

## Diagnostic Accuracy of Laparoscopy in Abdominal Tuberculosis

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### ABSTRACT

**Background:** Abdominal tuberculosis is a most common type of extra-pulmonary tuberculosis. Ileocecal area is the most commonly involved site due to the abundance of lymphoid tissue (Peyer's patches). Abdominal tuberculosis can mimic a variety of other abdominal conditions and only a high degree of suspicion can help in the diagnosis otherwise it is likely to be missed or delayed resulting in high morbidity and mortality. **Objective:** The objective of study was to determine the diagnostic accuracy of laparoscopy for the diagnosis of abdominal tuberculosis taking histopathology as gold standard. **Study Design:** Cross-sectional Study. **Settings:** Department of General Surgery, Nishtar Hospital, Multan Pakistan. **Duration:** 1<sup>st</sup> April 2021 to 30<sup>th</sup> September 2021. **Methods:** A total of 230 patients of either gender presenting with clinically suspected abdominal tuberculosis were included. Patients having history of decompensated cardiopulmonary failure, acute MI, bacterial peritonitis, coagulopathy and huge ventral hernia were excluded. General anesthesia was given to all patients undergoing laparoscopy. To introduce first trocar in the sub umbilical area which was of 10mm, open method was used so that injury to the gut can be avoided as there are chances of gut adhesions to the anterior abdominal wall in case of abdominal tuberculosis. Second trocar was introduced in the mid clavicular line in the right sub costal region under direct vision. Second trocar was of 5mm size. 3 or 4 peritoneal biopsies, omental biopsies, tubercles, lymph nodes were taken by biopsy forceps from multiple areas, biopsies were properly labeled and sent to pathology department for histopathology. Non absorbable sutures were used for closure of trocar sites. The diagnosis on diagnostic laparoscopy were made and data collected. **Results:** Ranges of the ages in this study were from 25 to 40 years with mean age of 33.521±3.55 years, while mean BMI was 26.756±1.80 Kg/m<sup>2</sup> and mean duration of symptoms was 6.960±1.55 months. Majority of patients were males i.e.,66.1%. Laparoscopy had diagnosed 22.6% and gold standard histopathology has diagnosed 21.3% patients with abdominal tuberculosis. Laparoscopy had shown sensitivity of 87.8%, specificity 95%, diagnostic accuracy by 93%, PPV 82.6% and NPV by 96.6% in diagnosis of abdominal tuberculosis. **Conclusion:** Diagnostic laparoscopy should be used for the prompt diagnosis and timely management of the abdominal tuberculosis as visual appearance of the abdominal tuberculosis is highly suggestive of the disease. This visual appearance must always be supported by the histopathological examination if the biopsies. If we only consider histological examination in diagnosis of abdominal tuberculosis it frequently delays the treatment.

**Keywords:** Abdominal tuberculosis, Laparoscopy, Histopathology.

### INTRODUCTION

There are multiple sites of extra pulmonary tuberculosis out of those abdominal tuberculosis is a most common type. Abdominal tuberculosis consists of tuberculosis of gastrointestinal tract, omentum, peritoneum, mesentery and lymph nodes with in it and other abdominal organs such as liver, spleen and pancreas.<sup>1</sup> Abdominal pain is the most common

presenting complain of the patient with abdominal tuberculosis, almost 67% of the patients with diagnosis of abdominal tuberculosis presents with this.<sup>1</sup> Ileocecal junction is the most common site of infection in case of abdominal tuberculosis and is seen in 36.1% of the patients.<sup>2</sup> The second most common site is peritoneum. Highest prevalence of abdominal tuberculosis is seen in population of India and Pakistan. Disease prevalence is

approximately 27.8% in Indian population and 19.4% in population of Pakistan.<sup>2</sup> In local study it was found that younger population and poor socioeconomic status are the two factors associated with the prevalence of disease in a population.<sup>3</sup>

