ORIGINAL RESEARCH PAPER
Volume - 11 | Issue - 02 | February - 2022 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ROLE OF LAPAROSCOPY IN THE DIAGNOSIS AND MANAGEMENT OF ABDOMINAL KOCHS' IN A TERTIARY CARE CENTRE.

General Surgery

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ABSTRACT

AIMS: To study the role of laparoscopy as diagnostic modality to confirm abdominal Koch's .

MATERIALS AND METHODS:

1. Instruments for grasping and dissection and performing biopsy :
- Maryland dissector,
- grasping forceps, and
- Hook dissector.

2. Instruments for incising and hemostasis include unipolar or bipolar electrocautery.
3. specimen retrieval bag

Irrigation And Suction

RESULTS: The incidence of disease was more common in age group 26-50 years with female to male ratio of 1.5:1. Ultrasonography abdomen was done in all patients out of which 38 patients had features suggestive of abdominal tuberculosis. CT scan abdomen was done in 29 patients; out of which 24 cases had findings suggestive of abdominal tuberculosis. The various findings of diagnostic laparoscopy suggestive of TB were thickened peritoneum, peritoneal tubercles, bowel adhesions, omental thickening, mesenteric lymphadenopathy, bowel wall thickening. Intraoperatively adhesions were found in 7 cases for which adhesiolysis was done. 32 patients were histologically positive in various specimens like peritoneal tubercles, mesenteric lymph nodes, omental biopsy. Amongst the 9 histology negative patients, all 9 had nonspecific chronic inflammation with reactive lymph nodes. **CONCLUSION:** 31 patients were started on category 1 AKT and were followed up. Out of 31 patients, 27 came for review, all of them improved symptomatically with improvement in repeat abdominal USG, Hb%, body weight **DISCUSSION:** Diagnostic laparoscopy is used to make a definitive clinical diagnosis whenever there is a diagnostic dilemma even after a complete evaluation clinically, biochemically , radiologically. It also allows tissue biopsy, and a variety of therapeutic intervention during the same procedure eg: adhesiolysis, bowel resection and anastomosis Diagnostic laparoscopy, when used along with other investigation modalities like blood investigations, histopathological analysis, gene x pert of tissue sample increases the overall diagnostic yield and accuracy compared to either diagnostic modality being used individually.

KEYWORDS

INTRODUCTION:

Tuberculosis of Gastrointestinal tract is the sixth most frequent form of extra-pulmonary site after lymphatic, genitourinary, bone, joint, military and meningeal TB. Tuberculosis can involve any part of GI tract from mouth to anus, peritoneum and pancreaticobiliary system. HIV predisposes to an increase in both the incidence and severity of abdominal tuberculosis. Abdominal tuberculosis is an increasingly common disease with a non specific nature, causing difficulty in diagnosis, since delay in diagnosis can lead to development of complications and a source of significant morbidity and mortality. This condition is regarded as a great mimicker of other abdominal pathology. It can affect abdominal organs without chest involvement. A high index of suspicion is an important factor in early diagnosis. Abdominal involvement may occur in the gastrointestinal tract, peritoneum, lymph nodes or solid viscera. [1]

Isolated single organ abdominal tuberculosis can mimic pancreatic tumors, colonic cancer, gastric cancer, and lymphomas. It can also mimic infectious diseases including appendicitis, acute cholecystitis, typhoid fever. [2,3,4]

Abdominal koch's has always been a difficult disease to diagnose since the ancient times, especially when there were no modalities of investigations. Diagnosis in the olden days was made solely on clinical symptoms.

Study:

A Prospective observational study was conducted on 40 patients with suspected abdominal TB admitted in surgical wards in a tertiary care centre satisfying inclusion criteria from the period of 20/11/2018 TO 21/10/2021

AIM:

To study the role of laparoscopy as diagnostic modality to confirm abdominal Koch's

OBJECTIVES :

1. To study the extent and severity of abdominal koch's
2. To obtain biopsy specimen from peritoneum, omentum, mesenteric lymph nodes, peritoneal fluid for further histopathological examination, screening for acid fast bacilli, culture - sensitivity and Gene Xpert for confirmation of abdominal Koch's
3. To assess therapy depending on culture sensitivity
4. To carry out therapeutic procedures like adhesiolysis, closure of perforation
5. To carry out resection, anastomosis under the cover of AKT.
6. To assess the incidence of complications arising out of laproscopy
7. To study the use of laproscopy to rule out other causes of chronic abdominal conditions.

Inclusion Criteria:

1. All patients above 18 years of age with suspected Koch's for clinical and radiological investigation.
2. Patients with relapse following primary therapy '
3. Patients with poor response to anti tuberculous therapy
4. Patients on AKT developing subacute obstruction due to stricture
5. Patients with incidental diagnosis of abdominal Koch's on diagnostic laproscopy done for some other condition.

Exclusion Criteria

1. Already diagnosed case of abdominal kochs
2. Suspected abdominal koch's with perforation peritonitis
3. Pregnancy
4. Medically unfit for anaesthesia
5. Abdominal cocoon.

METHOD OF CONDUCTION OF STUDY:

All patients enrolled in the study underwent thorough history taking and examination.

