International Surgery Journal
Saxena P. Int Surg J. 2017 Jan;4(1):326-333
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20164464

Original Research Article

The role of laparoscopy in diagnosis of patients with chronic abdominal pain

Pradeep Saxena*

Department of Surgery, Gandhi Medical College, Bhopal, Madhya Pradesh, India

Received: 27 September 2016
Revised: 10 October 2016
Accepted: 24 October 2016

***Correspondence:**
Dr. Pradeep Saxena,
E-mail: pradeep@bhopalsurgery.com

ABSTRACT

Background: Chronic abdominal pain still remains one of the leading clinical problems presenting to physicians. Reaching a definitive diagnosis and prompt management is usually delayed because invasive investigations are frequently required to come to a conclusive diagnosis. The aim was to study the varied clinical picture of chronic abdominal pain and evaluate the role of laparoscopy in reaching a conclusive diagnosis in these patients.
Methods: A prospective and retrospective study of 142 patients of chronic abdominal pain who underwent diagnostic laparoscopy in our surgery department from June, 2006 to December, 2015 was done. A descriptive analysis of data collected from case records of these patients was done to study the varied clinical picture, laboratory reports, radiological findings, laparoscopic findings and histological reports. The usefulness of laparoscopy to confirm the diagnosis and in clinical management of these patients of chronic abdominal pain was evaluated.
Results: Laparoscopy was performed in 142 patients of chronic abdominal pain with unsettled diagnosis. A conclusive diagnosis could be made in 136 of these patients. The common causes of chronic abdominal pain were abdominal tuberculosis, adhesions, bands, small intestinal strictures, chronic appendicitis, abdominal malignancy and various gynecological diseases. Gynecological problems causing chronic abdominal pain were pelvic inflammatory disease, ovarian cyst, tubo-ovarian mass, hydrosalpinx, fibroid uterus, bulky uterus, endometriosis. Thus laparoscopy provided positive diagnosis of in 136 (95.77%) patients based on laparoscopic findings, histological reports, ascitic fluid analysis and cytology.
Conclusions: In patients suspected to have abdominal pathology early laparoscopy may be useful to establish a conclusive diagnosis with acceptably low morbidity (<5 %). An early resort to laparoscopy can resolve the diagnostic dilemma and early treatment can be instituted.

Keywords: Ascites, Abdominal tuberculosis, Chronic abdominal pain, Laparoscopy, Nonspecific abdominal pain

INTRODUCTION

Chronic abdominal pain still remains one of the leading clinical problems presenting to physicians. Reaching a definitive diagnosis and prompt management is usually delayed because invasive investigations are frequently required to come to a conclusive diagnosis. Abdominal pathology which may involve the bowel, peritoneum, lymph node or solid viscera may be the underlying cause for chronic abdominal pain. These patients tend to present with non-specific clinical features and remain a diagnostic dilemma for very long time. Imaging studies, biochemical and serological tests provide only indirect evidence of the underlying disease and many times remain inconclusive.[1-5,8,9] Thus diagnosis of underlying pathology in chronic abdominal pain then is largely dependent on direct visualization of abdominal cavity and obtaining tissue or ascitic fluid for histological

confirmation by laparoscopy. Although diagnostic laparoscopy is fast becoming acceptable in surgical practice its role in ascertaining the diagnosis of nonspecific abdominal pain needs to be validated by evidence base. It was with this objective that this study was conducted in our Department of Surgery, Gandhi Medical College, Bhopal, Madhya Pradseh, India.

METHODS

This prospective and retrospective study on role of laparoscopy in reaching a conclusive diagnosis in patients of chronic abdominal pain was carried out in Department of Surgery, Gandhi Medical College, Bhopal, Madhya Pradesh India. In this study 142 adult patients who underwent diagnostic laparoscopy for chronic abdominal pain from July 2006 to December 2015 were included. The study was approved by the ethical committee of our hospital and informed consents were taken from the patients.

Inclusion criteria

- Abdominal pain of more than three months duration with unsettled diagnosis
- Recurrent episodes of subacute intestinal obstruction with frequent hospitalization
- Patients of ascites with unsettled diagnosis on laboratory and imaging studies.