In resource limited countries like Pakistan, it is very challenging for a general surgeon to diagnose and to treat a patient with abdominal tuberculosis.<sup>4</sup> It is often very time consuming to confirm the diagnosis of abdominal tuberculosis histologically and frequently leads in delaying of treatment and wastage of precious time for initiation of medical management. Abdominal tuberculosis have non-specific and vague clinical features. Hematological, biochemical investigations and contrast studies are usually not helpful in diagnosis.<sup>5</sup> While doing diagnostic laparoscopy visual appearance of abdominal tuberculosis significantly suggests the disease process but it must always be supported by histopathology of the biopsies taken during on diagnostic laparoscopy.<sup>5</sup> Early Laparoscopy helps in establishing the diagnosis of Abdominal tuberculosis in suspected cases. This early laparoscopy can avoid costly and time-consuming investigations and allow early and specific treatment.<sup>5,6</sup>

A recent study in 2014 reported that sensitivity and specificity of diagnostic Laparoscopy was 31% and 86% respectively.<sup>7</sup> Another study in 2011 reported that 133 patients were included in a study that were having abdominal pain and were undiagnosed, out of 133 patients, 109 patients were diagnosed as a case of abdominal tuberculosis on diagnostic laparoscopy.<sup>8</sup>

Present study is aimed to determine the role of diagnostic laparoscopy for diagnosis of abdominal tuberculosis. Although a lot work has been done internationally but data on local population is inadequate and there is a huge variability in recent publications for diagnosis of abdominal tuberculosis on diagnostic Laparoscopy i.e., 60.5%<sup>7</sup>- 82%.<sup>8</sup>

This study is imperative to determine the role of diagnostic Laparoscopy because it is very difficult to diagnose a patient as case of abdominal tuberculosis on the basis of clinical features as they are non-specific. Morbidity of the patient is directly related to the delaying in the initiation of treatment. After this study we will be clear and if we find higher percentage of diagnosis then in future, we will prefer diagnostic Laparoscopy for better prognosis after early treatment.

## METHODS

This was a cross sectional study conducted at department of General Surgery, Nishtar Hospital, Multan Pakistan. This study was carried out from 1<sup>st</sup> April 2021 to 30<sup>th</sup> September 2021.

By using non-probability consecutive sampling technique taking the sensitivity and specificity of Laparoscopy 31%<sup>7</sup> (d=11.5%) and 86%<sup>7</sup> (d=10%) respectively, prevalence of abdominal TB 19.4%,<sup>2</sup> precision 11.5% for sensitivity and 10% for specificity than 230 sample size at 95% confidence level.

All patients of either gender having age 25-40 years with clinically suspected abdominal tuberculosis with sign and symptoms of weight loss more than 5 kg since last 6 months, history of constipation for last 1 month and fever > 100F for the last 3 months on clinical record were included in the study.

Severe/decompensated cardiopulmonary failure (will be assessed on ECHO), acute myocardial infarction [will be assessed on ECG], history of bacterial peritonitis, history of severe coagulopathy and history of large ventral hernia patients were excluded from the study.

After approval from ethical review committee of Nishtar Medical University & Hospital Multan, 230 patients meeting inclusion criteria were taken in this study through OPD of general surgery department of Nishtar hospital Multan. After taking an informed consent their basic demographic information like age and gender along with their contact details were taken. All patients were told about the diagnostic procedure then Laparoscopy was done under general anesthesia in all patients. The first trocar (10mm) was introduced by open method in all patient in the sub umbilical region to avoid bowel injures due to adhesions. A second 5 mm trocar introduced under direct vision in the right sub costal region in the mid clavicular line. 3 or 4 peritoneal biopsies, omental biopsies, tubercles, lymph nodes taken by sharp biopsy forceps from different sites of the and sent for histology examination. Trocars sites were closed with non-absorbable sutures. All the procedures were done by consultant surgeon having 3 years of post-fellowship experience. The diagnosis of abdominal tuberculosis on diagnostic laparoscopy were made as per operational definition. All data was collected by researcher himself and recorded in a pre-designed proforma.

Data was entered and analyzed through IBM-SPSS version 20. Mean  $\pm$  standard deviation was calculated for all quantitative variables like age, BMI and duration of symptoms. For qualitative data like gender, diagnosis of tuberculosis on laparoscopy and histopathology frequency (%) was calculated. Sensitivity, specificity, Positive predicted value (PPV), Negative predictive value (NPV) and diagnostic accuracy (DA) for laparoscopy against histopathology was calculated by using 2X2 model. Effect modifiers like age, gender, BMI and duration of symptoms was controlled by stratification. Post stratification sensitivity, specificity, Positive

predicted value, Negative predictive value and diagnostic accuracy was calculated.

