

Original Research Article

The role of diagnostic laparoscopy in the era of modern imaging techniques: a study from a single center

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ABSTRACT

Background: Despite the tremendous progressive evolution in the field of medicine, wherein, most of the diseases can be diagnosed based on history, clinical examination and investigations, there are quite a number of diseases which remain undiagnosed. It is here, where the role of diagnostic laparoscopy becomes important to reach to a conclusion for further management of patients.

Methods: This study comprising of 70 patients undergoing diagnostic laparoscopy at SKIMS over a period of 4 years. This study was done to evaluate the role of diagnostic laparoscopy in patients with acute and chronic abdominal conditions wherein final diagnosis could not be achieved after all necessary imaging, serological, cytological, and microbiological investigations.

Results: Out of 70 patients subjected to diagnostic laparoscopy in our study, the commonest indication was as cites of undetermined etiology (42.9%) followed by chronic abdominal pain (25.7%) diffuse liver disease (11.4%) acute abdominal pain (SAIO, cholecystitis, acute appendicitis, PID, endometriosis) (5.7%) abdominal tuberculosis (4.3%) focal liver disease (2.9%) bleeding per rectum (2.9%) abdominal malignancy (2.9%) and primary infertility (1.4)%. The post diagnostic laparoscopy outcome (final diagnosis) were abdominal malignancy 22 (31.4%) followed by abdominal tuberculosis 16 (22.9%) diffuse liver disease 6 (8.6%) focal liver disease 6 (8.6%) PID 4 (5.7%) SAIO 4 (5.7%) post-operative pelvic adhesions 3 (4.3%) Meckel's diverticulum 2 (2.9%) abdominal plus pulmonary tuberculosis 1 (1.4%), endometriosis 1 (1.4%), ovarian cyst 1 (1.4%), pseudomyxoma peritonei 1 (1.4%), chronic appendicitis 1 (1.4%) and inconclusive 2 (2.9%). Diagnostic laparoscopy confirmed pre-operative diagnosis in 10 (14.3%) patients. In 29 (41.4%) patients pre-operative diagnosis was corrected by diagnostic laparoscopy. In 29 (41.4%) patients diagnosis was made only after diagnostic laparoscopy.

Conclusions: Diagnostic laparoscopy is a safe, quick, and effective adjunct to non surgical diagnostic modalities, for establishing a conclusive diagnosis with high percentage of accuracy in diagnosis and impact in further management in selected patients.

Keywords: Diagnosis, Diagnostic laparoscopy, Modern investigations

INTRODUCTION

Diagnostic laparoscopy (DL) is minimally invasive surgical procedure that allows an endoscopic examination of the peritoneal cavity which facilitates visualization of more than two thirds of the liver surface, gallbladder,

spleen, falciform ligament, parietal peritoneal surface, serosal aspects of the gastrointestinal (GI) tract and the pelvic organs directly.¹ The abdominal organs can be viewed directly with video images and documentation achieved. Diagnostic laparoscopy provides an intermediate option avoiding full exploratory laparotomy

and minimizing the surgical trauma in chronically ill patients. The video image of the liver, stomach, intestines, gallbladder, spleen, peritoneum, and pelvic organs can be viewed on a monitor after insertion of a telescope into the abdomen. Manipulation and biopsy of the viscera is possible through additional ports.

Despite all the modern era investigations like USG, contrast radiology, computed tomography scan, endoscopy, etc. many times we come across various pathological conditions where the diagnosis remains inconclusive. It is where the role of diagnostic laparoscopy becomes important to reach to conclusion for further management of patients. Imaging capabilities of the new techniques do overlap with DL and can accomplish something that DL can never do. These modalities are useful in making accurate diagnosis but also produce findings that may require visual clarifications. Ultrasound requires high professional skill and findings remain dubious in obese patients and gaseous distention of bowel loops. Lesions less than 1 cm cannot be identified and the parietal peritoneum cannot be assessed by the imaging techniques. In contrast, DL can identify lesions as small as 1 to 2 mm in size which can be biopsied with pinpoint accuracy under direct vision. DL provides the capability to obtain large histological specimens as compared to imaging-directed biopsies which are more of a cytological than histological examination. Although laparoscopy was planned basically for diagnosis of disease, sometimes it also helps in treating the aetiology in the same session so called as therapeutic laparoscopy. In the modern era, simultaneous laparoscopy therapeutic intervention is performed whenever required. The laparoscope allows surgeon to perform both minor and complex surgeries with a few small incisions in the abdomen. There are a number of advantages to the patient with laparoscopic surgery versus an open procedure. These include reduced pain due to smaller incisions and haemorrhage, and shorter recovery time.^{2,3}