Exclusion criteria

- Patients with acute intestinal obstruction or perforation/peritonitis on clinical evaluation
- Patients with chronic liver disease, cirrhosis or obvious carcinoma
- If laparoscopy was contraindicated.

The relevant data was collected and recorded in excel sheet. A descriptive analysis of data collected from case records of these patients was done. For statistical evaluation chi-square test and t-test were applied. All these patients who presented with chronic abdominal pain of more than three months duration were preoperatively evaluated with complete blood picture, ESR, blood sugar, routine biochemical tests like liver function tests, kidney function tests, X-ray of chest and abdomen and ultrasound of abdomen.

Sputum for AFB, serum ADA and tumor markers like AFP, CEA, CA 19-9 and CA-125 were also done whenever required based on clinical suspicion. CT scan of abdomen was done in 105 and enteroclysis was done in 32 patients. Thirty six patients underwent upper GI endoscopy and fifteen patients underwent colonoscopy for evaluation of their chronic abdominal pain.

Laparoscopic technique

Laparoscopy was done under general anesthesia in all patients. A 10 mm, 300 laparoscopes was used through umbilical port for visualization. One additional 5 mm port was inserted under vision in left lower quadrant for bowel holding forceps, biopsy forceps or aspiration of ascitic fluid. The whole of peritoneal cavity was sequentially visualized using trendelenberg and reverse trendelenberg positions, and right or left tilt as required. Starting from the pelvis the uterus, ovary, uterine adenexa in females, rectum and sigmoid colon, ileocecal region, ileum, cecum, appendix, colon were visualized and examined. The patient was then turned in reverse trendelenberg position for examination of upper abdomen. Transverse colon, stomach, duodenum, gallbladder, liver, spleen and descending colon were serially examined. With the help of bowel grasping forceps the whole length of small bowel could be walked over for direct visualization and examination. In patient with ascites, samples of fluid were obtained for routine and microscopic examination, biochemical analysis, culture and sensitivity, ascitic fluid ADA and cytology as required. Tissue specimen was taken from the peritoneum, omentum, bands and mesenteric lymph nodes using cupped biopsy forceps. A third port was created at right upper abdomen if a laparoscopic therapeutic procedure was required.

RESULTS

Amongst 142 patients majority were females 83 (58.45%) and 59 (41.54) were males. The distribution of patients in different age groups was as per Table 1 below. Most of the patients were between 20-50 years age group (Table 1).

Table 1: Age wise distribution of patients.

Age group (years)	Male	Female	Total	Percentage
11-20	9	11	20	14.08
21 -30	13	16	29	20.42
31 -40	15	26	41	28.87
41 -50	12	18	30	21.12
51 -60	6	8	14	09.85
>60	4	4	8	05.63
Total	**59 (41.54%)**	**83 (58.45%)**	**142**	

Clinical symptoms

Abdominal pain was the most common presentation (96.47 %), followed by distension of abdomen (38.02%) and low grade fever (21.83 %). Eighteen patients had a history of prior abdominal surgery.

Table 2: Clinical symptoms.

Symptoms	No of cases	Percentage
Abdominal pain	137	96.47
Vomiting	21	14.78
Distension of abdomen	54	38.02
Low grade fever	31	21.83
Loss of weight	18	12.67
Loss of appetite	18	12.67

Signs

Physical sign on abdominal examination in were very infrequent and nonspecific. Tenderness of abdomen was seen in 19.01%. Doughy abdominal feel and lump in abdomen were suggestive but present in a few cases only. Clinically detectable ascites was seen only in 5 patients (3.52%) (Table 3).

Table 3: Physical signs.

Physical signs	No of cases	Percentage
Tenderness of abdomen	27	19.01
Doughy abdomen	18	12.67
Lump in abdomen	11	07.74
Clinically detectable free fluid (ascites).	05	03.52

Laboratory test

A moderate degree of anemia was seen in 37 (26.05%) patients. ESR was raised in 29 (20.42%).

Radiological studies

Chest X-ray showed abnormal findings in 14 patients. Radiological studies and main findings were as per table below (Table 4).

Table 4: Radiological findings.