On admission, the following investigations were performed.
1. Blood investigations:
- HB, TLC, PLT
- Erythrocyte sedimentation rate
- LFT- Total bilirubin,
- SGOT/ SGPT
- Serum albumin
- RFT- urea, creatinine
- Serum electrolytes
- HIV, HBSAG, HCV

2. Imaging:
- X ray chest, abdomen
- Barium meal follow through
- Ultrasonography
- CT scan

3. Sputum for Acid fast bacilli ; Z-N staining
4. ECG

All details of the investigations were recorded in the study proforma. Written Informed valid consent was obtained with explanation of the procedure to the patients with the possible complications.

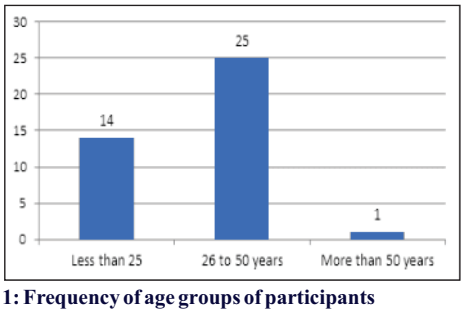
Statistical Analysis:
Statistical evaluation of data entailed analysis of sensitivity, specificity, positive predictive value and negative predictive value.

RESULTS OF THE STUDY:

1. Incidence :
The incidence of disease was more common in age group 26-50 years (62.5%) and lowest in >50 years. Mean age of incidence was 29 years .

Table 3: descriptive statistics for age

Descriptive statistics for Age (in years)	
Mean	29.63
Median	28.5
Std. Deviation	9.358
Range	42
Minimum	18
Maximum	60



Graph 1: Frequency of age groups of participants

Table 4: frequency of age groups with percentage

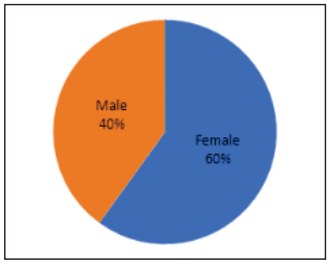
Age groups	Frequency	Percent
Less than 25	14	35
26 to 50 years	25	62.5
More than 50 years	1	2.5
Total	40	100

2. Sex Distribution:
It was found that the disease is slightly more common in females than males with a female to male ratio of 1.5:1.

Table 5: Sex distribution of participants

Gender	Frequency	Percent
Female	24	60
Male	16	40
Total	40	100

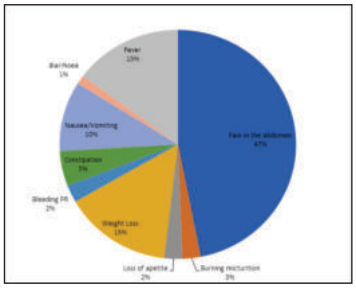
Symptoms:
The most common presenting symptom was abdominal pain present in 38 patients (95 %) with least presenting symptom of diarrhoea in 1 patient (2.5 %) while pallor and abdominal tenderness were the most common signs present in 7 (17.5%) and 12 (30%) patients respectively.



Graph 2: Sex distribution of participants

Table 6: frequency of presenting symptoms in participants

Presenting Symptoms in the participants	Frequency	Percent
Pain in the abdomen	38	95
Burning micturition	2	5
Loss of apetite	2	5
Weight Loss	12	30
Bleeding PR	2	5
Constipation	4	10
Nausea/Vomiting	8	20
Diarrhoea	1	2.5
Fever	12	30



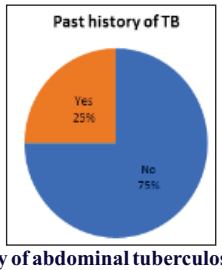
Graph 3: Frequency Of Presenting Symptoms Amongst Participants

1. Past History :
Past history of pulmonary TB was present only in 10 patients (25%).

2. Family History :
No patient gave positive history of presence of or treatment for pulmonary TB in other family member. No patient or family member had history of abdominal TB.

Table 7: Past history of abdominal tuberculosis

Past history of TB	Frequency	Percent
No	30	75
Yes	10	25
Total	40	100



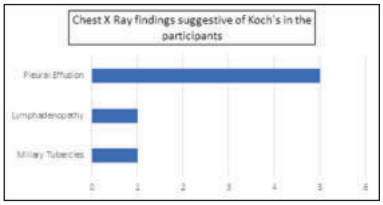
Graph 4: Past history of abdominal tuberculosis

3. X Ray Chest:
In this present study, X-ray chest were done in all patients but it was suggestive of tuberculosis in only 7 patients (17.5%).

Table 8: Chest X ray findings suggestive of tuberculosis

Chest X-Ray findings suggestive of TB	Frequency
Miliary Tubercles	1
Lymphadenopathy	1
Pleural Effusion	5

6: Sputum For Afb:
Sputum examinations were performed in patients with Chest x ray suggestive of TB however sputum AFB staining were negative in all 7 patients.



Graph 5: chest x ray findings suggestive of Tuberculosis

4. X Ray Abdomen:
5 patients with X ray abdomen standing showed signs of subacute intestinal obstruction.

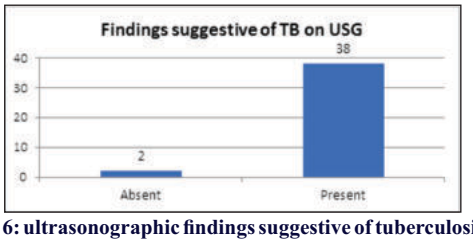
Table 9: X ray abdomen suggestive of tuberculosis

Abdominal X Ray findings suggestive of TB	Frequency
Multiple air fluid levels	4
Dilated Bowel Loops	1

5. Ultrasonography Abdomen:
Ultrasonography abdomen was done in all 40 patients out of which 38 (95%) patients had evidence suggestive of abdominal tuberculosis. Sonographic features were peritoneal collection, intraabdominal lymphadenopathy, dilated small bowel, thickened mesentery and omental thickening.

