperitoneal fluid sampling were performed from the parietal peritoneal area (Fig. 2). The pathology results indicated chronic granulomatous inflammation in three patients and necrotizing granulomatous inflammation in one patient (Fig. 3). Acid-fast bacilli were not detected in tissue cultures of the biopsy samples. Elevated adenosine deaminase

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level (75 U/L) was detected in the peritoneal fluid of one patient.

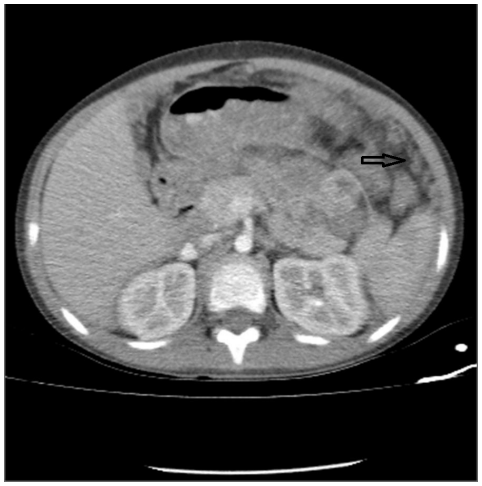

Fig. 1. Peritoneal thickening was observed in nine years old/boy patient

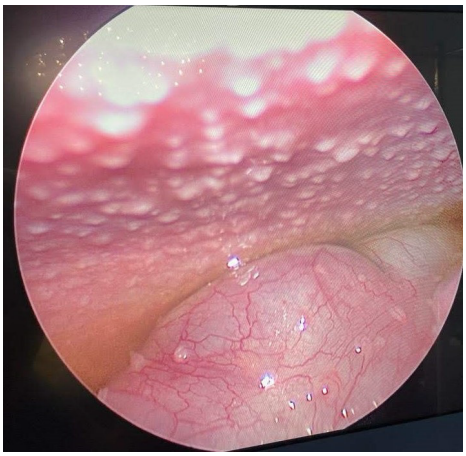

Fig. 2. Diagnostic laparoscopy image of 10 years old/girl patient

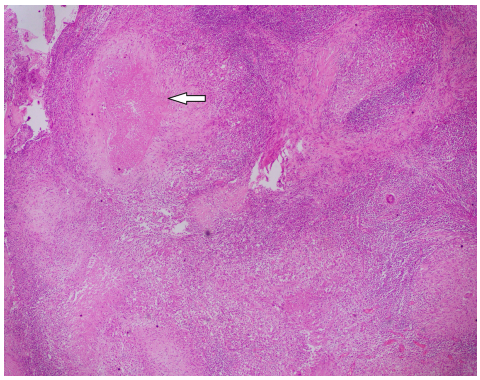

Fig. 3. Necrotizing granulomatous inflammation detected in laparoscopic biopsy material in a 14 years old/girl patient

All of the patients received quadruple antituberculous therapy consisting of isoniazid, ethambutol, pyrazinamide, and rifampicin (8). Postoperatively, one patient was followed up for a week due to signs of subileus. One patient presented with an acute abdomen and underwent an emergency laparotomy upon detecting signs of intestinal perforation. Examination revealed four perforation sites in the proximal jejunal segment, and primary repair was performed. The patients' mean postoperative follow-up time was 6.66±2.33 months. None of the patients died during follow-up.

3. Discussion

Despite advances in the treatment of tuberculosis, the diagnosis of primary peritoneal tuberculosis in children remains problematic due to the difficulty of detecting specific diagnostic findings (9). In addition, none of the diagnostic tools are sufficient on their own (10). The active inflammatory process in the peritoneal cavity of patients with tuberculous peritonitis also makes diagnosis and treatment prone to complications. For this reason, diagnostic laparoscopy procedures have notable advantages, such as enabling the identification of lesions in the intraperitoneal cavity and providing additional samples for diagnosis.

In children, extrapulmonary tuberculosis accounts for 0.3% of all tuberculosis cases (11). Lymphadenopathies are the most common extrapulmonary involvement of tuberculosis because it can spread via the lymphogenous route (12). Although 11% of abdominal tuberculosis is seen in the ileocecal area, it can also involve the liver and spleen (13). Primary tuberculous peritonitis is a clinical condition rarely seen in children (14). Children with tuberculous peritonitis generally have nonspecific findings such as abdominal pain, fever, and weight loss (14). Patients in this study had complaints of abdominal pain, a mass lesion in the epigastric region, and weight loss for several months. In addition, signs of the acute abdomen, such as intestinal obstruction and perforation, may occur along with increased inflammation in late-diagnosed cases of abdominal tuberculosis (15). In a study conducted in South Africa, Saczek et al. reported that 10% of tuberculous peritonitis cases were diagnosed by laparotomy after the patient presented with the clinical picture of an acute abdomen (16).