Radiological studies	No. of studies done	Abnormal findings seen
USG abdomen	142	Hepatomegaly, liver cyst, spleenomegaly, bowel thickening or mass, loculated collections, ascites (septate/particulate), peritoneal thickening, omental thickening, nodularity, mesenteric lymphadenopathy, calcified lymph node, hydrosalpinx, ovarian cysts, bulky uterus.
Enteroclysis	32	Strictures, dilated small intestine, delay in emptying, irregularity with narrowing of terminal ileum (string sign), filling defect of cecum/ ascending colon with or without vertical shortening.
CTscan abdomen	105	Hepatomegaly, spleenomegaly, liver cyst, hemangioma of liver, bowel mass, pelvic mass, dilated small bowel loops, strictures, ascites, periportal, paraaortic or mesenteric lymph node enlargement, thickening of stomach wall, thickening of colon or rectum, thickening of terminal ileum or small intestine, peritoneal thickening, omental thickening, ovarian cyst, bulky uterus.

Upper GI endoscopy was done in 36 patients for evaluation of upper abdominal pain and in patients with stomach wall thickening reported on imaging studies. It was normal in 26 patients and benign conditions like esophagitis, antral gastritis, peptic ulcers etc. were reported in 7 cases.

In 3 patients of ascites where CT scan abdomen was inconclusive diagnostic laparoscopy findings suggested stomach lesion. In these patients upper GI endoscopy was done after diagnostic laparoscopy and endoscopic biopsy from suspicious stomach lesions picked up adenocarcinoma.

Fifteen patients in whom CT scan abdomen reported thickening of cecum, colon or terminal ileum were further investigated by colonoscopy. Mucosal lesions involving cecum or terminal ileum were noted in 10 patients. Colonoscopic biopsy was insufficient or inconclusive in 7 patients and confirmed malignancy in 3 cases.

Laparoscopic findings

On diagnostic laparoscopy the findings were as per table 5.

Histopathology

At laparoscopy, 36 of these patients had peritoneal tubercles or nodules with or without adhesions and ascites.

Histopathology from the peritoneal nodules established the diagnosis of tuberculosis in 28 patients, whereas metastatic adenocarcinoma was reported in 4 cases and in 6 patients histopathology was inconclusive due to inadequate specimen.

Table 5: Laparoscopic findings.

Laparoscopic findings in patients of chronic abdominal pain	No. of cases 142
Tubercles/nodules (peritoneum, omentum, small bowel)	36
Ascites	44
Adhesions/ bands (postoperative/inflammatory)	21/9
Chronic appendicitis	21
Stricture of small bowel	3
Hyperemic edematous bowel loops	4
Tuboovarian mass, hydrosalphinx,	2
Edematous, inflamed tube and adenexa (PID)	9
Bulky uterus	11
Ovarian cyst/ PCOS	08
Endometriosis	02

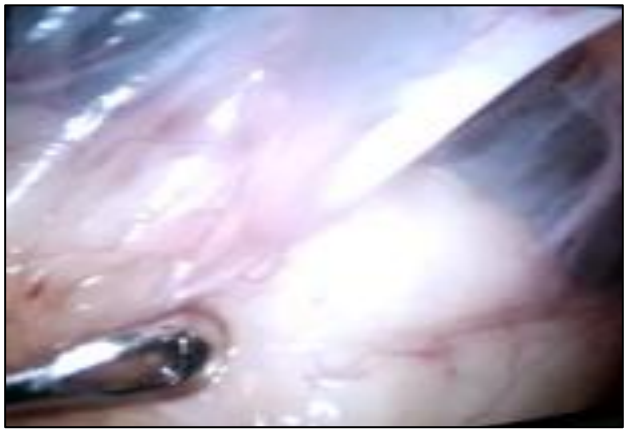

Figure 1: Adhesions pelvic ascites.

Figure 2: Tubercles with minimal.

Histopathology

At laparoscopy, 36 of these patients had peritoneal tubercles or nodules with or without adhesions and ascites. Histopathology from the peritoneal nodules established the diagnosis of tuberculosis in 28 patients, whereas metastatic adenocarcinoma was reported in 4 cases and in 6 patients histopathology was inconclusive due to inadequate specimen.

Figure 3: Long kinky appendix with adhesions.