Table 10: ultrasonographic findings suggestive of tuberculosis

TB ON USG	Frequency	Percent
Absent	2	5
Present	38	95
Total	40	100

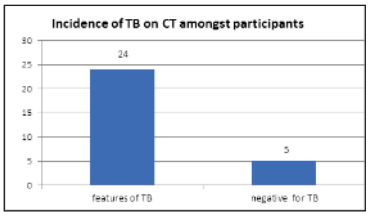


Graph 6: ultrasonographic findings suggestive of tuberculosis

6. Ct Abdomen:
CT scan abdomen was done in 29 patients; out of which 24 cases had findings suggestive of abdominal tuberculosis (82.75 %) and 5 were inconclusive. Features suggestive of TB were peritoneal free fluid, intraabdominal lymph adenopathy, thickened small bowel loops and omental thickening. Out of these 24 patients, 20 had positive (83.33%) histology for tuberculosis and 4 were negative for histology.

Table 11: CT scan findings suggestive of tuberculosis

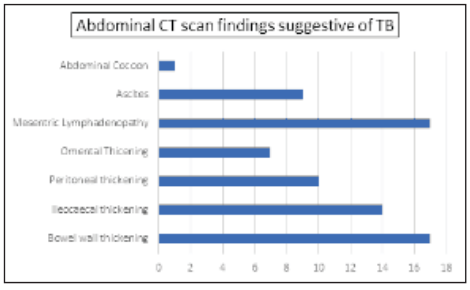
TB on CT	frequency	percent
features of TB	24	82.75
negative for TB	5	17.24
total	29	100



Graph 7: CT scan findings suggestive of tuberculosis

Table 12: frequency of CT findings suggestive of tuberculosis

Abdominal CT Scan findings suggestive of Koch's	Frequency
Bowel wall thickening	17
Ileocaecal thickening	14
Peritoneal thickening	10
Omental Thicening	7
Mesentric Lymphadenopathy	17
Ascites	9
Abdominal Cocoon	1

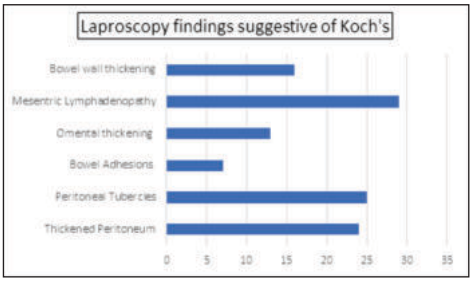


Graph 8: Frequency Of Abdominal Ct Scan Suggestive Of Tuberculosis

7. Diagnostic Laproscopy:
The various findings of diagnostic laproscopy suggestive of TB were as follows:

Table 13: Diagnostic laproscopy findings suggestive of abdominal tuberculosis

Laproscopy findings suggestive of Koch's	Frequency
Thickened Peritoneum	24
Peritoneal Tubercles	25
Bowel Adhesions	7
Omental thickening	13
Mesentric Lymphadenopathy	29
Bowel wall thickening	16

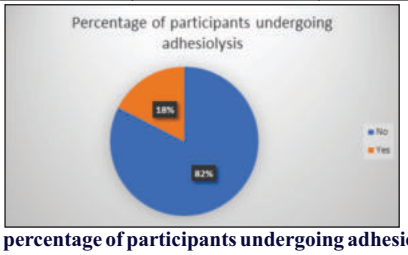


Graph 9: Frequency Of Laparoscopy Findings Suggestive Of Abdominal Tuberculosis

8. ADHESIOLYSIS :
Intraoperatively adhesions were found in 7 cases for which adhesiolysis was done.

Table 14: frequency of adhesiolysis done

Adhesiolysis	Frequency	Percent
No	33	72.5
Yes	7	2.5
Total	40	2.5

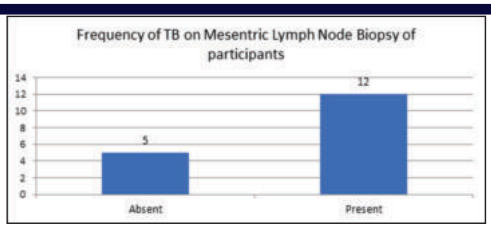


Graph 10: percentage of participants undergoing adhesiolysis

9. Mesenteric Lymph Nodes:
Mesenteric lymph node biopsy was taken from 17 patients out of which 12 patients (70.58%) had biopsy positive for tuberculosis and 5 patients (29.41%) had negative histopathological findings, or a reactive lymphadenitis.

