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Comparison between laparoscopy and laboratory tests for the diagnosis of tuberculous peritonitis

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Background/aim: Our study aimed to investigate a reliable diagnostic approach for tuberculous peritonitis (TBP) by comparing the commonly used diagnostic tools.

Materials and methods: Fifty-one patients had received a series of diagnoses, including laparoscopy, erythrocyte sedimentation rate (ESR), cancer antigen 125 (CA125), tuberculin skin test, tuberculosis antibody in serum (TB-Ab), the T-SPOT.TB test, or adenosine deaminase (ADA) in ascitic fluid. The positive rate of each method was calculated and the differences of positive rates between laparoscopy and laboratory tests that had higher positive rates were analyzed by McNemar chi-square test.

Results: The most common symptoms and signs of 51 patients were fever (86.3%), abdominal mass (78.4%), abdominal distension (62.7%), abdominal pain (74.5%), and weight loss (66.7%). Furthermore, the positive rates of CA125, laparoscopy, T-SPOT.TB test, and ESR were relatively higher than those of the other three methods (tuberculin skin test, TB-Ab, and ascitic ADA). Additionally, there was no significant difference ($P > 0.05$) in the positive rates between the diagnoses of laparoscopy and those three laboratory tests.

Conclusion: CA125, laparoscopy, T-SPOT.TB test, and ESR had a stronger diagnostic power for TBP, and they are reliable alternatives for the diagnosis of TBP.

Key words: Tuberculous peritonitis, laparoscopy, cancer antigen 125, erythrocyte sedimentation rate, T-SPOT.TB

1. Introduction

Tuberculous peritonitis (TBP) is a one of the most common forms of extrapulmonary tuberculosis in the world (1,2). Cases of TBP have increased with the increasing incidence of TB worldwide (3), among which 5% of cases were pulmonary TB and 25%–60% were abdominal TB (4). According to the lack of specific clinical features and the difficulty in isolating Mycobacterium tuberculosis, the accurate diagnosis of TBP continues to be a challenge (5). Meanwhile, treatment in most of cases is late, especially in developing countries. Therefore, fast and accurate diagnosis of TBP is critical to improve the prognosis and treatment of patients with TBP.

Recently, more accurate diagnostic tools have been widely used in the diagnosis of TBP, such as cancer antigen 125 (CA125), the T-SPOT.TB test, erythrocyte sedimentation rate (ESR), the ascitic adenosine deaminase (ADA) test, the tuberculin skin test, and tuberculosis antibody in serum (TB-Ab) (6,7). Besides laboratory analysis, laparoscopy is frequently needed for the observation of pathological tissues of TBP (8).

In the present study, in order to investigate a reliable diagnostic approach for TBP, the aforementioned commonly used diagnostic tools were statistically compared. The results will provide a guideline for the quick and accurate diagnosis of TBP.

2. Materials and methods

2.1. Patient selection

Fifty-one patients who were diagnosed with TBP between April 2011 and June 2014 in Guizhou Provincial People's Hospital were evaluated. The inclusion criteria were: 1) M. tuberculosis was found in ascites; 2) caseous granuloma was found by laparoscopy; 3) ascites receded by more than 50% after anti-M. tuberculosis treatment during 1 month of follow-up. Patients with severe heart and kidney disease, cirrhotic ascites, cardiogenic ascites, renal ascites, carcinomatous ascites, abdominal tumor, transudative ascites, or connective tissue disease were excluded.

Clinical data were obtained from the hospital records and telephone interviews. The medical records of these

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patients were reviewed for demographic information, clinical features, laparoscopy results, and other auxiliary examination results, including ESR, CA125, tuberculin skin test, TB-Ab, T-SPOT.TB test, and ADA in ascitic fluid. The diagnosis of TBP was established on the basis of standards reported by Wang et al. (9). This study was approved by the ethics committee of our hospital.

2.2. Laparoscopy and other auxiliary examinations

Laparoscopy was performed for 48 patients under general anesthesia and 3 patients under local anesthesia. Two to four biopsies were taken from each patient. The visual diagnosis was made as described in a previous study (10). Determination of ESR in the included patients was conducted using an automatic ESR analyzer. Serum CA125 was determined by the method described by Shu et al. (11), the tuberculin skin test was performed by the method reported by Song et al. (12), tests of TB-Ab and ascitic ADA were done by the method described by Ma et al. (13), and the T-SPOT.TB test was applied as described by Zhang et al. (14).

2.3. Statistical analysis

Data analysis was performed using SPSS 19.0 (IBM Corp.). The difference of positive rates between different examinations was calculated by the McNemar chi-square test. A difference with $P < 0.05$ was considered significant.

3. Results

3.1. Clinical data of TBP

A total of 21 males and 30 females were included in the analysis (Table 1). The most common symptoms and signs were fever (86.3%), abdominal mass (78.4%), abdominal distension (62.7%), abdominal pain (74.5%), and weight loss (66.7%).

3.2. Laboratory tests and histopathologic examinations

All of the included patients had received laparoscopy and ESR analysis, with positive rates of 84.31% and 76.47%, respectively (Table 2).

3.3. Comparison of T-SPOT.TB test, ESR, and CA125 with laparoscopy

In total, 50 patients received diagnoses via both laparoscopy and T-SPOT.TB test. Among them, 39 were positive and 8 negative as tested by both laparoscopy and T-SPOT.TB; 2 were positive by T-SPOT.TB, but negative by laparoscopy; and one was positive by laparoscopy, but negative by T-SPOT.TB. There was no significant difference in the positivity rate between laparoscopy and T-SPOT.TB ($P = 1.000$) (Table 3).