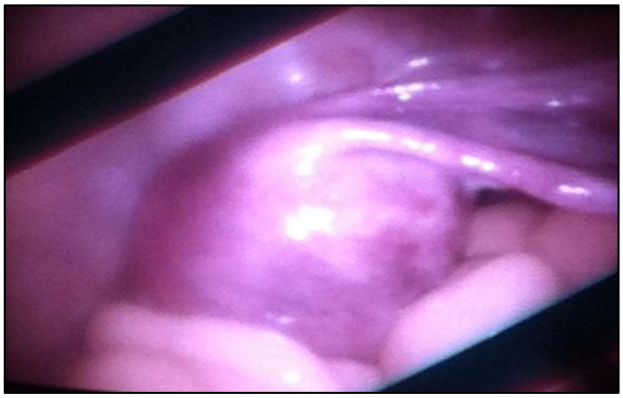

Figure 4: Bulky hyperemic uterus.

Table 6: Histopathology.

Histopathology	No. of cases
Granuloma with giant cell/ lymphocytes	28
Caseation	06
Adenocarcinoma	4
Nonspecific hyperplastic lymphadenitis	8
Inconclusive/ Inadequate specimen	6

Appendectomy was done in 27 patients who underwent laparoscopy for evaluation of recurrent right iliac fossa pain. Recurrent or chronic appendicitis was suspected on laparoscopy if appendix showed thickening, fibrosis or kink, peri-appendicular omental or bowel adhesions.

Appendectomy was also done when appendix was long and laparoscopy did not reveal any abnormal pathology

in the abdomen. Histopathology of appendix was consistent with chronic appendicitis in 21 patients.

Ascitic fluid studies and cytology

Forty-four patients had ascites as seen on laparoscopy. Ascitic fluid was sent for microscopic examination, biochemical analysis, ADA and cytology (Table 6). Ascitic fluid was positive for AFB in only 2 patients. Culture for mycobacterium was requested in 12 cases and was positive in one case. PCR for mycobacterial DNA was done in 6 cases and was positive in two cases. Ascitic fluid ADA was raised in 24 and below 37 U per Liter in 20 cases. Ascitic fluid was sent for cytology in 14 patients and was negative for malignancy in all.

Thus the diagnosis of abdominal tuberculosis was confirmed on microbiological and/or histological examination in 28 patients.

An inferred diagnosis of abdominal tuberculosis was made in 18 patients based on the clinical presentation, radiological imaging and raised ascitic fluid ADA. All 46 of these patients were put on anti-tubercular treatment (DOTS).

Table 7: Final diagnosis after laparoscopy.

Final diagnosis after laparoscopy		No. of cases (n = 142)		Percentage
Abdominal tuberculosis		46		32.39
Adenocarcinoma (stomach, pancreas, colon)		4		02.81
Adhesions		21		14.78
Bands		09		06.33
Small bowel stricture		03		02.11
Recurrent/ chronic appendicitis		21		14.78
Gynaecological pathology	Tubo-ovarian mass	02	32	22.53
	Pelvic inflammatory disease	09		
	Bulky uterus	11		
	PCOS/ benign ovarian cysts	08		
	Endometriosis	02		
No abnormal findings		06		04.22%

Final diagnosis after laparoscopy

Laparoscopic findings and final diagnosis were considered positive if findings seen in laparoscopy, histopathology report, biochemical analysis and cytology attributed to a conclusive diagnosis. The abdominal pathologies found in diagnostic laparoscopy were abdominal tuberculosis (32.39%), adhesions (14.78%) chronic appendicitis (14.78%) and abdominal malignancy (2.81%). Other conclusive diagnosis that could be ascertained by laparoscopy was bands, small bowel strictures and abdominal malignancies. Gynecological pathologies were frequently found in the females patients with chronic abdominal pain (22.53%). Common findings were ovarian cysts, tubo-ovarian mass, pelvic inflammatory disease, bulky uterus, endometriosis etc. (Table 7). The criteria for diagnosing PID laparoscopically were tubal wall edema, hyperemia, and presence of exudates or discharge on the tubal surfaces and fimbriae.

In our study conclusive diagnosis could be established in 136 out of 142 patients. Thus in our study laparoscopy had a diagnostic rate of 95.77%. Six patients had no abnormal findings on laparoscopy and laparoscopic appendectomy was also done in these patients to avoid future diagnostic dilemma. These patients were followed for varying length of time and no ominous findings were observed in these patients.

Table 8: Therapeutic procedures done laparoscopically.