Table 15: frequency of tuberculosis on mesenteric lymph node biopsy

TB on Mesenteric Lymph Node Biopsy	Frequency	Percent
Absent	5	29.411
Present	12	70.58
Total	17	100

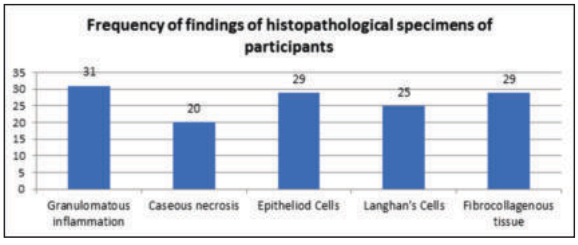


Graph 11: frequency of tuberculosis on mesenteric lymph node biopsy

10. Histopathology:
Amongst the 32 histology positive patients 20 had caseating granuloma and 12 had non-caseating granuloma. Amongst the 9 histology negative patients, all 9 had nonspecific chronic inflammation with reactive lymph nodes.

Table 16: histopathology findings suggestive of tuberculosis

Histopathology Specimen	Frequency	Percent
Granulomatous inflammation	32	80 %
Caseous necrosis	20	50 %
Epitheliod Cells	29	72.5 %
Langhan's Cells	25	62.5 %
Fibrocollagenous tissue	29	72.5 %

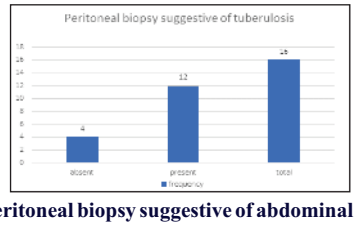


Graph 12: Frequency Of Findings Of Histological Specimens Of Participants

11. Peritoneal Biopsy:
Peritoneal biopsy was taken from 16 cases out of which 12 had positive histological findings for Koch's .

Table 17: Peritoneal biopsy suggestive of tuberculosis

Peritoneal biopsy	Frequency	percent
absent	4	25.00%
Present	12	75.00%
Total	16	100

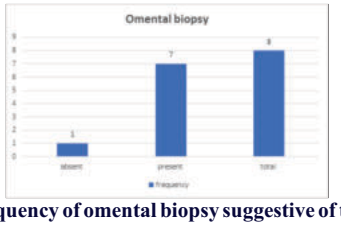


Graph 13: peritoneal biopsy suggestive of abdominal tuberculosis

12. Omental Biopsy:
Omental biopsy was taken from 16 cases out of which 12 had positive histological findings for Koch's .

Table 18: omental biopsy suggestive of abdominal tuberculosis

Omental biopsy	Frequency	percent
absent	1	12.50%
present	7	87.50%
total	8	100%

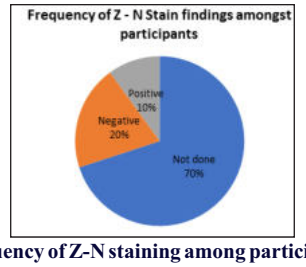


Graph 14: frequency of omental biopsy suggestive of tuberculosis

13. Z-n Staining:
Z-N staining was done in 12 patients out of which AFB was detected in 4 patients

Table 19: frequency of AFB detected on Z-N staining

Z-N staining for AFB	Frequency	Percent
Not done	28	70
Negative	8	20
Positive	4	10
Total	40	100

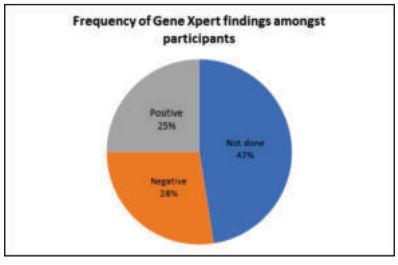


Graph 15: frequency of Z-N staining among participants

14. Gene Xpert:
Peritoneal fluid for gene xpert was performed in 21 patients out of which MTB was detected in 10 cases.

Table 20: frequency of MTB detected by Gene X pert

Gene Xpert	Frequency	Percent
Performed	21	52.5
Not done	19	47.5
Negative	11	27.5
Positive	10	25
Total	40	100



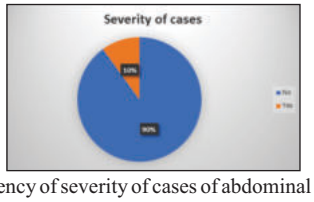
Graph 16: frequency of MTB detected by Gene Xpert

15. Amongst the 9 histology negative patients, all had nonspecific chronic inflammation, one had no pathology found.

16. Severity Of Abdominal Tb:
The severity of abdominal Koch's was found to be higher in 4 patients out of 40 in terms of acute onset of symptoms, fever, tenderness per abdomen, signs of acute obstruction.

Table 21: frequency of severity of cases of abdominal tuberculosis

Severity of cases	Frequency	Percent
No	36	90
Yes	4	10
Total	40	100



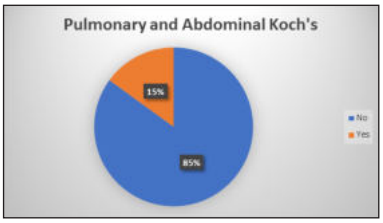
Graph 17: Frequency of severity of cases of abdominal tuberculosis

17. Pulmonary With Abdominal Tb:
Concomitant pulmonary with abdominal TB was found to be present in 6 cases out of 40. Drug sensitivity testing was performed in 10 cases. All 10 were found to be drug sensitive.

