

Ultrasonographic Mapping Reduces the Complications of Diagnostic Laparoscopy for Abdominal Tuberculosis

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Background and Aim: Diagnostic laparoscopy is of great value in the early diagnosis of abdominal tuberculosis and to help improve bed turnover. Diagnostic laparoscopy, however, is subject to all the risks and complications inherent to any invasive procedure. Our aim was to evaluate the role of ultrasonography in the prevention of complications when using diagnostic laparoscopy, and to present its efficacy in the monitoring of response to therapy.

Materials and Methods: Nineteen male patients who had ascites with unknown etiology or with suspected abdominal tuberculosis were recruited. In order to analyze the potential role of ultrasonographic mapping as an aid in the prevention of complications when using diagnostic laparoscopy for diagnosis, abdominal ultrasonographic mapping was performed in all patients just 2 h before the operation.

Results: Diagnostic laparoscopy findings for each patient supported preoperative suspicions of abdominal tuberculosis and all operations were performed without complications.

Conclusion: US-guided mapping of the abdomen allows a safe and accurate diagnostic laparoscopy.

Key Words: Abdominal tuberculosis, diagnostic laparoscopy, ultrasonography, complication

Abdominal Tüberküloz Tanısı İçin Diagnostik Laparoskopik Uygulamasının Komplikasyonlarını Azaltmada Ultrasonografik Batın Haritalamasının Yeri

Amaç: Abdominal tüberkülozun erken tanısında diagnostik laparoskopinin büyük değeri vardır. Diğer invaziv prosedürlerde olduğu gibi diagnostik laparoskopide komplikasyonlara açık bir cerrahi yöntemdir. Çalışmada amacımız diagnostik laparoskopinin komplikasyonlarından korunmada ve tedaviye verilen cevabın takip edilmesinde ultrasonografinin rolünü değerlendirmektir.

Materyal ve Metod: Nedeni bilinmeyen asit yada abdominal tüberküloz şüphesi olan 19 erkek hasta çalışmaya alındı. Ultrasonografik batın haritalaması, diagnostik laparoskopinin komplikasyonların önlenmesindeki etkisini araştırmak için, tüm hastalara ameliyattan 2 saat önce uygulandı.

Sonuçlar: Diagnostik laparoskopide bulguları tüm hastalarda abdominal tüberküloz şüphesini doğruladı. Tüm operasyonlar, ultrasonografik haritalama ile güvenli trokar girişi sayesinde komplikasyonsuz olarak gerçekleştirildi.

Tartışma: Ultrasonografik batın haritalaması abdominal tüberkülozun tanısında güvenli diagnostik laparoskopide imkanı sağlamaktadır.

Anahtar Sözcükler: Abdominal tüberküloz, diagnostik laparoskopide, ultrasonografi, komplikasyon

Introduction

Tuberculosis (Tbc) causes nearly 3 million deaths per year worldwide and is increasing in incidence in developed and developing countries. Abdominal Tbc, which may involve the peritoneum, lymph nodes, solid organs, and the gastrointestinal tract, constitutes up to 12% of extrapulmonary Tbc and 1%-3% of the total cases (1,2). Despite the improvement and introduction of effective antituberculous chemotherapy since the first peritoneal Tbc case was documented (3) in 1843, the mortality of abdominal Tbc (AT) has remained high. This is probably related to diagnostic difficulties (4,5). Because the clinical presentation tends to be non-specific, with abdominal pain and general complaints, unless a high degree of suspicion is maintained, the diagnosis can easily be missed or delayed, resulting in increased morbidity and mortality (6,7). Obviously, an accurate and reliable diagnostic test is needed to avoid mortality and morbidity.

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Diagnostic laparoscopy (DL), performed by direct eye vision, is of great value in the early diagnosis and to help improve bed turnover. However, it must be stressed that DL is subject to all the risks and complications inherent to any invasive procedure. Ultrasonography (US) is a readily available, noninvasive, flexible, cross-sectional modality for imaging the abdomen and pelvis and an ideal guidance technique for exact and untroubled placement of the biopsy needle (8) and laparoscopic ports. It also permits the monitoring of responses to therapy.

The aim of this study was to analyze the potential role of ultrasonographic mapping as an aid in the prevention of complications when using DL.