**RESULTS**

Ranges of the ages in this study were from 25 to 40 years with mean age of 33.521±3.55 years, while mean BMI was 26.756±1.80 Kg/m<sup>2</sup> and mean duration of symptoms was 6.960±1.55 months. Majority of patients were males i.e.,66.1%. Laparoscopy had diagnosed 22.6% and gold standard histopathology has diagnosed 21.3% patients with abdominal tuberculosis. Laparoscopy had shown sensitivity of 87.8%, specificity 95%, diagnostic accuracy by 93%, PPV 82.6% and NPV by 96.6% in diagnosis of abdominal tuberculosis.

**Table 1: Mean ± SD of patient’s age, BMI and duration of symptoms. (n=230)**

Demographics		Mean ± SD
1	Age(years)	33.521±3.55
2	BMI (Kg/m <sup>2</sup> )	26.756±1.80
3	Duration of Symptoms (months)	6.960±1.55

**Table 2: Percentage of patients according to gender**

Gender	No. of Patients	Percentage
Male	152	66.1%
Female	78	33.9%
Total	230	100%

**Table 3: Overall Results of Laparoscopy and Histopathology**

Abdominal Tuberculosis	Laparoscopy	Histopathology
Positive	52(22.6%)	49(21.3%)
Negative	178(77.4%)	181(78.7%)
Total	230 (100%)	230 (100%)

**Table 4: Comparison of Laparoscopy versus Histopathology**

Laparoscopy	Histopathology (Gold Standard)		Total
	Positive	Negative	
Positive	43 (TP)	9 (FP)	52
Negative	6 (FN)	172 (TN)	178
Total	49	181	230

TP=True positive, FP=False positive, FN=False negative, TN=True negative, Chi square=151.28P-value=0.000

**Table 5: Sensitivity, Specificity and Diagnostic Accuracy of Laparoscopy**

<b>Sensitivity</b>	$\frac{\text{True (+)}}{\text{True (+) + False (-)}} \times 100 =$ $\frac{168}{168 + 30} \times 100 = 87.8\%$
<b>Specificity</b>	$\frac{\text{True (-)}}{\text{True (-) + False (+)}} \times 100 =$ $\frac{16}{16 + 11} \times 100 = 95\%$
<b>Diagnostic Accuracy</b>	$\frac{\text{True (+) + True (-)}}{\text{True (+) + True (-) + False (+) + False (-)}} \times 100 =$ $\frac{168 + 16}{168 + 16 + 11 + 30} \times 100 = 93\%$
<b>PPV</b>	$\frac{\text{True (+)}}{\text{True (+) + False (+)}} = 82.6\%$
<b>NPV</b>	$\frac{\text{True (-)}}{\text{False (-) + True (-)}} = 96.6\%$

**Table 6: Stratification with respect to age groups (25-33 years) of laparoscopy versus histopathology (n=94)**

Laparoscopy	Histopathology		Total	P value
	Positive	Negative		
Positive	20 (TP)	19 (FP)	39	0.857
Negative	74 (FN)	75 (TN)	149	
Total	94	94	188	

Specificity: 79.8%, PPV=51.2%, DA=51%, Sensitivity: 21.3%, NPV=50.3%

**Table 7: Stratification with respect to age groups (34-40 years) of laparoscopy versus histopathology (n=136)**

Laparoscopy	Histopathology		Total	P value
	Positive	Negative		
Positive	32 (TP)	30 (FP)	62	0.772
Negative	104 (FN)	106 (TN)	210	
Total	136	136	272	

Specificity: 77.9%, NPV=50.4%, DA=51%, Sensitivity: 23.5%, PPV=51.6%

**Table 8: Stratification with respect to gender (male) of laparoscopy versus histopathology(n=152)**

Laparoscopy	Histopathology		Total	P value
	Positive	Negative		
Positive	36 (TP)	34 (FP)	70	0.785
Negative	116 (FN)	118 (TN)	234	
Total	152	152	304	