Therapeutic procedures done laparoscopically	No. of cases
Laparoscopic adhesiolysis, band excision	30
Laparoscopic appendectomy	27
Total	**57**

Complications

Four patients had umbilical port site wound infection which was controlled by antibiotics. Three patients had postoperative paralytic ileus necessitating prolongation of hospitalization. There were no major procedure or anesthesia related complications.

DISCUSSION

Clinical symptoms and signs are usually insufficient, ambiguous and often misleading for a conclusive diagnosis in chronic abdominal pain. In our study radiological studies USG, enteroclysis and CT scan did showed strictures, adhesions, dilated bowel loops, bowel

wall thickening, mass lesions and presence of ascites suggesting indirectly about abdominal pathology. But most of these findings are nonspecific and not helpful in reaching a conclusive diagnosis. This fact has been experienced by many authors in different studies on laparoscopy for chronic abdominal pain.[1-5,8,9]

The common causes of chronic abdominal pain were abdominal tuberculosis, gynecological pathology, bands, adhesions, chronic appendicitis and abdominal malignancy in our study. In many developing countries including India infectious disease like tuberculosis is a more common cause of chronic abdominal pain than cancer. In our study also tuberculosis of abdomen (32.39%) was the most common cause for chronic abdominal pain. Many other authors have in their studies reported abdominal Tuberculosis as common cause of chronic abdominal pain. Akeely MH (45.71%), Mallik et al (72%), Athavale et al (30%), Sayed ZK (21.8%).[5-8]

The most common presenting complaints of abdominal tuberculosis are abdominal pain, fever, distension of abdomen and weight loss. Laparoscopic finding in patients of abdominal tuberculosis are tiny peritoneal tubercles or nodules, ascites, bowel mass, adhesions, multiple small bowel strictures, pelvic adhesions, tuboovarian mass, hydrosalpinx, pyosalpinx, perihepatic adhesions (Fitz-Hugh-Curtis syndrome), hyperemic edematous bowel, omental thickening or nodularity and mesenteric adenopathy. Besides directly visualizing the pathology laparoscopy has the advantage of providing tissue and ascitic fluid for histopathology and more definitive tubercular testing.

Conclusive diagnosis of tuberculosis requires microscopic identification of AFB after Ziehl-Neelson stain, culture on Lowenstein-Jensen medium or by characteristic histopathologic findings. Identification of AFB on smears and culture have poor yield and low sensitivity. The sensitivity of polymerase chain reaction (PCR) for mycobacterial DNA of tissue or ascitic fluid is in smear negative patients it is very low (only 48%). Serodiagnosis for detecting Mycobacterial antigens or antibodies has largely failed and sensitivity of serological tests is much low in smear negative cases, extrapulmonary disease, HIV positive patients and children. Ascitic fluid ADA often used for diagnosis of abdominal tuberculosis is not specific but may be positive even when number of Mycobacterium is very low. Specimens with low ADA levels exclude tuberculosis from consideration. Tubercular ascites can be diagnosed by increased levels of ascitic fluid adenosine deaminase, above 40 U per liter. However in cirrhotic patients with low protein ascites, false-negative results for ADA are quite common as well.

In our study tiny peritoneal tubercles or nodules (36 cases) and minimal ascites (44 cases) were distinctly visible on laparoscopy, and tissue and ascitic fluid were retrieved for histological, cytological or further definitive studies. Only four out of 142 patients had findings of peritoneal deposits or thickening on radiological investigations (USG and CT scan abdomen). USG and CT scan abdomen could pick up ascites in 21 cases, whereas ascites was found in 44 cases on laparoscopic examination ($p < 0.01$). Adhesions were reported in 4 cases on radiological investigations and bands could be detected in none of the patients, whereas on laparoscopy 21 patients were found to have adhesions and 9 patients had bands as the cause of chronic abdominal pain ($p < 0.01$). Thus diagnostic laparoscopy clearly scores above the imaging studies in picking up tubercles, nodules, minimal ascites, bands and adhesion. And these findings were found to be clinically significant ($p < 0.01$).

