Ultrasonography of peritoneal tuberculosis

Ababacar Mbengue, Abdou Rahmame Ndiaye, Ndeye Isseu Amar, Moustapha Diallo, Aminata Diack, Mame Diarra Ndao, Massamba Diop, Amath Fall, Cheikh Tidiane Diouf, Thierno Omar Soko, Ibrahima Cisse Diakhate

Département d’Imagerie Médicale Hôpital Principal de Dakar, Dakar, Sénégal
Correspondence: Mbengue Ababacar, Département d’Imagerie Médicale, Hôpital Principal de Dakar, 1 Avenue Nelson Mandela, BP 3006, Dakar, Sénégal; tel.: (+221) 775668658, e-mail: mbenguex@yahoo.fr
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Abstract

Purpose: The objective of this work was to describe different presentations of peritoneal tuberculosis on ultrasound. Materials and methods: This was a retrospective study conducted between 2008 and 2016 at the Main Hospital in Dakar, and including 38 cases of peritoneal tuberculosis. The tests were performed on Philips Envisor and Hitachi Preirus with 10 and 12 MHz linear transducers. The mean age was 26 years and the sex ratio was 0.8. The diagnosis of peritoneal tuberculosis was based on histological evidence (17 cases), isolation of BK from sputum (5 cases), positive adenosine deaminase in ascites fluid (4 cases) or a favorable clinical course after trial antituberculosis treatment (4 cases). The structures studied were the parietal peritoneum, the mesentery, the large omentum, as well as the characteristics of ascites, and extra-peritoneal lesions. Results: Parietal peritoneal involvement was found in 89.4% of patients, including regular diffuse hypoechoic thickening in 70.5% and nodular thickening in 11.7%. Ascites was present in 84.2% of patients. The great omentum showed anomalies in 73.6% of cases in relation to 3 aspects: trilamellar thickening made up of a thick, hyperechoic central layer surrounded by 2 thin peripheral hypoechoic layers in 46.4% of cases; a single-layer hyperechoic thickening in 21.4% of cases; heterogeneous hyperechogenic thickening with hypoechoic nodules in 32.1% of cases. Mesentery abnormalities were noted in 63.1% of patients with hypoechoic thickening. Conclusion: Ultrasound with the advantage of safety and accessibility is a reliable technique for the diagnosis of peritoneal tuberculosis. In some cases, it allows for a guided percutaneous biopsy to avoid the use of laparoscopy.

Introduction

Peritoneal tuberculosis is a public health problem in endemic areas. It constitutes the most frequent abdominal site (50 to 58% of the abdominal locations) and is the third most frequent of the extrapulmonary locations. Clinical manifestations are nonspecific, causing frequent delays and diagnostic wanderings. Ultrasonography is the most common first-line examination of ascites, which is the most common presentation of peritoneal tuberculosis. This work aims to describe different presentations of peritoneal tuberculosis on ultrasound.

Materials and methods

This was a retrospective study conducted between 2008 and 2016, including 38 cases of peritoneal tuberculosis investigated using an ultrasound at DAKAR Principal Hospital. Philips Envisor and Hitachi Preirus machines with linear 10 and 12 MHz transducers were used. The group consisted of 21 women and 17 men (sex ratio of 0.8). The mean age was 26 years (from 8 to 72 years). A total of 12% of patients had AIDS. The diagnosis was based on:

- histological evidence by laparoscopic peritoneal biopsy (17 cases) or ultrasonography (8) in 25 patients;
- isolation of BK in the sputum in 5 patients;
Discussion

Peritoneal tuberculosis is the third most common extrapolapulmonary location, particularly in the African environment\(^5\). Its frequency is steadily increasing in the industrialized countries due to population migrations and immunosuppressive diseases. Mycobacterium tuberculosis is the main cause\(^6\).

It is a pathology of young women with a mean age of 28 years in our group and sex ratio of 0.8; as reported by many African authors\(^5,7,9\).

Adenopathies were present in 13 cases (34.2%), most often necrotic. Other abdominal lesions were as follows: splenic nodules (14 cases or 36.8%), ileocaecal involvement (1 case), hepatic nodules (2 cases). Pleuropulmonary involvement was reported in 6 cases (15.7%).

Results

Ultrasound revealed ascites (Fig. 1) in 32 patients (84.2%). It was hypoechoic in all cases and was associated with adhesions in 32%. It was free 68% (Tab. 2).