Table 22: frequency of pulmonary with abdominal tuberculosis

Pulmonary + Abdominal TB	Frequency	Percent

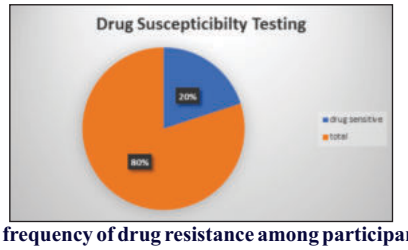
No	34	85
Yes	6	15
Total	40	100



Graph 18: frequency of pulmonary with abdominal tuberculosis

18. Drug Resistant / Drug Sensitive Tb
Table 23: frequency of drug resistance among participants

Drug Resistant/Sensitive	Frequency	Percent
Drug Resistant	0	0
Drug Sensitive	10	25%
Total	40	100



Graph 19: frequency of drug resistance among participants

19. Treatment And Follow Up:
31 patients were started on category 1 while 7 patients were started on category 2 treatment.

The patients were followed up to two months post laparoscopy. No patients died during the two months period.

Out of 31 patients, 27 came for review, all of them improved symptomatically with anti TB medications.

Repeat abdominal USG, Hb%, were done and body weight were taken in all 27 patients and a trend of improvement was noted in all patients. All the histologically negative cases were managed with broad spectrum antibiotics and responded to the same.

There was no procedure related mortality during or after the laparoscopy.

The above results were analyzed and compared with a similar study conducted by Tirpude BH et al on the role of laparoscopy in the diagnosis and management of abdominal tuberculosis at the department of surgery at a tertiary care hospital from Nov 2013 to Nov 2015 34. A total of 38 patients of suspected abdominal tuberculosis underwent diagnostic laparoscopy. Out of 38 patients, 20 were males and 18 were females.

The Parameters Studied Were As Follows:
1. Demographics:
The incidence of disease was more common in age group 20-29 years (47.36%) and lowest in 50-59 years. The disease was found to be slightly more common in males than female with male to female ratio of 1:0.9.

2. Clinical Features:
The most common presenting symptom was abdominal pain present in 35 patients (92.10%) with least presenting symptom of diarrhoea in 7 patients (18.42%) while pallor and abdominal tenderness were the most common signs present in 25 (65.78%) and 24 (63.15%) patients respectively with least patients having ascites.

3. Past History Of Pulmonary Tb:
Past history of pulmonary TB was present only in 7 patients (18.42%) and 23.68% patients gave positive history of presence of or treatment for pulmonary TB in other family member. No patient or family member had history of abdominal TB.

4. X Ray:
In this present study, X-ray chest were done in all patients but it was suggestive of tuberculosis in only 10 patients (26.31%) though sputum AFB staining were negative in all of 10 patients. Sputum examinations were performed only in patients with CXR suggestive of tuberculosis and all examinations were negative for tuberculosis.

28.94% patients with X ray abdomen standing showed signs of subacute intestinal obstruction which responded to conservative management.

5: Ultrasonography:
Ultrasonography abdomen were done in 38 patients and all patients had evidence suggestive of abdominal tuberculosis, but histology/CBNAAT results were positive for tuberculosis in 23 patients (60.52%). Sonographic features were peritoneal collection, intraabdominal lymphadenopathy, dilated small bowel, thickened mesentery and omental thickening. The sensitivity of ultrasonography abdomen was 92% while specificity was 61.54%.

6. Ct Scan Abdomen :
CT scan of abdomen was done in all patients; 31 of them were suggestive of abdominal tuberculosis and seven were inconclusive. Features suggestive of TB were peritoneal free fluid, intra abdominal lymph adenopathy, thickened small bowel loops and omental thickening. Only 24 of them had positive (63.15%) histology for tuberculosis and 14 were negative (36.84%).

6. Mesenteric lymph nodes
Mesenteric lymph nodes were biopsied from 27 patients . Out of 27, 20 patients had positive (74.07%) histology for tuberculosis. 7 patients (25.92%) had negative histology for tuberculosis.

Amongst the 20 histology positive patients 14 (70%) had caseating granuloma and 6 had non-caseating granuloma (30%). Amongst the 7 histology negative patients, all 7 had nonspecific chronic inflammation with reactive lymph nodes. The sensitivity and specificity of lymph node biopsy was found to be 80% and 100% respectively.

7. Omental tubercles:
38 specimens (100%) were taken from omentum and sent for histological examination; 21 of them were positive (55.26%) for tuberculosis and 17 were negative (44.73%). Amongst the 21 positive patients 16 had caseating granuloma (76.19%) and 5 had non-caseating granuloma.

8. Peritoneal Tubercles
These are present and sent for histological examination in 17 patients (44.73%) and there was no deposit in the other 21 patients (55.26%); 14 of them were positive (82.35%) for tuberculosis and 3 (17.64%) were negative.

Amongst the 14 positive patients 10 had caseating granuloma (71.42%) and 4 had non-caseating granuloma (28.57%). Amongst the 3 negative patients, all had nonspecific chronic inflammation. The sensitivity and specificity of tubercles are 56% (CI 37.07-73.33%) and 100% (CI 77.19-100%) respectively.

9. Amongst the 17 histology negative patients, all had non specific chronic inflammation, one had no pathology found. The sensitivity and specificity of omentum histology are 84% (CI 65.35-93.6%) and 100% (CI 77.19-100%) respectively.

10. Peritoneal Fluid:
Small amounts of peritoneal fluid was aspirated and sent for gene xpert from 30 patients (78.94%).

Among 30 patients, 10 were positive (33.33%) for tuberculosis gene and 20 (66.33%) were negative. The correlation has been established between the peritoneal fluid CBNAAT and histology results. It has been found that all 10 patients had histology positive. The sensitivity and specificity of peritoneal aspirate CBNAAT are 40% (CI 23.4-59.26%) and 100% (CI 77.19-100%) respectively.