The aims and objectives of the study was done to evaluate the role of diagnostic laparoscopy in patients with acute and chronic abdominal conditions wherein final diagnosis could not be achieved after all necessary imaging, serological, cytological, and microbiological investigations.

METHODS

Study design: Prospective observational study.

Study area: The study was conducted at Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Department of General And Minimal Invasive Surgery, Srinagar after obtaining approval from Institutional Ethical Committee.

Study population: The Study comprised total of 70 patients undergoing diagnostic laparoscopy (DL) for different indications.

Study period: The study was conducted over a period of 4 years.

Inclusion criteria

All the patients above 10 years with any suspected intra-abdominal pathology wherein we could not reach to a diagnosis conclusively were subjected to diagnostic laparoscopy.

Exclusion criteria

- Following patients were excluded from the study:
- Patients <10 years of age
- Unstable haemodynamic conditions
- Pregnancy
- Patients with coagulation disorders
- Patients with markedly distended bowel loops
- Patients with absolute contraindications for pneumoperitoneum like severe COPD, cardiac arrhythmias.

After thorough history and clinical examination, all the patients were subjected to following investigations before diagnostic laparoscopy

- Complete haemogram, kidney and liver function test
- Tumor markers like carcinoembryonic antigen (CEA), CA125 and CA19-9 were determined whenever suspected.
- Ultrasonographic examination of the abdomen and pelvis was done in all patients.
- Computerized tomography and/or magnetic resonance imaging were done as per clinical information.
- Imaging-guided fine-needle aspiration biopsies of focal lesions were done whenever possible.
- Ascitic fluid examination including total proteins, albumin, cell count, lactate dehydrogenase(LDH), adenosine deaminase (ADA), PCR for tuberculosis and cytology for malignant cells were done.
- Other ancillary studies like upper and lower GI endoscopies and endoscopic retrograde cholangiopancreatography (ERCP) and serological markers for viral, autoimmune or metabolic diseases were performed as deemed necessary

In all patients diagnostic laparoscopy was done electively under general anesthesia after preoperative anesthetic check-up.

The two ports technique was used routinely employing 10 mm sub umbilical port for telescope and 5 mm port for probing, diathermy and biopsy in the relevant abdominal quadrant. An additional 5 mm port was inserted only if necessary. The whole peritoneal cavity, including the pelvis, was thoroughly examined routinely. The impact of the procedure was considered to be positive if the laparoscopy revealed pathology or when the suspected pathology was excluded. In patients where a definitive

pathology was found, an attempt was made to take biopsy for histopathological examination to make the diagnosis more conclusive. With regard to this, the option for conversion to open procedure was kept and prior informed consent was taken from the patient pre-operatively. In patients where no diagnosis could be established after diagnostic laparoscopy, the diagnostic laparoscopy was said to be inconclusive.

RESULT

A total of 70 patients (21 male, 49 female) underwent diagnostic laparoscopy during the 4-year period from 2012 to 2015. The age range of the patients was 15-80 years with a mean age of 36.4 years. Pain was the most common presenting symptom in 62 patients (88.6%). Vomiting was 2nd most common complaint being present in 31 patients (44.3%) followed by loss of appetite being present in 30 patients (42.9%), distension in 26 patients (37.1%), loss of weight 20 patients (28.6).

The other complaints include (altered bowel habits present in 11 patients (15.7%), dysuria 7 patients (10%),

fever 5 patients (7.1%) and bleeding per rectum being present in 2 patients (2.9%).