Parietal peritoneum involvement was found in 34 patients (89.4%) with the type of regular diffuse hypoechoic thickening greater than 2.5 mm (Fig. 1, Fig. 2) in 70.5% (Fig. 1), peritoneal nodules in 11.7% (Fig. 3) and peritoneal thickening and nodules in 17.6%.

Mesenteric anomalies were reported in 24 (63.1%) cases with hypoechoic thickening of mesenteric leaflets greater than 2.5 mm (Fig. 4) with agglutination of small bowel loops (Tab. 3).

The large omentum was thickened in 28 cases (73.6%) with a diameter greater than 1 cm (Tab. 4) with:
- a trilamellar thickening made of a thick hyperechoic central layer surrounded by two thin hypoechoic peripheral layers (Fig. 5) in 46.4% (13 cases);
- a thickened hyperechoic mono-layer (Fig. 6) in 21.4% (6 cases);
- heterogeneous hyperechoic thickening with hypoechoic nodules (Fig. 7) in 32.1% (9 cases).

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From a biological point of view, ascites is of the lymphocyte type, the dosage of adenosine deaminase (ADA) is positive
Fig. 1. Lobulated ascites and entero-parietal adhesions (star)

Fig. 2. Thickening of the anterior parietal peritoneum in the presence (A) and in the absence of ascites (B)

Fig. 3. Form without ascites: nodules of the anterior parietal peritoneum (A) and diaphragmatic peritoneum with impression on the liver (B)
in 93 to 100% \( (18,19) \). The search for AFB in the ascitic fluid is rarely positive on direct examination with sensitivity between 0 and 6\% \( (20,21) \).

Ultrasound is an important tool for the diagnosis of peritoneal tuberculosis due to its accessibility and low cost. It is very important to highlight the peritoneal anomalies, even in the absence of ascites.

Although the diagnosis of certainty requires histological evidence, some peritoneal anomalies are of great diagnostic value, especially in endemic areas. Peritoneal carcinomatosis remains the main differential diagnosis.

Ultrasonography also has the advantage of being able to guide peritoneal biopsy in the case of significant thickening of the large omentum, peritoneal nodules of more than 1 centimeter, thus avoiding a more invasive laparoscopy \( (22) \).

All peritoneal structures may be involved: parietal peritoneum, mesentery of small bowels and large omentum \( (22-24) \). Ascites is the most commonly found; 84.2\% in our series, as reported by many African authors \( (16,23) \). It is often divided by septas \( (24) \). Adhesions are common in laparoscopic series \( (8,20,21,25) \). They are visible on ultrasound only in the presence of ascites in the form of linear septa fixing.

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**Fig. 4.** Hypoechoic thickening of visceral peritoneum of small bowels (mesenteric leaflets) (curved arrow) with agglutination of small bowel loops. Note the involvement of the associated parietal peritoneum (right arrow).

**Fig. 5.** Large omentum involvement: tri-lamellar thickening with 2 thin hypoechoic peripheral layers (right arrow) surrounding a central hyperechoic thick layer (star).
diaphragmatic peritoneum, causing scalloping on the liver and spleen (28% in our series), are found. Some authors, however, report a predominance of these parietal peritoneum nodules (23,25,28).

The involvement of the large omentum is very suggestive of the disease in our experience. It results in a thickening of the epiploon with 3 aspects, the understanding of which requires recalling the anatomy of the large epiploon. The latter consists of two peritoneal leaflets separated by fat, within which there are lymphoid formations of the OALT system. The most frequent aspect is a trilaminar or triple-layer thickening (46.4%) with a hyperechoic thick central layer corresponding to hypertrophied omental fat, surrounded by 2 thinner hypoechoic layers of 3 to 8 mm (identical to the affected parietal peritoneum) corresponding to the thickening of the 2 peritoneal leaflets. This form has not been reported in the literature to our knowledge, probably due to the age of the studies, some of which were conducted with low frequency probes (23,28–30). The single-layer or uni-lamellar thickening, homogeneous and hyperechoic, found in 21% in our series, reflects an isolated hypertrophy of the fatty layer without affecting the two peritoneal leaflets. Nodular heterogeneous omental thickening, the most described form in the literature (12,22,31,32), was found in 32.1% of our series. The nodules, most often hypoechoic, correspond to hypertrophic lymphoid formations. More rarely, they can appear anechoic due to a caseous necrosis. This aspect is less specific in our experience, which can be found in peritoneal carcinomatosis (27).