Materials and Methods

Study populations: Between April 2002 and April 2004, all patients who had ascites with unknown etiology or suspected AT were recruited for the study.

All patients underwent a thorough gastroenterological examination and standard preoperative laboratory tests (whole blood count, blood chemistry, urinalysis, chest radiograms, purified protein derivative skin test, etc.), including tests for HIV. In order to determine the nature of the ascites we performed biochemical and bacteriological analysis of ascites material before the operation. Abdominal computed tomography was also performed to obtain some additional idea in the preoperative stage about the range of abdominal involvement of the suspected AT. Patients who were judged to have ascites of unknown origin according to the test results listed above, and those with suspected AT were enrolled in the study.

Abdominal mapping and surgical procedure: Abdominal US was performed in all patients just 2 h before the operation. The patient's abdomen was labeled with a permanent surgical point marker by a radiologist in order to locate a safe area for the Veress needle and trocar insertion during the operation. Additionally, in the labeled area, radiologists marked a safe place best for the initial puncture with an "X" sign. After the abdominal labeling was done, the patients were taken to the operating room. When the patient was completely anesthetized, a Veress needle was inserted into the abdomen through the "X" labeled point. Drainage of ascites content after the puncture is considered a "safety sign", which is evidence of the safe placement of the

Veress needle in the abdominal cavity. If drainage cannot be achieved in the safe labeled area it is considered that the patient may have a relatively low volume of ascites content and that the first trocar should be inserted by an open technique. After the Veress needle was inserted, pneumoperitoneum was established until 10 mmHg abdominal pressure was achieved. (This step was performed directly using the 10 mm trocar if it was placed by an open technique). Following the abdominal distention, a 10 mm trocar was inserted through the previous Veress needle location and the abdomen was examined with a 30° camera. A 5-mm second port was introduced into the abdomen through another safe location, determined by direct eye visualization. Biopsies were performed with the forceps introduced through this port. Multiple peritoneal biopsies were taken by forceps, which were introduced into the abdomen via a second trocar. As a final step, the first trocar placement site was inspected in order to check the safety and accuracy of preoperative labeling to utilize the second trocar, which was used to introduce the grasper into the abdomen.

As all of the invasive procedures are a standard part of the patients' care used in routine treatment and are accepted in the medical literature, no ethical committee approval was needed for the study.

Results

Patients' demographics and clinical findings: During the 2-year period, 19 male patients diagnosed with DL and having AT were identified and recruited for the study. The mean age for patients was 21.2 years (range 20-24). There were 16 patients with ascites, as ascertained by physical examination, and 3 patients without any signs and symptoms related to ascites but with some symptoms related to AT. The onset of the disease was insidious in many patients and presentation of the symptoms ranged from 10 days to 6 months. The most common symptoms were abdominal pain (84%) and weight loss (84%), followed by anorexia (63%), malaise (57%), and abdominal distension (47%).

USG Findings: There were 12 patients with wet type (Figure 1), 4 with fibrotic type and 3 with dry type (Figure 2) AT according to abdominal USG. The most common finding on USG was peritoneal tuberculosis, which was characterized by ascites. Additionally there were other associated USG findings as listed in the Table. Although there were variable amounts of ascites fluid, most of them were free ascites (n = 12, 63%). Ascites

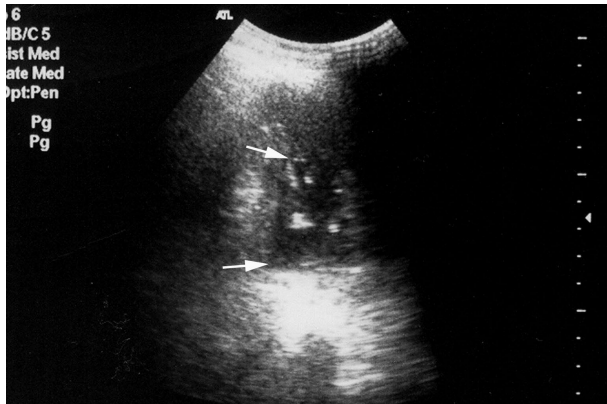


Figure 1. USG images of the wet type AT.



Figure 2. USG images of the dry type AT.