Specificity: 77.6%, NPV=50.4%, DA=51%, Sensitivity: 23.7%, PPV=51.4%

**Table 9: Stratification with respect to gender (female) of laparoscopy versus histopathology(n=78)**

Laparoscopy	Histopathology		Total	P value
	Positive	Negative		
Positive	16 (TP)	15 (FP)	31	0.841
Negative	62 (FN)	63 (TN)	125	
Total	78	78	156	

Specificity: 80.8%, NPV=50.4%, DA=51%, Sensitivity: 20.5%, PPV=51.6%

**Table 10: Stratification with respect to BMI ( $\leq 25$  Kg/m<sup>2</sup>) of laparoscopy versus histopathology(n=60)**

Laparoscopy	Histopathology		Total	P value
	Positive	Negative		
Positive	11 (TP)	8 (FP)	19	0.453
Negative	49 (FN)	52 (TN)	101	
Total	60	60	120	

Specificity: 86.7%, NPV=51.4%, DA=53%, Sensitivity: 18.3%, PPV=57.8%

**Table 11: Stratification with respect to BMI (>25 Kg/m<sup>2</sup>) of laparoscopy versus histopathology(n=170)**

Laparoscopy	Histopathology		Total	P value
	Positive	Negative		
Positive	41 (TP)	41 (FP)	82	1.000
Negative	129 (FN)	129 (TN)	258	
Total	170	170	340	

Specificity: 75.9%, NPV=50%, DA=53%, Sensitivity: 24.1%, PPV=50%

**Table 12: Stratification with respect to duration of symptoms (3-6 months) of laparoscopy versus histopathology (n=87)**

Laparoscopy	Histopathology		Total	P value
	Positive	Negative		
Positive	23 (TP)	24 (FP)	47	0.864
Negative	64 (FN)	63 (TN)	127	
Total	87	87	174	

Specificity: 72.4%, NPV=49.6%, DA=49%, Sensitivity: 26.4%, PPV=48.9%

**Table 13: Stratification with respect to duration of symptoms (>6 months) of laparoscopy versus histopathology(n=143)**

Laparoscopy	Histopathology		Total	P value
	Positive	Negative		
Positive	29 (TP)	25 (FP)	54	0.545
Negative	114 (FN)	118 (TN)	232	
Total	143	143	286	

Specificity: 82.5%, NPV=50.8%, DA=51%, Sensitivity: 20.3%, PPV=53.7%

## DISCUSSION

In my study laparoscopy had shown specificity 95%, sensitivity of 87.8%, diagnostic accuracy by 93%, Positive Predicted Value 82.6% and Negative Predicted Value by 96.6% in diagnosis of abdominal tuberculosis in patients having chronic abdominal pain. Contrary to many developed countries where common cause of chronic abdominal pain is cancer, in many developing countries like Pakistan and India abdominal tuberculosis is a more common cause of chronic abdominal pain than cancer. In our study 21.3 % of the patients with chronic abdominal pain were having abdominal tuberculosis. Many other local and international authors have reported in their studies that one of the common cause of chronic abdominal pain is abdominal tuberculosis.<sup>8,9,10</sup>

Abdominal tuberculosis mostly presents as history of low-grade fever, generalized abdominal pain, weight loss and distention of abdomen. But these clinical signs and symptoms are usually not enough to diagnose the patient as a case of abdominal tuberculosis.

Abdominal Tuberculosis (TB) can involve the peritoneum, gastrointestinal tract, omentum, mesentery and the pancreato-biliary system. It can frequently mimic other diseases.<sup>11</sup>

Site commonly involved in abdominal tuberculosis is the ileocecal region, likely because of abundant lymphoid tissue, stasis of succus entericus and increased rate of fluid and electrolyte imbalance.<sup>12</sup>

There are 3 types of peritoneal tuberculosis.<sup>13</sup> A wet type having ascites or loculated fluids, an encysted type having mesenteric thickening and lymphadenopathy and fibrotic type with mass formation of omental and mesenteric thickening.