The involvement of the mesentery is also very evocative. Its frequency is variable and estimated between 22 and 68% according to studies (30,31). It results in regular hypoechoic thickening continuing on the visceral peritoneum covering the loops and responsible for small bowel agglutination (12).
Adenomegaly is found in 34.3% of patients, most often with necrotic appearance; frequency comparable to some African studies\(^{(23,33)}\). Other African authors report a much lower frequency, less than 10%\(^{(5,16)}\). The association with progressive pulmonary tuberculosis is possible\(^{(5)}\). Adnexal involvement mimicking an ovarian malignant mass is frequently reported in the literature\(^{(34,35)}\).

**Conclusion**

The diagnosis of peritoneal tuberculosis remains a challenge because the clinical symptoms are nonspecific. Biological tests such as adenosine deaminase (ADA) may be useful, but are not always available in developing countries. Ultrasound has the advantage of being cheaper, widely available and easy to perform\(^{(32)}\). In addition, it has high diagnostic cost-effectiveness and may be used in certain situations to guide peritoneal biopsy.

**Conflicts of interest**

The authors do not report any financial or personal connections with other persons or organizations, which might negatively affect the contents of this publication and/or claim authorship rights to this publication.

**Ethical consideration**

This article has received the favorable opinion of our hospital’s ethics committee.

**References**

1. Rai S, Thomas WM: Diagnosis of abdominal tuberculosis: the importance of laparoscopy. J R Soc Med 2003; 96: 586–588.
2. Guirat A, Affes N, Rejab H, Trigui H, Ben Amar M, Mzali R: [Role of laparoscopy in the diagnosis of peritoneal tuberculosis in endemic areas]. Med Sante Trop 2015; 25: 87–91.
3. Bouchentouf R, Eljastami S, Achour A: La tuberculose péritonéale: à propos de 38 observations. Rev Mal Resp 2012; 29: A119.
4. Benjazia E, Khalifa M, Hachfi W, Aaloua A, Krifa A, Letaief A et al.: Profil actuel de la tuberculose péritonéale: étude d’une série tunisienne de 24 cas. Rev Med Endoscopie 2009; 30: S401.
5. Fall F, Ndiaye AR, Ndiaye B, Gning SB, Diop Y, Fall B et al.: Peritoneal tuberculosis: a retrospective study of 61 cases at Principal hospital in Dakar. J Afr Hepatol Gastroenterol 2010; 4: 38–43.
6. Improving the diagnosis and treatment of smear-negative pulmonary and extrapulmonary tuberculosis among adults and adolescents. Recommendations for HIV-prevalent and resource-constrained settings. World Health Organization, Geneva 2007. Available from: www.who.int/tb/publications/2006/tbhin_recommendations.pdf.
7. Amouri A, Boudabbous M, Mnif L, Tahrir N: Profil actuel de la tuberculose péritonéale: étude d’une série tunisienne de 42 cas et revue de la littérature. Rev Med Interne 2009; 30: 215–220.
8. Dembéle M, Matiga MY, Minta DK, Traore S, Sacco M, Traore AK et al.: Tuberculose péritonéale dans un service de médecine interne en milieu tropical: aspects clinique, biologique et laparoscopique à Bamako – Mali. Acta Endoscopica 2003; 33: 561–567.
9. Ait-Khaled N, Emarnor D: Tuberculose. Manuel pour les étudiants en médecine. Organisation Mondiale De La Sante 1999. Available from: https://trieder.org/publications/books_french/students_fr.pdf.
10. Ramesh J, Banait GS, Ormerod LP: Abdominal tuberculosis in a district general hospital: a retrospective review of 86 cases. QJM 2008; 101: 189–195.
11. Thoeni RF, Margulis AR: Gastrointestinal tuberculosis. Semin Roentgenol 1979; 14: 283–294.
12. Atzori S, Vidili G, Delitala G: Usefulness of ultrasound in the diagnosis of peritoneal tuberculosis. J Infect Dis 2012; 6: 886–890.
13. Thoreau N, Faon O, Babinet P, Lortholary O, Robineau M, Valeyre D et al.: [Peritoneal tuberculosis: 27 cases in the suburbs of northeastern Paris]. Int J Tuberc Lung Dis 2002; 6: 253–258.
14. Sawadogo A, Ilboubou P, Ki-Zerbo GA, Peghini M, Zoubga A, Sawadogo A et al.: [Peritoneal tuberculosis and HIV infection. Reflection apropos of 22 cases at the National Hospital of Bobo Dioulasso]. Bull Soc Pathol Exot 2001; 94: 296–299.
15. Malik A, Saxen NC: Ultrasound in abdominal tuberculosis. Abdom Imaging 2003; 28: 574–579.
16. Darré T, Tchauo M, Sonhaye L, Patassi AA, Kanassoua K, Tchan-gai B et al.: Analyse d’une série de 44 cas de tuberculose péri-