Table. USG findings of AT.

USG Findings	n
Peritoneal tuberculosis	16 (84%)
Lymphadenopathy	13 (68%)
Omental thickening	8 (42%)
Hepatomegaly	2 (10%)
Splenomegaly	1 (5%)
Hepato-splenomegaly	1 (5%)

was loculated in 4 (21%) patients with fibrotic type AT. Abdominal mapping was easily performed in all patients enrolled in the study. The radiologist found and labeled the possible safe places accurately and without any difficulty. The majority of the labeled abdominal areas were located in the left upper quadrant of the abdomen while a small number were periumbilical (17 and 2 consecutively).

DL findings: In 3 patients, the first trocar was placed by the open technique as the safety sign was not observed. Those 3 patients were also reported to have the dry type of AT using USG. DL supported these diagnoses for all 3 patients. As a guide for preoperative mapping, the first trocar was placed in the upper right quadrant in 17 patients and the umbilical area in 2 patients. It was observed that at least a 25 mm safe distance was established between the first trocar placement point and the intestine that adhered to the abdominal wall, if present. A varying severity of intra-abdominal adhesions, scattered or confluent multiple, whitish multiple nodules over the visceral and parietal peritoneum, and varying amounts of ascites were the most common findings of DL (Figure 3). DL findings for each patient supported the preoperative suspicions of AT with these certain findings mentioned above. Because the trocar placement was so precise, all operations were performed without complications. All patients received antituberculous treatment starting from a day before the operation without waiting for the biopsy result. All biopsy results, obtained with DL from those 19 patients, revealed that the patients had AT.

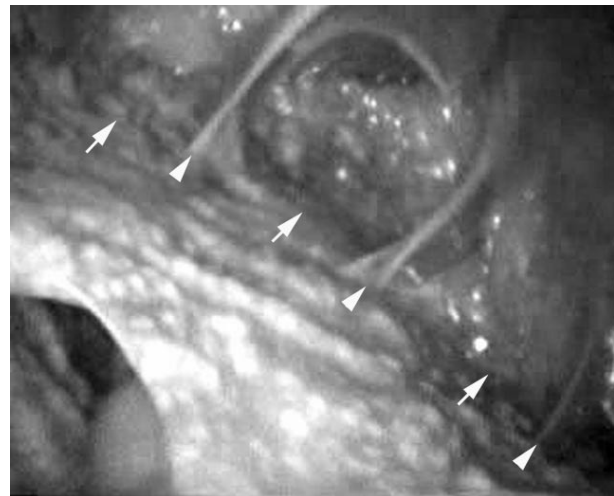


Figure 3. Laparoscopic view of multiple peritoneal tubercles (white arrows) and peritoneal spider web adhesions (white arrowheads).

Discussion

In patients experiencing abdominal pain, weight loss, and other non-specific abdominal symptoms for a long period and/or with a history of recent travel to countries where tuberculosis is endemic, AT should be suspected.

Most symptoms in this illness mimic many other intra-abdominal pathologies, including inflammatory bowel disease, pelvic mass, intra-abdominal abscess, peritoneal carcinomatosis, ovarian cancer, and intractable ascites of portal hypertension or heart failure, etc. (9-11). Therefore, diagnosis is usually delayed, which in turn results in high mortality and morbidity rates (6,7,12,13). Prompt diagnosis is important because it allows an early start for anti-tuberculosis therapy and can help prevent patient morbidity and mortality.

Different diagnostic tools have been mentioned in the literature for AT. These include radiological studies (chest X-ray, plain X-ray of abdomen, barium study of small and large intestine, USG, CT), colonoscopy, and immunological tests with ELISA, dermal tests (tuberculin skin test), ascites fluid examination (obtained with diagnostic paracentesis), and histological and PCR study of peritoneal biopsy specimens (obtained with diagnostic laparoscopy) (14-19). Chest X-rays show evidence of concomitant pulmonary lesions in less than 25% of cases (20). Many of the aforementioned diagnostic tools that require sophisticated laboratory examinations usually have a high failure rate in diagnosing the disease and, most importantly, a long period is needed before the results are available. DL is an exception to this. DL offers an opportunity for direct visualization of the intra-abdominal space, as well as a fast and high diagnostic value that can prompt early treatment (19,21). Furthermore, adequate homeostasis of the punctured side of the abdominal wall and a direct biopsy from granulomas localized on the peritoneum are some other advantages of DL. AT frequently presents typical visual clues, which support preoperative suspicion. Multiple yellowish-white, uniform sized, diffusely distributed tubercles can be seen on the parietal peritoneum and solid viscera. The peritoneum is usually thickened, hyperemic and lacks its usual shiny luster. In case of fibro-adhesive peritonitis, the peritoneum is markedly thickened and multiple thick adhesions affixing the viscera are remarkable. A variable amount of ascites can be found.