11. In this study total 24 patients had histology positive for tuberculosis.

12. patient had histology negative but peritoneal fluid CBNAAT positive.

Total (24+1) 25 patients had positive tuberculosis findings.

13 patients were negative for tuberculosis.

The histology, AFB staining and ascitic fluid CBNAAT were all negative for tuberculosis in 13 patients, but it showed non-specific chronic inflammation in 12 and no pathology was found in one patient.

The histology, AFB staining and ascitic fluid CBNAAT were all positive in 2 patients.

Sensitivity and specificity of these couldn't be established because the numbers of patients are not the same in all the group of tests.

12. Conversion To Open Surgery:
In this study 3 patients (7.89%) had conversion to laparotomies for various reasons; there was no death related to conversion to laparotomy.
However in our study, there was no conversion to laparotomy.

13. Treatment And Follow Up:
All 38 patients undergoing laparoscopy were started on standard anti-tuberculosis treatment without delay, whilst awaiting histology report. 31 patients were started on category 1 while 7 pateints were started on category 2 treatment.

The patients were followed for up to two months post laparoscopy.

No patient died during the two months period.

Out of 38 patients, only 24 patients (63.15%) came for review, all of them had positive diagnosis of tuberculosis and all of them improved symptomatically with anti TB medications.

Repeat abdominal U/S, Hb%, were done and body weight were taken in all 24 patients and a trend of improvement was noted in all patients. There was no procedure related mortality during or after the laparoscopy.

DISCUSSION:
The abdominal TB usually occurs in four forms: tuberculous lymphadenopathy, peritoneal tuberculosis, gastrointestinal (GI) tuberculosis and visceral tuberculosis involving the solid organs. Tuberculous bacteria reach the Gastrointestinal tract via the following modes : Firstly, the tubercle bacilli may enter the intestinal tract through the ingestion of infected milk or sputum :

Infected Food Or Milk: primary intestinal tuberculosis

Infected Sputum: secondary intestinal tuberculosis.

The mucosal layer of the GI tract can be infected with the bacilli with formation of epithelioid tubercles in the lymphoid tissue of the submucosa. After 2-4 wk, caseous necrosis of the tubercles leads to ulceration of the overlying mucosa which can later spread into the deeper layers and into the adjacent lymph nodes and into peritoneum. Rarely, these bacilli can enter into the portal circulation or into hepatic artery to involve solid organs like liver, pancreas and spleen

- The second pathway is hematogenous spread from tubercular focus elsewhere in the body like lungs
- The third pathway includes direct spread to the peritoneum from infected adjacent foci, including solid organs, fallopian tubes or adnexa, or psoas abscess, secondary to tuberculous spondylitis.
- Lastly it can spread through lymphatic channels from infected lymph nodes. 1,5,6

Before the discovery of a bacterial agent in the causation of TB, this disease was associated with social outcasting. [7]

By the 1950s, mortality in Europe had decreased to about 90 % due to improvements in sanitation, vaccination and other public health measures, before the arrival of streptomycin and other antibiotics. However the disease still remained a threat until the development of the antibiotic streptomycin in 1946, which made the treatment and cure of TB a reality.

Prior to this medication, the only treatment was surgical intervention; the 'pneumothorax technique' which involved collapsing the entire infected lung to 'rest' and allow tuberculous lesions to heal. [8]

Dr. James Carson, a Scottish physician (1821) began treatment by draining pleural effusion from around the lungs and found surgery helpful in prolonging life. [9]

Hartmann A Pileit (1891) first published a report on surgery for intestinal tuberculosis

Lichtheim (1893): demonstrated presence of tubercle bacilli in the stools of patients of intestinal tuberculosis.

The various modes of investigations evolved over the years for diagnosis of abdominal kochs' are as follows: plain X ray abdomen 10 , barium studies 11, ultrasound abdomen12,13,14 , CT scan abdomen 15, Mantoux test 16, interferon release assay 17, Gene Expert 18,19 , Ascitic fluid analysis in TB 20,21

Following Are Some Studies Conducted On The Various Methods Of Diagnosis Of Abdoinal Koch's: M