It is thus clear that laparoscopy provides an opportunity for the surgeon to look and see rather than rely on indirect means to presume about the surgical pathology. It also simultaneously provides tissue and ascitic fluid for the all-important confirmation of histological diagnosis and definitive testing for tuberculosis or malignancy. In our study abdominal tuberculosis was confirmed by histological diagnosis in 28 patients and on the basis of clinical features, radiological findings and ascitic fluid ADA as inferred diagnosis in 18 patients. Conclusive diagnosis could be made for various other clinical conditions like abdominal malignancy, adhesions, bands, small intestinal stricture, chronic appendicitis any gynecological diseases.

In our study laparoscopy provided a positive diagnosis in 136 (95.77 %) of the patients of chronic abdominal pain with unsettled diagnosis. So the diagnostic dilemma could be resolved in 95.77% of cases and the remaining patients could be reassured of not having a serious abdominal illness. Laparoscopy has been found to be very effective in establishing a definitive diagnosis in chronic abdominal pain in many other studies. Musharraf et al (86.5%), Amandeep S et al (93.33%), Virendra A (88%), Zafar K (89.1%).[6,8,17,19] Similar observations have also been made by other authors from different countries. Chien MH et al in their study on diagnostic laparoscopy in ascites of unknown origin concluded that laparoscopy with peritoneal biopsy can clarify the causes of unexplained ascites in the majority of cases.[5] It failed to reveal any gross abnormality in only 15% of cases. Sanai FM et al in their systematic review of tubercular peritonitis observed that diagnostic laparoscopy with peritoneal biopsy for histopathological examination is preferred both for the diagnosis of peritoneal tuberculosis and to rule out other diseases such as malignancy.[10] Fatih E et al in their study of 1484 patients, who underwent diagnostic laparoscopy over a twenty year period, observed that laparoscopy remains the most reliable, safest, and quickest method for the diagnosis of peritoneal tuberculosis.[9] Ibrarullah et al, Rai S et al, Mohamed A et al, Bhargava et al, Musharraf H et al and Karvade R et al also in their independent studies have found laparoscopy to be safe, reliable and preferred method for arriving at a conclusive diagnosis in patients

with chronic abdominal pain and abdominal tuberculosis.[12,13,15-18]

In our study also besides laparoscopy and biopsies, therapeutic surgeries were performed laparoscopically in 57 patients. There were no major laparoscopy or anesthesia related complications. Most of patients were discharged in a 2-4 days. Morbidity was 4.92% and there was no mortality. Finding no abnormal pathology on laparoscopic exploration in patients suspected to have malignancy or abdominal tuberculosis is also considered a useful outcome, as this provides reassurance to the patients and avoids further costly investigations and treatment. Thus our study highlights the positive role of laparoscopy in patients of chronic nonspecific abdominal pain.

CONCLUSION

Abdominal pathology should be suspected in patients with chronic abdominal pain and ascites. A diagnostic laparoscopy should be done for histological confirmation as no clinical, laboratory or radiological finding can give a conclusive diagnosis. The role of laparoscopy is expected to become more important and mandatory in the diagnosis and management of chronic abdominal pain. Our study establishes the role of diagnostic laparoscopy as a safe and useful adjunct to other diagnostic modalities in management of chronic abdominal pain.

Clinical significance

In many patients presenting with chronic abdominal pain blood tests, serological tests and imaging studies fail to confirm any diagnosis. Many patients remain undiagnosed for prolong periods because conclusive diagnosis largely depends upon direct visualization of abdominal viscera, histology and further evaluation of ascitic fluid, which requires invasive intervention in form of laparoscopy or laparotomy. A delay results in progression of the underlying disease, prolonged morbidity and complications like perforation and intestinal obstruction which are so common in surgical practice. It not only results in inevitable emergency abdominal surgery but also is associated with morbidity and mortality. The lack of accurate diagnosis leads to undesirable burden of human sufferings and wastage of resources.