Although valuable in diagnosing AT, laparoscopy has different degrees of morbidity and mortality rates. Laparoscopic investigation of AT could fail in 1% to 16% of cases (16,22). Intestinal perforation is a major complication, which was thought to be more common in the fibro-adhesive form of AT (22). Another frequent injury mentioned in the literature is major vascular

damage (22-25). This becomes even more important when fibro-adhesive peritonitis is present. Intensive adhesions increase the possibility of damage to the visceral organs and make the trocars potentially dangerous. To avoid this, we need to know how intensive the peritoneal adhesions are and which side of the abdomen is safer for trocar placement.

Ultrasonography guided preoperative mapping of the safest area of the abdomen, or "ultrasonographic mapping", as we call it, is noninvasive, simple, readily available and an economical way to prevent complications of laparoscopy. Although ultrasonographic examination of the abdomen does not allow for a definite diagnosis, it does help as a guide for invasive procedures and offers an advantage of examining the range of abdominal involvement of the disease in a single examination. Mainly 3 different types of AT were described in the literature (26,27): 1) Wet type (characterized by ascites that may be free or loculated), 2) Fibrotic type (characterized by large omental masses and matted loops of bowel and mesentery), 3) Dry type (characterized by caseous nodules, fibrous peritoneal reaction, dense adhesions). Combinations of these forms are also found (28-30). Although nonspecific, generally all the kinds of AT described above have typical US findings. An experienced radiologist can describe those findings including loculated or generalized ascites, omental cake, bowel adhesions (bowel to bowel or bowel to abdominal wall), lymphadenopathy, bowel wall thickening, organomegaly, multiple fibrous septation and intra-abdominal masses. Using these findings, an appropriate location for trocar replacement can easily be found and marked on the abdominal wall before the operation. In our study of 19 patients, we performed DL in all of them without complications using preoperative ultrasonographic mapping, although 7 patients had fibro-adhesive peritonitis. We think that using the US findings prevented bowel perforation or solid organ damage while pneumoperitoneum was created and trocars were placed. Additionally, we were given the opportunity to start antituberculous therapy as soon as possible (postoperative first day), relying on the data obtained from direct visualization of the abdomen.

In conclusion, this study showed that US guided mapping of the abdomen during the preoperative period allows a safe and accurate diagnostic laparoscopy for AT and prevents the potential risks of DL.