Aldriwesh et al. suggested that diagnostic methods with proven efficacy in pulmonary tuberculosis have low sensitivity in peritoneal tuberculosis (17). They reported that this caused delayed treatment and a resulting increase in morbidity among patients with extrapulmonary tuberculosis (17). Tuberculin skin tests are a diagnostic test in which an induration 10 mm in diameter occurs on the skin as a result of excessive immunological response, indicating infection with *Mycobacterium tuberculosis*. The positivity rate is up to 90% in patients with pulmonary tuberculosis (18). However, its sensitivity decreases in cases of comorbidities associated with immunodeficiency and in cases of miliary tuberculosis (19). In cases of extrapulmonary tuberculosis, the sensitivity of the tuberculin skin test decreases to 60% (19). Consistent with this, tuberculin skin tests were negative in all patients in this study. The QuantiFERON tuberculosis test, which is used as an alternative to tuberculin skin tests, measures the levels of interferon-alpha in response to mycobacterium antigens and is reported to have 70% sensitivity and 90% specificity (20). However, factors associated with bacterial load, such as the site

of involvement and the degree of inflammation, are reported to impact the sensitivity of the test (20). For this reason, it is thought that the tuberculosis quantiFERON test alone may not be sufficient to diagnose tuberculosis peritonitis. In all four patients in this study, QuantiFERON tuberculosis test was positive. These results suggest that the QuantiFERON tuberculosis test may aid the diagnosis of early tuberculous peritonitis at a stage when inflammation is milder and complications have not yet developed.

Adenosine deaminase is produced by T-lymphocytes against mycobacterium antigens. An adenosine deaminase level above 30 U/L in the peritoneal fluid was reported to have 96% sensitivity for abdominal tuberculosis (21). However, it was also reported that diseases affecting the immune system, such as congenital diseases, malignancy, and viral infections, may cause false-negative results (22). In one of the patients in this study, adenosine deaminase in the peritoneal fluid sample was found to be elevated, at 75 U/L. However, when evaluating this result, it is necessary to take into account the low bacterial load in extrapulmonary tuberculosis (22). Another diagnostic technique, polymerase chain reaction (PCR) test, has a reported sensitivity of 40% in the diagnosis of tuberculosis due to immunological reasons (23). Considering the cost of tuberculosis PCR test and its reduced sensitivity at low bacterial loads, its place in the diagnosis of extrapulmonary tuberculosis continues to be a subject of debate (23).

Regarding radiological diagnostic methods, while chest X-rays are within normal limits in 36% of pulmonary tuberculosis cases, nonspecific findings are obtained in 80% of abdominal tuberculosis cases on ultrasound and computed tomography (24). In our study, direct abdominal and chest radiographs were evaluated as within normal limits, while computed tomography revealed an edematous appearance suggestive of inflammation in the parietal peritoneum in all four patients. In diagnostic laparoscopy, diffuse granulomatous lesions were detected on the parietal and visceral peritoneum in all patients. This suggests that computed tomography findings of inflammation in the parietal peritoneum should be considered in the diagnosis, treatment, and follow-up of abdominal tuberculosis.

Culture remains the gold standard in the diagnosis of tuberculosis (25). However, culture positivity is low, with reported rates of 18% among all tuberculosis cases and 8.3% in patients with extrapulmonary tuberculosis. Another limitation of diagnostic cultures is that results are obtained after a period of 4-6 weeks (26). In tuberculosis, histological examination of tissue samples may reveal chronic granulomatous inflammation with and without caseating necrosis. However, the specificity of this type of inflammation to tuberculosis is reported to be 43% (26). A more sensitive diagnosis in histological examination requires the detection of the tuberculosis bacillus (acid-fast bacilli) (27). However, the histological identification of tuberculosis bacilli also involves drawbacks such as difficult detection because of the low bacterial load in the tissue and the cost of the dyes used (28). Although there was no growth in the tissue cultures of the patients in the study, findings suggestive of chronic granulomatous inflammation were detected upon examination of the tissue samples. Krishnan et al. reported that diagnostic laparoscopy procedures can be performed with low morbidity and mortality in patients with tuberculous peritonitis (29). Laparoscopy procedures in patients with tuberculous peritonitis offer a less invasive method of tissue sampling and obtaining morphological information about lesions in the intraperitoneal area (29). In the present study, diagnostic laparoscopy was used for the initial diagnosis. However, all patients responded to medical treatment and their clinical complaints regressed during follow-up, so control laparoscopy was not performed. In the literature, it is reported that the main determinant of postoperative complications in these patients is the severity of the ongoing inflammatory process (29). One patient in our study exhibited signs of partial ileus after laparoscopy, while intestinal perforation occurred in another patient. When all these results are evaluated together, it is seen that laparoscopy in patients with tuberculous peritonitis has advantages in terms of tissue sampling and determining the extent of intraperitoneal lesions. However, the low bacterial load in extrapulmonary tuberculosis is associated with disadvantages such as the low positivity of tissue cultures and low sensitivity of histological evaluation (29). In addition these results suggest that multiple diagnostic methods should be evaluated together when diagnosing tuberculous peritonitis.

Laparoscopic peritoneal biopsy is an effective diagnostic tool in patients with tuberculous peritonitis. In cases of tuberculous peritonitis, laparoscopy comes to the fore especially in the morphological identification of lesions. However, laparoscopy has limitations in the diagnosis of extrapulmonary tuberculosis, similar to microbiological, histopathological, and radiological methods. Nevertheless, due to the advantages it provides in terms of morphological characterization and tissue sampling, we think it is a useful diagnostic procedure for identifying latent infections both during diagnosis and treatment follow-up.

Conflict of interest

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None to declare.

Authors' contributions

Concept: C.İ., E.Y., Design: C.İ., E.Y., Data Collection or Processing: C.İ., E.Y., Ş.Ç., Analysis or Interpretation: C.İ, H.T., Literature Search: C.İ., E.Y., H.T. A.N., Writing: C.İ., E.Y., H.T., A.N.

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