Out of 70 patients subjected to diagnostic laparoscopy in our study, the commonest indication was ascites of undetermined etiology (42.9%), followed by chronic abdominal pain (25.7%), diffuse liver disease (11.4%), acute abdominal pain [SAIO, cholecystitis, acute appendicitis, PID, endometriosis] (5.7%), abdominal tuberculosis (4.3%), focal liver disease (2.9%), bleeding per rectum (2.9%), abdominal malignancy (2.9%) and primary infertility (1.4%) (Table 1).

The post diagnostic laparoscopy outcome (Final diagnosis) (Table1) were abdominal malignancy 22 (31.4%) followed by abdominal tuberculosis 16 (22.9%), diffuse liver disease 6 (8.6%), focal liver disease 6 (8.6%), PID 4 (5.7%), SAIO 4 (5.7%), post-operative pelvic adhesions 3 (4.3%), Meckel’s diverticulum 2 (2.9%), abdominal plus pulmonary tuberculosis 1(1.4%), endometriosis 1 (1.4%), ovarian cyst 1 (1.4%), Pseudomyxoma peritonei 1 (1.4%), chronic appendicitis 1 (1.4%) and inconclusive 2 (2.9%).

Table 1: Indications and outcome in patients undergoing diagnostic laparoscopy.

Provisional diagnosis	No.	Percentage (%)	Final diagnosis	No.	Percentage (%)
Ascites of undermined etiology	30	42.9	Diffuse liver disease	6	8.6
Chronic abdominal pain	18	25.7	Focal liver disease	6	8.6
Diffuse liver disease	8	11.4	Abdominal TB	16	22.9
Focal liver disease	2	2.9	Abdominal malignancy	22	31.4
Acute abdominal pain (SAIO, cholecystitis, acute appendicitis, PID, endometriosis)	4	5.7	Meckels diverticulum	2	2.9
Abdominal TB	3	4.3	Pelvic adhesions	3	4.3
Bleeding P/R	2	2.9	Chronic appendicitis	1	1.4
Abdominal malignancy	2	2.9	PID	4	5.7
Primary infertility	1	1.4	SAIO	4	5.7
			Abdominal+pulmonary TB	1	1.4
			Endometriosis	1	1.4
			Ovarian cyst	1	1.4
			Pseudomyxoma peritonei	1	1.4
			Inconclusive	2	2.9
Total	70	100	Total	70	100

Table 2: Effect of diagnostic laparoscopy (DL) on diagnosis.

Diagnostic status	No. of patients	% age
Confirmed Dx	10	14.3
Corrected Dx	29	41.4
Diagnosis after DL	29	41.4
Failed	2	2.9

Out of 70 patients in study, diagnostic laparoscopy confirmed pre-operative diagnosis in 10 (14.3%) patients. In 29 (41.4%) patients pre-operative diagnosis was corrected by diagnostic laparoscopy. In 29 (41.4%) patients, diagnosis was made only after diagnostic laparoscopy. In 2 (2.9%) patients diagnostic laparoscopy failed to reach to a definitive diagnosis (Table 2). There was 100% impact of diagnostic laparoscopy on the management of all 70 patients in our study since in the 2 patients with negative laparoscopy, at least tuberculosis

and malignancy were excluded, the sensitivity of diagnostic laparoscopy being 97.14%.