References

1. Mahdavi A, Malviya VK, Herschman BR. Peritoneal tuberculosis disguised as ovarian cancer: An emerging clinical challenge. *Gynecol Oncol* 2002; 84: 167-170.
2. Lai N, Soto-Wright V. Peritoneal tuberculosis: Diagnostic options. *Infect Dis Obstet Gynecol* 1999; 7: 244-247
3. Dineen P, Homan WP, Grafe WR. Tuberculous peritonitis: 43 years' experience in diagnosis and treatment. *Ann Surg* 1976; 184: 717-722.
4. Thomas M, Walker R, Hung N. Tuberculosis: Still the great pretender. *Hosp Med* 1999; 60: 602-603.
5. Balian A, de Pinieux I, Belloula D, Barthelemy P, Montebault S, Girard T et al. Abdominal tuberculosis: Deceptive and still encountered. *Presse Med* 2000; 29: 994-996.
6. Marshall JB. Tuberculosis of the gastrointestinal tract and peritoneum. *Am J Gastroenterol* 1993; 88: 989-999.
7. Ahmad M, Ahmed A. Tuberculous peritonitis: Fatality associated with delayed diagnosis. *South Med J* 1999; 92: 406-408.
8. Mueller PR, Wittenberg J, Ferrucci JT. Fine needle aspiration biopsy of abdominal masses. *Semin Roentgenol* 1981; 16: 52-61.
9. Kapoor VK. Abdominal tuberculosis. *Postgrad Med J* 1998; 74: 459-467.
10. Jadvar H, Mindelzun RE, Olcott EW, Levitt DB. Still the great mimicker: Abdominal tuberculosis. *Am J Roentgenol* 1997; 168: 1455-1460.
11. Talwani R, Horvath JA. Tuberculous peritonitis in patients undergoing continuous ambulatory peritoneal dialysis: Case report and review. *Clin Infect Dis* 2000; 31: 70-75.
12. Fraki O, Peltokallio P. Intestinal and peritoneal tuberculosis: Report of two cases. *Dis Colon Rectum* 1975; 18: 685-693.
13. Sheer TA, Coyle WJ. Gastrointestinal tuberculosis. *Curr Gastroenterol Rep* 2003; 5: 273-278.
14. Kapoor VK, Chattopadhyay TK, Sharma LK. Radiology of abdominal tuberculosis. *Ausiralas Radiol* 1988; 32: 365-367.
15. Prakash A. Ulcero-constrictive tuberculosis of the bowel. *Int Surg* 1978; 23-29.
16. Bhargava DK, Tandon HD, Chawla TC, Shrinivas, Tandon BN, Kapur BM. Diagnosis of ileocecal and end colonic tuberculosis by colonoscopy. *Gastrointest Endosc* 1985; 31: 68-70.
17. Gulati MS, Sarma D, Paul SB. CT appearances in abdominal tuberculosis. A pictorial essay. *Clin Imaging* 1999; 23: 51-59.
18. Bhargava DK, Shrinivas P, Chopra P, Nijhawan S, Dasarathy S, Kushwaha AK. Peritoneal tuberculosis: Laparoscopic patterns and its diagnostic accuracy. *Am J Gastroenterol* 1992; 87: 109-112.
19. Sharman MP, Bhatia V. Abdominal tuberculosis. *Indian J Med Res* 2004; 120: 305-315.
20. Tandon RK, Sarin SK, Bose SL, Berry M, Tandon BN. A clinico-radiological reappraisal of intestinal tuberculosis-changing profile? *Gastroenterol Jpn* 1986; 21: 17-22.
21. Demir K, Okten A, Kaymakoglu S, Dincer D, Besisik F, Cevikbas U et al. Tuberculous peritonitis—reports of 26 cases, detailing diagnostic and therapeutic problems. *Eur J Gastroenterol Hepatol*. 2001; 13: 581-5.
22. Mimica M. Usefulness and limitations of laparoscopy in the diagnosis of tuberculous peritonitis. *Endoscopy* 1992; 24: 588-591.
23. Nordestgaard AG, Bodily KC, Osborn RW Jr, Buttorff JD. Major vascular injuries during laparoscopic procedures. *Am J Surg* 1995; 169: 543-5.
24. Chapin JW, Hurlbert BJ, Scheer K. Hemorrhage and cardiac arrest during laparoscopic tubal ligation. *Anesthesiology* 1980; 53: 342-3.
25. Moore CL, Vasquez NF, Lin H, Kaplan LJ. Major vascular injury after laparoscopic tubal ligation. *J Emerg Med*. 2005; 29: 67-71.
26. Leder RA, Low VHS. Tuberculosis of the abdomen. *Radial Clin North Am* 1995; 33: 691-705.
27. Kedar RP, Shah PP, Shivde RS, Malde HM. Sonographic findings in gastrointestinal and peritoneal tuberculosis. *Clin Radial* 1994; 49: 24-29.
28. Sheikh M, Abu-Zidan F, Al-Hilaly M, Behbhani A. Abdominal tuberculosis: comparison of sonography and computed tomography. *Clin Ultrasound*. 1995; 23: 413-417.
29. Lee DH, Lim JH, Ko YT, Yoon Y. Sonographic findings in tuberculous peritonitis of wet-ascitic type. *Clin Radiol*. 1991; 44: 306-310.
30. Akhan O, Pringot J. Imaging of abdominal tuberculosis. *Eur Radiol*. 2002; 12: 312-323.