

# Role of Laparoscopy in Diagnosis of Abdominal Tuberculosis

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## ABSTRACT

**Introduction:** To study the efficacy of visual impression of the peritoneal cavity by laparoscopy in the diagnosis of abdominal tuberculosis (TB).

**Materials and methods:** Fifty patients with suspected abdominal Kochs underwent diagnostic laparoscopy, and the visual impression was compared with other tests like acid-fast bacillus (AFB) stain, AFB culture, histopathology, TB PCR and Gene Xpert.

**Observations:** Out of 50 patients, 42 (84%) had positive visual findings on laparoscopy characterized by enlarged lymphadenopathy, ascites, peritoneal tubercles, and interbowel adhesions. Thirty-eight (76%) patients had positive histopathological findings and TB PCR, while thirty-nine (78%) patients had positive Gene Xpert. So, laparoscopic visualization of abdominal cavity is 100% sensitive for the diagnosis of abdominal tuberculosis.

**Conclusion:** Laparoscopy is a safe and rapid method for the diagnosis of abdominal TB.

**Keywords:** Abdominal tuberculosis, Laparoscopy, Visual impression.

*World Journal of Laparoscopic Surgery* (2021): 10.5005/jp-journals-10033-1459

## INTRODUCTION

Tuberculosis (TB) has an incidence of 211 cases per 100,000 population and adds about 2.8 million cases to the total pool every year.<sup>1</sup> Abdominal TB is a major contributor to extrapulmonary TB both incidence wise and mortality wise. It accounts for 11–16% of cases of TB.<sup>2–4</sup> It presents a clinical dilemma due to its myriad ways of presentation. A battery of investigations like erythrocyte sedimentation rate (ESR), ultrasonography (USG), computed tomography, Ziehl-Neelsen staining, acid-fast bacillus (AFB) culture, and biopsy has been used conventionally to diagnose abdominal TB. However, none of these are considered the gold standard for the diagnosis of abdominal TB.<sup>5</sup> Recent advances in molecular and immunological studies like TB PCR and Gene Xpert assay have improved the rates of detection, but they are expensive and time-consuming. Previously, the diagnosis and treatment of abdominal Kochs were based on either blind biopsy or visual findings on laparotomy.<sup>6</sup> Recently, greater experience and availability of laparoscopy has made it possible to have a direct visual impression of the abdominal cavity with the added benefit of biopsy. Various studies have proven laparoscopy to be a rapid, safe, and most specific procedure for the diagnosis of abdominal Kochs.<sup>2,3,7–9</sup> Ours is an attempt to establish the role of laparoscopy for the diagnosis of abdominal Kochs. We have compared the visual findings by laparoscopy with other tests like AFB stain, AFB culture, TB PCR, Gene Xpert, and histopathology to prove the efficacy of diagnostic laparoscopy.

## AIMS AND OBJECTIVES

To study the efficacy of visual impression of peritoneal cavity by laparoscopy in the diagnosis of abdominal tuberculosis.

## MATERIALS AND METHODS

Our study included 50 patients who presented with features suggestive of abdominal TB.

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**How to cite this article:** Pathan S, Kakade SV, Ambre S. Role of Laparoscopy in Diagnosis of Abdominal Tuberculosis. *World J Lap Surg* 2021;14(3):145–148.

**Source of support:** Nil

**Conflict of interest:** None

## Inclusion Criteria

- Patients between the age-group of 18–60 years.
- Symptoms of abdominal TB—abdominal pain, weight loss, night sweats, low-grade fever, or evening rise of temperature.
- Elevated ESR.
- Mantoux test positivity.
- Abdominal USG showing mesenteric lymphadenopathy—more than or equal to 1 cm; Small bowel mesenteric thickening—1.5 cm or more.