DISCUSSION

Diagnostic laparoscopy—a minimal access surgical procedure that allows the visual examination and documentation of intra-abdominal organs in order to detect pathology. Although laparoscopy was first described at the turn of last century, many years lapsed before evolution of instrumentation and experience allowed internal organs to be adequately viewed and biopsies to be obtained.⁴ General surgeons were slow in adopting laparoscopy as a diagnostic technique. With the advent of laparoscopic cholecystectomy, general surgeons became more interested in other uses of laparoscopy, including its diagnostic applications.⁵ Some patients with chronic abdominal complaints constitute a difficult group in terms of the diagnosis. The search for pathology in these patients usually entails a series of laboratory and non-invasive or even invasive tests and procedures.⁶ Surgeons are sometimes consulted when a battery of relevant investigations fail to reveal the diagnosis or when a tissue diagnosis is deemed necessary for initiation of a specific therapy.^{6,7} In such cases, laparoscopy provides an effective diagnostic tool avoiding a formal exploratory laparotomy. It minimizes the surgical trauma, particularly in chronically ill patients with chronic abdominal disorders, resulting in a better outcome and making a short stay possible.⁸ Imaging capability of newer diagnostic techniques does overlap with diagnostic laparoscopy but for the sake of visual clarification, diagnostic laparoscopy has an edge. Diagnostic laparoscopy can visualize peritoneal lesions as small as 1 to 2 mm in size whereas the radiological imaging techniques cannot identify lesions < 1cm in size.

Ascites (42.9%) was the major indication for diagnostic laparoscopy in our patients. These findings were consistent with other studies as well. Amarapurkar et al in their study showed ascites (51.1%) being the major indication for diagnostic laparoscopy.⁹

In our study chronic abdominal pain was second most common indication for diagnostic laparoscopy present in 25.7% of patients. In a study by Srinivasulu et al, 80% patients had pain abdomen as indication for diagnostic laparoscopy.¹⁰

Intra-abdominal malignancy (31.4%) and abdominal tuberculosis (22.9%) remained the most common final diagnoses in our study. These results are consistent with other similar studies done by Amarapurkar et al and Al-Akeely et al on the role of diagnostic laparoscopy on diagnosis of abdominal conditions.^{9,11} Abdominal tuberculosis sometimes closely mimics malignancy in clinical presentation. Laboratory and radiological investigations can only suggest, but not confirm, the diagnosis.^{12,13} Ascites, loss of appetite, loss of weight and abdominal pain were among the common features of

tuberculosis and malignancy. Although recent advances in diagnosis of tuberculous ascites like ADA and PCR for mycobacterial tuberculosis have improved efficacy, they still lack specificity and are costly. ADA is of no utility in patients of cirrhosis with tuberculosis. There is no specific biological marker for tuberculosis.¹⁴ Diagnostic laparoscopy has a great deal to offer in the early diagnosis of abdominal tuberculosis.¹⁵ Udawadia suggests that the common findings in abdominal TB are peritoneal or visceral tubercles, varying in size from 2mm to 1cm.¹⁶ In current study abdominal tuberculosis was finally found to be present in 16 patients (22.9%). Laparoscopic findings in tuberculous abdomen are omental, peritoneal and/or liver nodules with or without ascites.¹² Similar findings may be found in intra-abdominal malignancy. Laparoscopy and biopsy are accurate in differentiating this potentially treatable disease from potentially fatal malignancies. Negative laparoscopic exploration in patients suspected to have malignancy can be regarded a 'useful outcome', as this provides reassurance to patient and physician and avoids the performance of further expensive diagnostic tests as well as unnecessary laparotomy if not feasible.⁶ A definite diagnosis of tubercular peritonitis is established only on diagnostic laparoscopy examination with peritoneal biopsy and it helps in excluding other causes of ascites.¹⁷

In spite of widespread use of percutaneous liver biopsy, there are potential limitations to it. Percutaneous liver biopsy can have a sampling error of 10% to 20% with a tendency to underestimate cirrhosis by 30%.^{18,19} Amarapurkar et al reported usefulness of diagnostic laparoscopy in diagnosis of cirrhosis and liver tumors.²⁰ It offers a direct view of the liver and facilitates targeted biopsies for histological confirmations. In an elegant study, Poniachik et al demonstrated that DL with biopsy is the gold standard for diagnosis of liver cirrhosis.¹⁹

Diagnostic laparoscopy in the present study was able to establish diagnosis in 68 patients (97%) and excluded suspected pathology in the remaining two patients. So the procedure had a positive impact on the management in all studied patients.