1. A study was conducted by Rana et all on 300 patients admitted from November 2005 to October 2007 at Jawahar Lal Nehru Medical College, Aligarh on 'The role of laboratory investigations in evaluating abdominal tuberculosis'
   The study had the following conclusions: Serological investigations have a limited value, while PCR is a highly specific test, however cost was a limiting factor to be used in all patients. BACTEC was seen to be more sensitive and faster than culture techniques for the diagnosis of mycobacterial infections. FNAC is a reliable, cost effective alternative, and 81% diagnostic yield in the present study suggests that ultrasound guidance is a useful tool. Histopathological evaluation with positive AFB staining remains the gold standard for diagnosing abdominal TB. However, although the demonstration of AFB in aspirates and tissue sections is a definitive diagnostic method for TB , however the positivity for AFB is variable due to variable yield of the Acid fast bacilli in different specimens. [22]
2. A study was conducted by Ahmad et al at a Tertiary Care Hospital of Bihar in 2006 to study the Role of Imaging Modalities in the Diagnosis of Abdominal Tuberculosis. from this study, the role of imaging in diagnosis of tuberculosis of abdomen was assessed as follows:
   In patients with high index of suspicion, the presence of the USG findings of conglomerated mesenteric lymph nodes of heterogeneous attenuation with central hypoechogenicity or calcification, ascites with internal echoes/septae, mesenteric thickening ≥15 mm, or omental thickening is suggestive of tubercular etiology. CT scan was equally or more accurate than USG in identifying abnormalities of abdominal tuberculosis except bowel dilatation. CT scan has advantage of not being affected by bowel gas; therefore, it more commonly identified periportal, peripancreatic, pericaval and para-aortic lymph nodes, and bowel wall thickening. It also more commonly identified omental thickening. USG, however, more commonly identified bowel dilatation and has edge over CT scan in defining complex nature of ascites. [23]
3. A retrospective study was conducted by Kumar et al on The role of Tissue Xpert® MTB/RIF Assay in Peritoneal Tuberculosis in from December 2015 to December 2017 at the Department of Gastroenterology and Gastrointestinal Surgery at G.B. Pant Institute of Postgraduate Medical Education and Research (GIPMER), New Delhi. The study concluded the following:
   Xpert® MTB/RIF assay on peritoneal tissue has a good sensitivity and specificity. The multidrug resistance and the ability to provide results rapidly make it clinically useful. This assay is highly specific when performed in peritoneal tissue biopsy specimens, with specifity reaching upto 100 %, this phenomenon could be attributed to the abundant tissue obtained by peritoneoscopy. Gene Xpert can also detect MDR TB i.e. diagnose tuberculosis and rifampicin resistance within four hours, which otherwise could have taken four days to four weeks. AKT was started on day two in patients who were Xpert® MTB/RIF-positive.

The Limitations Of This Study Were As Follows:

1. This study was a retrospective study, and hence, Xpert® MTB/RIF assay could not be compared with respect to the culture owing to its variable yield in PTB.
2. The cost-effective analysis for Xpert® MTB/RIF assay also could not be performed.
3. Also, the sample size of the current study was small. [24]

4. A study was conducted by Sharma et al in conducted at the All India Institute of Medical Sciences (AIIMS), Delhi during the period from November 2003 to May 2005 on the diagnostic accuracy and cost-effectiveness of ascitic fluid interferon- (IFN-) and adenosine deaminase (ADA) assays in the diagnosis of tuberculous ascites. The study concluded the following: Ascitic fluid ADA assay was equivalent to the IFN gamma assay in terms of sensitivity, specificity. Along with a good diagnostic accuracy, the ADA test can deliver timely results at a fraction of the cost. The difference in cost between IFN gamma and ADA assays more significant. The ADA assay requires a simple spectrophotometer, whereas the IFN- assay requires an ELISA reader, which is a sophisticated and much costlier instrument than the former. The IFN- assay also requires greater technical expertise than does the ADA assay. More operational research is required in this subject area. The results of this study, however, indicate that in most cases the ADA assay will be the diagnostic test of choice. [25]
5. A prospective observational study was carried by Patel and Yagnik in the gastroenterology department of a tertiary care hospital between August 2011 and January 2013 on the role of colonoscopy in diagnosis of abdominal Kochs.
   The morphology of the colon and ileum were evaluated during colonoscopy.
   Sites within the gastrointestinal tract that were commonly found to be involved in our 69 GITB patients were (in descending order of prevalence) the ileocecal valve in 58 patients (84.05%), the ileum in 25 patients (36.23%), the ascending colon in 22 patients (31.88%), the transverse colon in 4 patients (5.80%), and the descending colon in 2 patients (2.90%). Of these lesions, transverse ulcers and patulous ileocecal valves were found to be significantly associated with a diagnosis of GITB.[26]
6. A study was conducted by Seema Awasthi et all; a 5 year retrospective study (from January 2010 to January 2014) in a tertiary teaching hospital in Northern India. The aim of the study was to to define the role of histopathological examination in establishing the diagnosis in resource poor settings and to analyze the compliance and response to anti-tubercular treatment.
   This study emphasized the importance of histopathological examination in establishing the diagnosis in poor resource settings. Since the clinical presentations of abdominal tuberculosis are very non-specific and vague and the diagnostic criteria are limited, diagnosis has to be supported by additional tests and by retrospective analysis with reference to clinical patterns, underlying diseases and radiological findings.[27]

Some Pitfalls Observed In The Above Studies Were As Follows:

1. The study of Xpert® MTB/RIF assay was a retrospective study, and hence, Xpert® MTB/RIF assay could not be compared with respect to the culture owing to its variable yield in PTB.
   The cost-effective analysis for Xpert® MTB/RIF assay also could not be performed. Moreover, this test has limitations due to higher cost, making it non usable by poor people.
2. When routine laboratory and microbiology tests are non-conclusive, then molecular biology-polymerase chain reaction (PCR) results may support the clinical diagnosis while waiting for the culture results and drug susceptibility. Nevertheless, PCR cannot differentiate between living and dead M. tuberculosis. They remain positive for long periods after completion of anti-TB treatment and death of the bacteria. They should be used only for initial diagnosis and not for follow-up [36]. Furthermore, the excellent results reported from research labs may not be reproduced by service clinical labs. There are contamination, technical, and sampling errors in the clinical labs that may give false positive results and reduce the generalizability of these tests. [28,29]
3. The limitations of colonoscopy in diagnosis of abdominal Koch's are : it cannot be performed in an unstable patient, it cannot demonstrate the extraluminal manifestations of abdominal Koch's such as bowel adhesions, peritoneal tubercles, omental and mesenteric thickening, thus limiting the diagnostic efficacy and yield of diagnosis with respect to obtaining tissue samples for histopathology.
4. Although imaging has a good sensitivity in the diagnosis, tuberculosis may masquerade as any disease; therefore, tissue and microbiological assessment is sometimes important for establishing the diagnosis. It also cannot differentiate between drug sensitive and drug resistant Tuberculosis. Assessment of response to therapy in the form of repeated follow- up scan increases the dose of exposure to radiation and risking contrast induced delayed and acute hypersensitivity and nephropathy.