## PROCEDURE

All patients underwent diagnostic laparoscopy under general anesthesia. Ports are placed as shown in [Figure 1](#). A 10 mm, 30° laparoscope was inserted through the infraumbilical port using Hasson's technique. The peritoneal cavity was systematically examined as follows: Parietal peritoneum, small bowel loops with mesentery, appendix, large bowel, subdiaphragmatic area, liver, stomach, pelvis, and the rest of the cavity. Peritoneal-free fluid was collected. The mesentery was traced from ileocecal region proximally to look for enlarged mesenteric lymph nodes and

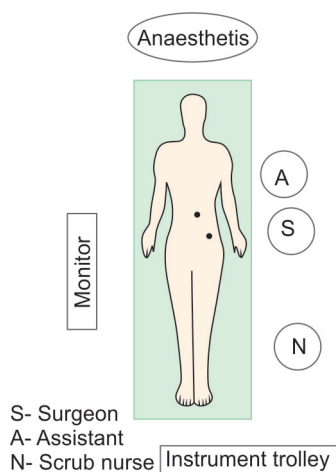


Fig. 1: Operating room setup

bowel wall tubercles. Biopsy of abdominal tubercles and enlarged mesenteric lymph nodes was taken and sent for histopathology, AFB culture, TB PCR, Gene Xpert. Peritoneal fluid was sent for the analysis, microscopy, AFB staining, and AFB culture. Postoperatively, most of the patients were started orally after 24 hours.

## OBSERVATIONS AND RESULTS

The mean age of the patients was 35.08 years, in the range of 18–60 years. Out of 50, there were 33 male and 17 female patients. All 50 patients underwent diagnostic laparoscopy. The visual findings on laparoscopy were recorded. Positive findings on visual impression were as follows: free fluid in the abdomen, peritoneal tubercles, enlarged mesenteric lymph nodes, and intraabdominal adhesions (Fig. 2). We compared visual impression on laparoscopy with other investigative parameters done on samples collected intraoperatively from AFB staining, AFB culture, histopathology, TB PCR, and Gene Xpert. AFB staining showed a positive result in 20 (40%) cases. Peritoneal fluid AFB culture showed a positive result in 28 (56%) cases. Histopathological examination was positive in 38 (76%) cases. TB PCR was positive in 38 (76%) cases. Gene Xpert was positive in 39 (78%) cases. Gene Xpert is the most sensitive test for the diagnosis of TB and was considered standard for starting antitubercular treatment in our study.

Out of 50 patients, 38 patients had tuberculous lymphadenitis as a histopathological diagnosis. Reactive lymphadenitis as a histological diagnosis was found in the remaining 12 patients. Among the group of reactive lymphadenitis, one patient had positive Gene Xpert as well as positive visual findings, so this patient was started on AKT.

On laparoscopy, 42 (84%) patients were found to have positive findings suggestive of TB. Those patients who had positive Gene Xpert, TB PCR, and histopathology had positive visual findings. All 39 patients who had positive Gene Xpert were started on antitubercular treatment (Table 1). It suggests that visual impression coincides with positive Gene Xpert, TB PCR, and histopathology. Only three patients had positive visual findings on laparoscopy and had negative Gene Xpert. This shows that laparoscopy has 100% sensitivity for the diagnosis of TB when compared with other tests (Tables 2 and 3).

$$1. \text{ Sensitivity} = \frac{TP}{TP + FN} = \frac{39}{39} = 100\%$$

$$2. \text{ Specificity} = \frac{TN}{TN + FP} = \frac{8}{11} = 72.7\%$$

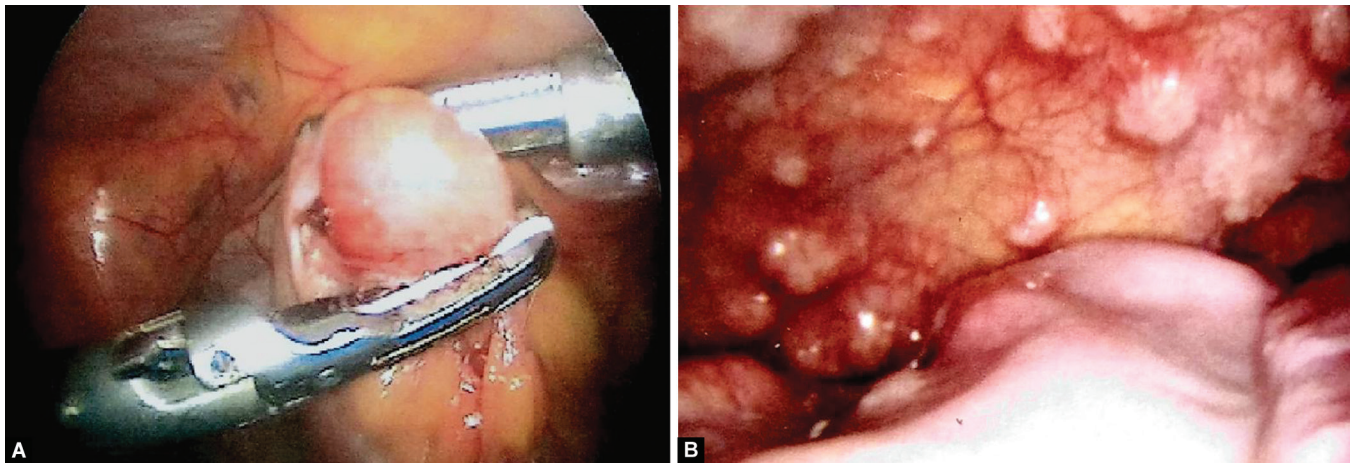
$$3. \text{ Positive predictive value} = \frac{TP}{TP + FP} = \frac{39}{42} = 92.8\%$$