tonéale diagnostiqués au laboratoire d’anatomie pathologique du CHU Tokoin de Lomé (1993–2014). Bull Soc Pathol Exot 2015; 108: 324–327.
17. Ndiaye AR, Klotz F: Tuberculose abdominale. EMC Gastro-entérologie 2012; 7: 1–9.
18. Siddé M: Tuberculose péritonéale: étude rétrospective à l’Hôpital Principal de Dakar sur une période de 17 ans [Thèse de Doctorat]. Université El Hadji Ibrahima Niasse, Ecole de Médecine St Christopher Iba Mar DJOPI Dakar 2018.
19. Dülger AC, Karadaş S, Mete R, Türköğlan MK, Demirkiran D, Gülflepe B: Analysis of cases with tuberculous peritonitis: a single-center experience. Turk J Gastroenterol 2014; 25: 72–78.
20. Chow KM, Chow VC, Szeto CC: Indication for peritoneal biopsy in tuberculosis peritonitis. Am J Surg 2003; 185: 567–573.
21. Sanai FM, Bzeizi KI: Systematic review: tuberculous peritonitis, presenting features, diagnostic strategies and treatment. Aliment Pharmacol Ther 2005; 22: 685–700.
22. Pereira JM, Madureira AJ, Vieira A, Ramos I: Abdominal tuberculosis: imaging features. Eur J Radiol 2005; 55: 173–180.
23. N’dri K, Gbazi GC, Konan A, Kouadio, Koffi, N’dri N et al.: Apport de l’échographie dans le diagnostic de la tuberculose péritonéale ascitique. Médecine d’Afrique Noire 1993; 40: 503–506.
24. Porteije JE, van der Werf SD, Mutsaers JA, Lohle PN, Puylaert JB: [Echographic recognition of tuberculous peritonitis]. Ned Tijdschr Geneeskd 1997; 141: 89–93.
25. Dafiri R, Imani F: Tuberculose abdominale. Encycl Méd Chir (Editions Scientifiques et Médecines Elsevier SAS, Paris, tous droits réservés). Radiodiagnostic – Appareil digestif 2001; 33-010-A-30: 12.
26. Gastli H, Hassine W, Abseessem K, Garhbi HA: [Echographic aspects of peritoneal tuberculosis. Apropos of 14 cases]. J Radiol 1983; 64: 325–329.
27. Weill FS, Costaz R, Guetarni S, Maltoni I, Rohmer P: [Echographic diagnosis of peritoneal metastases in patients with ascites]. J Radiol 1990; 71: 365–368.
28. Kedar RP, Shah PP, Shivde RS, Malde HM: Sonographic findings in gastrointestinal and peritoneal tuberculosis. Clin Radiol 1994; 49: 24–29.
29. Akhan O, Demirkasik FB, Demikarzik A, Gülekon N, Eryilmaz M, Unsal M et al.: Tuberculous peritonitis: ultrasonic diagnosis. J Clin Ultrasound 1990; 18: 711–714.
30. Lee DH, Lim JH, Ko YT, Yoon Y: Sonographic findings in tuberculous peritonitis of wet-asctic type. Clin Radiol 1991; 44: 306–310.
31. Batra A, Gulati MS, Sarma D, Paul SB: Sonographic appearances in abdominal tuberculosis. J Clin Ultrasound 2000; 28: 233–245.
32. Ozkan K, Gürses N, Gürses U: Ultrasonic appearance of tuberculous peritonitis. J Clin Ultrasound 1987; 15: 350–352.
33. Heller T, Goblirsch, Wallrauch C, Lessells R, Brunetti E: Abdominal tuberculosis: sonographic diagnosis and treatment response in HIV-positive adults in rural South Africa. Int J Infect Dis 2010; 14 (Suppl. 3): 108–112.

34. Tongsong T, Sukpan K, Wanapirak C, Sirichotiyakul S, Tongprasert F: Sonographic features of female pelvic tuberculous peritonitis. J Ultrasound Med 2007; 26: 77–82.

35. Gosein MA, Narinesingh D, Narayansingh GV, Bhim NA, Sylvester PA: Peritoneal tuberculosis mimicking advanced ovarian carcinoma: an important differential diagnosis to consider. BMC Res Notes 2013; 6: 88.