Diagnostic laparoscopy has also widened the horizon in the field of hepatology.²¹ In the current study, 6 out of 70 patients were diagnosed as having focal liver disease (8.6%) (2 benign liver cysts, 3 liver hydated cysts and 2 hepatic adenomas) and 6 were diagnosed as having diffuse liver disease (8.6%) (3 cirrhosis, 1 non-alcoholic steatohepatitis, 2 hepatocellular carcinoma), a total of 12 patients (17.2%) having liver disease. Similar results were obtained by Amarapurkar et al in their study, with about 16.5% of cases of liver diseases diagnosed by DL.⁹ In our study, 17.2% of the patients had liver pathology. In our study diagnostic laparoscopy suggested liver pathology in 86% of the cases. Herrera et al also reported the detection rate of liver lesions and a diagnostic yield up to 95% with laparoscopy.²²

Chronic appendicitis is a very common pathology missed by normal radiological investigations such as ultrasound and sometimes even on CT scan. The advantage of laparoscopy in these patients is that they can be provided therapy in the same setting. Kolts et al in their study of 44 children with chronic lower abdominal pain, showed resolution of symptoms in 70.5% of cases after appendectomy.²³ In our study, we had one patient of chronic appendicitis who was relieved of symptoms of chronic pain after laparoscopic appendectomy without any significant complications.

Laparoscopy is indicated in mild cases of PID to confirm diagnosis and in severe cases for treatment. Indications for laparoscopy in PID are especially strong in young women, in whom early diagnosis is essential to preserve future fertility.²⁴ In our study 4 (5.7%) cases of PID were diagnosed by diagnostic laparoscopy. Conventional methods failed to diagnose any of the cases of PID in our study.

Laparoscopy as a minimally invasive approach has emerged as both diagnostic as well as therapeutic means to deal with various surgical conditions including Meckel's diverticulum. Its ability to visualize whole of the abdomen makes it a diagnostic choice for various undiagnosed intra-abdominal pathologies. There are several studies stating the safe and effective use of laparoscopy in case of complicated Meckel's diverticulum.²⁵⁻²⁹ In our study two cases of Meckel's diverticulum were diagnosed by diagnostic laparoscopy. These patients presented with bleeding per rectum and severe anaemia. These patients had undergone CT enterography, RBC scan and Meckel's scan but were unable to diagnose by these conventional methods of diagnosis.

Pseudomyxoma peritonei was diagnosed on findings of pale translucent jelly like material in the abdominal cavity as well as attached to peritoneal surface.³⁰

Diagnostic laparoscopy provides immense help in diagnosis and staging of gastrointestinal malignancies including lymphomas. Laparoscopic lymph node biopsy safely provides adequate tissue for full histological evaluation on an outpatient basis in most patients with intra-abdominal lymphoma.³¹ The stomach is the most frequent site of malignant lymphoma of the GI tract (60 – 75%) of cases.^{32,33} One of our patients in our study had gastric lymphoma on DL. There was a large polypoidal mass with nodular irregularities in gross appearance. The diagnosis was confirmed by tissue biopsy taken during diagnostic laparoscopy.

Negative laparoscopic exploration in patients suspected to have malignancy is considered a useful outcome, as this provides reassurance to the patient and physician, thus avoiding the execution of further expensive diagnostic tests.³⁴

In this study, we demonstrate the role of diagnostic laparoscopy in the era of modern imaging and show that it continues to be useful in patients in whom diagnosis and extent of disease are unclear or the diagnosis is still in dilemma in spite of having a wide range of modern investigations available.

CONCLUSION

Diagnostic laparoscopy is a safe, quick, and effective adjunct to non surgical diagnostic modalities, for establishing a conclusive diagnosis with high percentage of accuracy and impact in further management in selected patients. It is safe, less time consuming, cosmetic with lesser complications and reduces chances of unnecessary laparotomies. It is superior to imaging modalities like CT abdomen for staging of GI malignancies. It reduces patient suffering by establishing definitive diagnosis and thus early initiation of definitive treatment. It is therapeutic in some of the cases by performing definitive procedure. Diagnostic Laparoscopy is specifically important in females of reproductive age group with pain abdomen to confirm or refute pelvic pathology.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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