$$4. \text{ Negative predictive value} = \frac{TN}{TN + FN} = \frac{8}{8} = 100\%$$

## DISCUSSION

TB is one of the commonest diseases of mankind for decades, and the incidence is rising due to the increased incidence of the human immunodeficiency virus and other immunocompromised conditions.<sup>2–4,10,11</sup> It continues to be an important medical, social, and economic problem in many developing countries where public health and sanitation are minimal.<sup>12</sup> The disease has a high incidence and is fairly curable provided it is diagnosed early and treated adequately. However, failure to do so causes increased severity of disease and the development of multidrug resistance. This is why a prompt and accurate diagnosis of this disease is very important.

Abdominal TB is the most common extrapulmonary manifestation of TB accounting from 11–16% of cases.<sup>2–4,13,14</sup> It can develop at any age but is more common in patients of 25–45 years.<sup>4,12</sup> The peritoneum and intestine are the most frequently involved sites of abdominal Kochs and present with nonspecific symptoms like fever, ascites, and abdominal pain, mimicking other chronic abdominal conditions.<sup>2,3,7–11,13</sup> The clinical features of abdominal TB are vague. Whereas the diagnosis of pulmonary TB can be done fairly easily with a noninvasive procedure on an outpatient basis, the diagnosis of abdominal TB poses a greater challenge. Delay in diagnosis and treatment can be a significant cause of morbidity and mortality. Due to its unusual presentation, a high index of suspicion is needed for diagnosis.<sup>7–9,14</sup> Among all the tests done, not a single test is conclusive for starting AKT. The routinely done laboratory tests and radiological tests are inconclusive.<sup>3</sup> The value of Mantoux test remains uncertain. Raised ESR is found in many patients, but it is not conclusive. Examination of ascitic fluid is helpful but needs a collection of around 1 L of ascitic fluid followed by centrifugation. The yield of organisms on staining and culture is very low. Moreover, culture requires 6–8 weeks for the mycobacterium colony to appear, causing a delay in diagnosis and treatment. TB PCR test for M.TB in biopsy and culture may be diagnostic, but it requires obtaining a tissue sample, for which laparotomy had to be done.<sup>10</sup> The most confirmatory option for diagnosis was a biopsy or direct viewing of the peritoneal cavity by laparotomy, and AKT was started accordingly. Earlier, the percutaneous peritoneal biopsy was another procedure used to diagnose TB but had a low sensitivity due to its blind nature and also risk of bowel perforation, visceral injury, etc.<sup>13</sup> Thus, many patients underwent laparotomy, and the diagnosis was made by visual findings on laparotomy or biopsy taken during laparotomy. But, it caused many complications increasing the morbidity and mortality of the patients.



**Figs 2A and B:** Intraoperative findings. (A) Mesenteric lymph node biopsy; (B) Parietal wall tubercles

**Table 1:** Comparison of various methods for the diagnosis of TB with a visual impression

Study group	Visual findings		AFB		Gene	
	S/o TB	AFB staining	culture	Histopathology	TB PCR	Xpert
50	42	20	28	38	38	39
Percentage	84	40	56	76	76	78

**Table 2:** Sensitivity and specificity test

Visual impression	Disease	No disease	Total
Positive	True-positive (39)	False-positive (3)	42
Negative	False-negative (0)	True-negative (8)	8
	39	11	50

**Table 3:** Comparison of all tests with laparoscopy

	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)
AFB staining	51.28	100	100	36.66
AFB culture	59.57	100	100	36.66
Histopathology	97.4	100	100	91.66
TB PCR	97.4	100	100	91.60
Gene Xpert	100	100	100	100
Laparoscopy	100	72	92.85	100

In the last few years, laparoscopy has emerged as a safe and rapid investigation for the direct visualization of the peritoneal cavity in cases of suspected abdominal Kochs. Laparoscopy under general anesthesia permits the observation of the entire peritoneal space and provides tissue samples in targeted areas for histopathology.<sup>3</sup> Few complications during laparoscopy are reported without any mortality. Thus, laparoscopy can be safely performed in all patients suspected to have abdominal TB for rapid diagnosis rather than relying on conventional methods that may take up to 4–6 weeks.