Laproscopy In Abdominal Koch's

Macroscopic signs suggestive of abdominal tuberculosis in laparoscopy are small whitish tubercles over the visceral and parietal peritoneum; inflammatory adhesions on the visceral and parietal surface; thickening, hyperemia and retraction of the greater omentum and a long fibrous band extending from the parietal to the visceral peritoneum termed "stalactic" which is characteristic of abdominal tuberculosis.

Abdominal tuberculosis remains one and most difficult diseases to be diagnosed. It is also one of the common extra-pulmonary sites for tuberculous lesions. The disease may affect any part of the gut and may produce a chronic illness with vague abdominal symptoms or else may present in an acute obstructive form. The gravity of this problem is further increased by the vague and totally non-specific symptomatology. The presentation of abdominal tuberculosis always mimics many other conditions like inflammatory bowel diseases and other similar conditions . This state of confusion usually leads to an undue delay in diagnosis and treatment plan and thus further increases the overall morbidity. A large number of these patients present with acute abdomen and are diagnosed on exploratory laparotomy only. These laparotomies can be easily avoided if there is an efficient and reliable method to diagnose abdominal tuberculosis. Diagnostic laparoscopy is an efficient method in all patients with suspected abdominal tuberculosis to find out tuberculous lesions and to take biopsy of any such foci. This proved to be a breakthrough with a very encouraging result. Early diagnosis and starting anti-tuberculous diagnosis and an early resort to the anti-tuberculous treatment can coma after morbidity can facilitate an early recovery. [30,31,32,33]

Advantages

There are a number of advantages to the patient with laparoscopic surgery versus an open procedure. These include:

- Smaller incision, which reduces pain and shortens the recovery time.
- Less post operative scarring.
- Reduced blood loss, which reduces the chance of requiring a blood transfusion.
- Shorter duration of hospital stay
- Reduced exposure of internal organs to possible external contaminants which reduces the risk of acquiring infections.
- Direct visualization of intrabdominal viscera for changes caused by tuberculosis, obtaining tissue samples through direct visualization and an additional benefit of performing therapeutic procedures in the same sitting, eg: adhesiolysis, bowel resection and anastomosis, ascitic fluid aspiration.

Disadvantages

While laparoscopic surgery is clearly advantageous in terms of patient outcomes, the procedure is more difficult from the surgeon's perspective when compared to traditional, open surgery in the following aspects:

- Longer operating time, depending on the surgeons skills.
- Loss of dexterity: The surgeon has a limited range of motion at the surgical site
- Poor depth perception, due to 2 dimensional imaging.
- Reduced tactile sensation: The surgeons cannot manipulate tissues directly with their hands, instead ,tools are used to interact with tissue. This limitation reduces tactile sensation, making it more difficult for the surgeon to feel the tissue (sometimes an important diagnostic tool, such as when palpating for tumors) This results in an inability to accurately judge how much force is being applied to tissue as well as a risk of damaging tissue by applying more force than necessary. It also makes delicate procedures more difficult such as tying sutures.
- Fulcrum effect: The tool endpoints move in the opposite direction to the surgeon's hands due to the pivot point, making laparoscopic surgery a non-intuitive motor skill that is difficult to learn.
- Although laparoscopy in adult age group is widely accepted, its advantages in paediatric age group is questioned. Benefits of laparoscopy appears to recede with younger age. Efficacy of laparoscopy is inferior to open surgery in certain conditions such as pyloromyotomy for Infantile hypertrophic pyloric stenosis. Although laparoscopic appendectomy has lesser wound problems

than open surgery, the former is associated with more intra-abdominal abscesses

CONCLUSION :

- Diagnostic laproscopy is used to make a definitive clinical diagnosis whenever there is a diagnostic dilemma even after a complete evaluation including clinical, biochemical , radiological investigations, in cases of trauma with suspected intra- abdominal injuries, suspected intra-abdominal pathologies (eg: abdominal koch's), as a staging tool in intra-abdominal cancers (gastric, pancreatic, biliary, liver cancers and lymphoma) it also helps in assessing the response to chemotherapy given for cancer or abdominal infections like tuberculosis .
- It also allows tissue biopsy, culture acquisition and a variety of therapeutic intervention during the same procedure. Laparoscopic ultrasonography can also be performed to evaluate organs that are not amenable to inspection
- Diagnostic laparoscopy, when used along with other investigation modalities like blood investigations, histopathological analysis, gene x pert of tissue sample increases the overall diagnostic yield and accuracy compared to either diagnostic modality being used individually.
- It offers the advantage of direct visualization of intrabdominal viscera for changes caused by tuberculosis, obtaining tissue samples through direct visualization and an additional benefit of performing therapeutic procedures in the same sitting, eg: adhesiolysis, bowel resection and anastomosis, ascitic fluid aspiration.

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