A conclusive diagnosis by direct visualization with help of laparoscopy along with histology, culture, PCR or ascitic fluid studies is becoming a necessity in present day scenario for initiation of treatment in patients of chronic nonspecific abdominal pain. It is difficult due to need for invasive access to the involved area i.e. peritoneum, small intestine mainly terminal ileum, ileocecal region, mesenteric lymph nodes, colon, pelvic organs etc. Minimally invasive laparoscopy and peritoneal biopsy thus has an intermediary space in the diagnosis of abdominal pathology by providing an opportunity for directing visualizing the peritoneal cavity and retrieving tissue or ascitic fluid for histology or further evaluation. It can also obviate the need for a full exploratory laparotomy and minimize the surgical trauma in many chronically ill patients. Early diagnosis with the help of laparoscopy allows a prompt treatment to be initiated with advantages for the patients and savings to health care system.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Saxena P, Saxena S. The role of laparoscopy in diagnosis of abdominal tuberculosis. Int Surg J 2016;3:1557-63.
2. Prafull K, Gaur KJBS. Laparoscopy a tool In diagnosis of lower abdominal pain. Indian J Surg. 2004;66(4):216-20.
3. Krishnan P, Vayoth SO, Dhar P, Surendran S, Ponnambathayil S. Laparoscopy in suspected abdominal tuberculosis is useful as an early diagnostic method. Anz J Surg. 2008;78(11):987-9.
4. Akeely MH. The impact of elective diagnostic laparoscopy in chronic abdominal disorders. Saudi J Gastroenterol. 2006;12:27-30.
5. Lin HC, Shiang MW, Chang WH, Chuan SS, Hsin C, Bair MJ. Abdominal tuberculosis in southeastern taiwan: 20 years of experience. J Formos Med Assoc. 2009;108(3):195-201.
6. Sayed ZK, Verma RA, Madhukar KP, Vaishampayan AR, Kowli MS, Vaja C. Role of diagnostic laparoscopy in chronic abdominal pain. Int J Sci Stud. 2015;3(4):31-5.
7. Arshad M, Khamiso T, Hussain A. Yield of diagnostic laparoscopy in abdominal tuberculosis: is it worth attempting? Surgical Laparoscopy, Endoscopy Percutaneous Techniques. 2011;21(3):191-3.
8. Athavale V, Khandalkar S. The role of laparoscopy in chronic abdominal pain. IJSR. 2016;5(4):75-8.
9. Ermis F, Uvanikoglu A. Has the role of diagnostic laparoscopy in a single gastroenterology unit changed over 20 years? Akademik Gastroenterol Dergisi. 2013;12(1):6-8.
10. Sanai FM, Bzeizi KI. Systemic review: tuberculous peritonitis-presenting features, diagnostic strategies and treatment. Aliment Pharmacol Ther. 2005;22:685-700.
11. Demir K, Okten A, Kaymakoglu S. Tuberculous peritonitis-reports of 26 cases, detailing diagnostic and therapeutic problems. Eur J Gastroenterol Hepatol. 2001;13:581-5.
12. Ibrarullah M, Mohan A, Sarkari A, Srinivas M, Mishra A, Sundar TS. Abdominal tuberculosis: diagnosis by laparoscopy and colonoscopy. Trop Gastroenterol. 2002;23(3):150-3

13. Bhargava DK, Shriniwas, Chopra P, Nijhawan S, Dasarathy S, Kushwaha AK. Peritoneal tuberculosis: laparoscopic patterns and its diagnostic accuracy. Am J Gastroenterol. 1992;87:109-12.
14. Han CM, Long CL. Diagnostic laparoscopy in ascites of unknown origin. Chang Gung Memorial hospital 20-year experience. Chang Gung Med J. 2008;31:378-83.
15. Rai S, Thomas WM. Diagnosis of abdominal tuberculosis: the importance of laparoscopy. JR Soc Med. 2003;96:586-8.
16. Mohamed A, Bhat N, Abukhater M, Riaz M. Role of laparoscopy in diagnosis of abdominal tuberculosis. Internet J Infectious Dis. 2009:8(2):12-5.
17. Husain M, Sachan PK, Khan S, Lama L, Rehan NK. Role of diagnostic laparoscopy in chronic and recurrent abdominal pain. Tropical Gastroenterol. 2013;34(3):170-3.
18. Karvande R, Kamble R, Kharade M. A study of role of diagnostic and therapeutic laparoscopy in chronic and recurrent abdominal pain. Int Surg J. 2016;3:1336-40.
19. Amandeep S, Nar. Role of diagnostic laparoscopy in chronic abdominal conditions with uncertain diagnosis. Nigerian J Surg. 2014;20(2):156-67.

Cite this article as: Saxena P. The role of laparoscopy in diagnosis of patients with chronic abdominal pain. Int Surg J 2017;4:326-33.