Furthermore, among the 51 patients who received diagnoses via both laparoscopy and ESR, 38 were positive and 9 negative as tested by both laparoscopy and ESR; one was positive by ESR, but negative by laparoscopy; and 3 were positive by laparoscopy, but negative by ESR. The McNemar chi-square test showed that there was no significant difference in the positivity rate between the diagnoses of laparoscopy and ESR in patients with TBP ($P = 0.625$) (Table 4).

Additionally, among the 48 patients who received diagnoses via both laparoscopy and CA125, 34 were positive and 5 negative as tested by both laparoscopy and CA125; 7 were positive by CA125, but negative by laparoscopy; and 2 were positive by laparoscopy, but negative by CA125. The McNemar chi-square test showed that there was no significant difference in the positivity rate between the diagnoses of laparoscopy and CA125 in patients with TBP ($P = 0.180$) (Table 5).

4. Discussion

In the present retrospective study, we reviewed the medical records of 51 patients who were diagnosed with TBP. According to the results of multiple diagnostic methods in these cases, the positive rates of CA125, laparoscopy, T-SPOT.TB test, and ESR were relatively higher than those of the other three methods. The McNemar chi-square test showed that there was no significant difference ($P > 0.05$) in the positivity rate between the diagnoses of laparoscopy and three laboratory tests (CA125, T-SPOT.TB test, and ESR).

The most common symptoms are fever, abdominal pain, abdominal distension, and weight loss in TBP (7,8,15). In this study, fever was found in 86.3% of patients, abdominal pain in 74.5%, abdominal distension in 62.7%, and weight loss in 66.7%, which was consistent with previous studies.

Furthermore, the positive rate of CA125 in the TBP cases was the highest compared to the other diagnostic methods in this study. CA125 is a kind of macromolecular glycoprotein (16). Previous studies reported that serum

Table 1. Details of the included 51 cases.

No. of patients	No. of males/ females	Mean age of males (years)	Mean age of females (years)	Mean duration (months)	No. of cases accompanied by phthisis	No. of cases accompanied by enterophthisis	No. of cases accompanied by tuberculous pleuritis	No. of cases accompanied by pelvic tuberculosis	No. of cases accompanied by pelvic inflammation
51	21/30	38.33	32.37	1.5	20 (39.22%)	1 (1.96%)	11 (10.19%)	2 (3.92%)	1 (1.96%)

Table 2. Inspection results of important items for the 51 patients.

Test	No. of checked cases	No. of positive cases	Positive rate (%)
T-SPOT.TB	50	41	82.00
TB-Ab	49	7	14.29
Erythrocyte sedimentation rate	51	39	76.47
Tuberculin skin test	50	23	46.00
ADA in ascitic fluid	48	27	56.25
CA125	48	41	85.42
Laparoscopy	51	43	84.31

TB-Ab, Tuberculosis antibody in serum; ADA, adenosine deaminase; CA125, cancer antigen 125.

Table 3. Comparison of T-SPOT and laparoscopy results.

T-SPOT	Laparoscopy		Total	P-value
	No. of positive cases	No. of negative cases		
+	39	2	41	1.000
-	1	8	9	
Total	40	10	50	

Table 4. Comparison of erythrocyte sedimentation rate and laparoscopy results.

Erythrocyte	Laparoscopy		Total	P-value
sedimentation rate	No. of positive cases	No. of negative cases		
+	38	1	39	0.625
-	3	9	12	
Total	41	10	51	

Table 5. Comparison of CA125 and laparoscopy results.

CA125	Laparoscopy		Total	P
	No. of positive cases	No. of negative cases		
+	34	7	41	0.180
-	2	5	7	
Total	36	12	48	

CA125, Cancer antigen 125.

CA125 levels are detected to be elevated in all patients with TBP compared to healthy controls (6,17). CA125 was found to have 83.33% sensitivity in the diagnosis of clinically suspected TBP (18). In our study, CA125 was positive in 85.42% of patients, which is consistent with other studies. Therefore, serum CA125 can be used as a diagnostic indicator for TBP.

In the diagnosis of TBP, the T-SPOT.TB test is also commonly used along with other diagnostic methods, and it shows significantly higher positivity rates in patients

with TBP than patients without TBP (19,20), which is consistent with the results of this study. ESR determination is a commonly performed blood test that measures erythrocyte settling rate in anticoagulated blood under standard conditions. Elevated ESR is detected in most patients with TBP and contributes well to the diagnosis of TBP (7,21), which is also consistent with the results of this study. As a result, the T-SPOT.TB test and ESR determination can also be applied for the diagnosis of TBP.

Laparoscopy is thought to be the most effective diagnostic method for TBP, allowing doctors to look straight into the abdominal cavity lesions and take biopsy specimens for a quick and accurate diagnosis (20). Despite the higher positivity rates of CA125, T-SPOT.TB, and ESR tests, as well as laparoscopy, the statistical data showed no significant difference in the positivity rates between the three tests and laparoscopy, suggesting that the three laboratory tests are beneficial for the accurate diagnosis of TBP as auxiliary methods of laparoscopy.

Ascitic ADA is usually used as an auxiliary method in the diagnosis of TBP (18). However, in this study, the positive rate of ascitic ADA is only 56.25%, indicating a relatively weaker diagnostic power for TBP, which is still needed to be validated by larger size of cases.

In conclusion, CA125, laparoscopy, the T-SPOT.TB test, and ESR showed a stronger diagnostic power for TBP, and they are reliable alternatives for the diagnosis of TBP. Additionally, clinical findings such as the symptoms of patients are helpful to diagnose TBP. Thus, a combination of various noninvasive tests should be considered prior to laparoscopy.

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