Reactivation of latent tuberculosis foci is the cause of tuberculous peritonitis in most of the cases. This latent foci is disseminated from primary disease in the lungs via hematogenous route and it remains latent.<sup>14</sup>

Hematological, biochemical investigations and contrast studies are usually not helpful.<sup>15</sup> Role of mantoux test is diagnosis of active abdominal TB is not clear. To diagnose between abdominal TB and inflammatory bowel diseases is very difficult with the help of clinical and radiological basis.

Systemic symptoms may recover early i.e., within 4 to 6 weeks of ATT but GIT related symptoms may take longer time.<sup>16</sup> ATT therapy for trial basis for the period of 4 to 6 weeks can alter histological picture of the disease and make it difficult to diagnose between tuberculosis and Crohn's disease.<sup>17</sup>

Appropriate method to diagnose abdominal tuberculosis and rule out other diseases is histological confirmation but the method to take biopsy for this purpose is difficult and debatable.<sup>36,37,38</sup> As there are limited noninvasive procedures but to take appropriate biopsy with that is very difficult. Peritoneal biopsy can be taken via blind procedure, laparoscopic and small incision in RIF under local anesthesia but it is very risky expect in patients with ascites.<sup>18,19</sup>

According to most of the researchers' and authors, most specific test for diagnosis of abdominal tuberculosis is laparoscopy with histopathology.<sup>20,21,22</sup> Unfortunately there is a trend to use this investigation as last option.<sup>22,23</sup> Bhargava *et al*<sup>23</sup> included 87 patients in his study that were having high protein ascetic fluid, out of which 38 were diagnosed as having abdominal tuberculosis.

Visual appearance was more helpful than histology and culture. There are few signs that are seen during laparoscopy that shows abdominal tuberculosis.<sup>29,30,31</sup> These include small whitish tubercles and inflammatory adhesions on viscera and parietal peritoneum, "stalactic" which is defined as hyperemic thickening and retraction of the greater omentum and a long fibrous band extending from the parietal to the visceral peritoneum.<sup>24,25,32,33</sup>

Rai and Thomas has done a case series of patients with suspicion of abdominal tuberculosis. They concluded that laparoscopy may help in early diagnosis of this disease. In another study diagnostic laparoscopy was performed in 23 patients having chronic abdominal pain with the results showing that laparoscopy was helpful in 87 % of the cases in diagnosing abdominal tuberculosis.<sup>26</sup> A retrospective study was performed in IRAN over the period of 10 years which showed that 28 out of 29 patients showed histological picture of abdominal tuberculosis after laparoscopic picture of suspected abdominal tuberculosis.<sup>24</sup>

Laparoscopy can help in differential diagnosis of abdominal tuberculosis and other abdominal pathologies. Perks of diagnostic laparoscopy are direct

visualization and peritoneal sampling (biopsy for histopathology).<sup>27,28,34</sup> It is helpful reducing the morbidity and mortality in chronically ill patient<sup>8,35</sup> A study was conducted in South Africa from 2008 to 2010, 81 patients included in study underwent diagnostic laparoscopy; of them 64 patient shave peritoneal deposits and 62 patients were having lymph nodes positive for tuberculosis, whereas 28 of ascitic fluid cultures were positive.<sup>7,28</sup>

## CONCLUSION

To establish the diagnosis of abdominal tuberculosis via histology is often hard and time consuming that leads to delay in initiation of proper management. Its clinical features are also vague. Visual appearance of small whitish tubercles and inflammatory adhesions on viscera and parietal peritoneum & stalactic via laparoscopy is significantly highly suggestive of abdominal tuberculosis and it must be supported with histopathological examination of all of the biopsies. Early laparoscopy is helpful in avoiding expensive investigations and allow early management of the patients.

## LIMITATIONS

Non availability of diagnostic laparoscopy in emergency department, short time frame of study and smaller sample size.

## SUGGESTIONS / RECOMMENDATIONS

Abdominal pain of non-specific origin must be proceeded with diagnostic laparoscopy and this study can be further conducted in a larger population with more sample size and for a longer period of time for better assessment of results.

## CONFLICT OF INTEREST / DISCLOSURE

No conflict of interest.

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