In our study, we have made an attempt to find the efficacy of diagnostic laparoscopy in abdominal TB. We have compared visual impression during laparoscopy with different tests like AFB stain, AFB culture, histopathology, TB PCR, and Gene Xpert.

AFB staining is positive in 40% of subjects. The sensitivity and specificity were 51.28 and 100%, respectively. The positive predictive value was 100%, and the negative predictive value was 91.66%.

AFB culture is positive in 56% of subjects. The sensitivity and specificity were 59.57 and 100%, respectively. The positive predictive value was 100%, and the negative predictive value was 36.66%.

Histopathology is a very specific method for the diagnosis of abdominal TB. In our study, (38/50) 78% of the patients who were diagnosed to have TB had histopathology findings suggestive of TB. The association was statistically significant ( $p < 0.05$ ). The sensitivity of the test was 97.4%, and the specificity was 100%. The positive predictive value was 100%, and the negative predictive value was 91.66%.

TB PCR is a highly sensitive method. In our study, it was positive in (38/50) 76% of patients who were diagnosed to have TB in laparoscopy. The association was statistically significant ( $p < 0.05$ ). The sensitivity of the test was 97.4%, and the specificity was 100%. The positive predictive value was 100%, and the negative predictive value was 91.66%.

Gene Xpert is a newer technique that is based on the same principle as PCR. In our study, it was found to be present in (39/50) 78% of the cases diagnosed after laparoscopy. Hence, it is a highly sensitive method for diagnosing abdominal TB. The association was statistically significant ( $p < 0.05$ ). Gene Xpert was found to be the most sensitive test in diagnosing abdominal TB. The sensitivity and specificity of the test were 100%.

Diagnostic laparoscopy is a minimally invasive procedure that enables us to directly visualize the peritoneal cavity and is completely safe in expert hands.<sup>13</sup> In our study, direct visualization of abdominal TB yielded positive results in (42/50) 84% of cases. The sensitivity of the test was 100% and specificity 72%. The positive predictive value is 92.8%, and the negative predictive value is 100%. Table 2 shows the comparison between all the tests with laparoscopy. On calculation, the diagnostic accuracy of laparoscopy was found to be 0.94 in our study, which is excellent accuracy.

Laparoscopic findings are suggestive of TB, that is, intraabdominal adhesions, peritoneal tubercles, mesenteric lymph nodes, and ascitic fluid correlated with tissue diagnosis of abdominal TB in maximum cases. According to visual impression, 6% of patients were overdiagnosed as positive predictive value of 92% and negative predictive value of 100%, which indicate that visual impression is negative; then, there is a 100% chance for the patients to have no disease. We have considered Gene Xpert as the standard to start AKT. All patients diagnosed with the visual examination are supported by biopsy and Gene Xpert. Otherwise, all 50 patients had to be started on AKT on empirical basis based on the clinical symptoms and radiological findings. The use of diagnostic laparoscopy obviates the need for starting on AKT in additional eight patients.

Our findings also support previous work on the value of laparoscopy as the most sensitive diagnostic test for abdominal TB with its advantage of histological confirmation.<sup>7,8,15,16</sup> It decreases the cost of added investigations and improves prognostic outcomes and can be treated as a gold standard.<sup>8</sup> It helps in the early diagnosis and treatment of patients with abdominal TB. It is also less invasive and obviates the need for laparotomy.<sup>9,15,16</sup>

## CONCLUSION

Laparoscopy can diagnose abdominal TB in a minimally invasive manner by providing direct visualization of the abdominal cavity.

Laparoscopy with tissue biopsy and cultures provides the most reliable, rapid, and correct diagnosis of abdominal TB preventing the need for more expensive procedures. In conclusion, for the diagnosis of abdominal TB, laparoscopy can be used as a primary investigation rather than the last resort, and the threshold for diagnostic laparoscopy should not be too high.

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