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A prospective observational study on role of laparoscopy in patients presenting with abdominal trauma in a tertiary care government medical college in Uttar Pradesh

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ABSTRACT

Background: Laparoscopic surgery, also called minimal access surgery or key hole surgery, is a modern surgical technique, in which operations are performed far from their location through small incisions (usually 0.5–1.5 cm). **Aims and Objectives:** The aim of the study was to study the role of diagnostic laparoscopy (DL) in reassessing solid organ injury, diagnosing occult injuries, and selecting patients for conservative or operative line of management in cases of abdominal trauma with equivocal findings on CT scan And to study the role of therapeutic laparoscopy in a select group of cases where it can follow the initial DL and avoid laparotomy. **Materials and Methods:** The prospective study source of data will be from patients a presenting with abdominal trauma in the emergency at M.L.B. Medical College Jhansi (Trauma Centre). The duration of study will be from May 2021 till December 2022. We concluded that total study size of 152 patients for the assessment of diagnostic and therapeutic laparoscopy. **Results:** Among this, 130 (85.53%) were male patients. Females were 22 (14.47%). Most of the abdominal trauma caused by road traffic accidents 116 (76.32%). Other mode of injuries are assault, fall from height, gunshot injuries, and working machine-related injuries. Most commonly involved age groups are young adults between 21 and 30-year age group (42.76%). Most commonly injured organ is the spleen, i.e., 45 cases (30%) followed by liver, i.e., 23 cases (18.63%). **Conclusion:** In our study, we concluded that laparoscopic surgery can be considered an alternative option over conventional laparotomy.

Key words: Laparoscopy; Abdominal trauma; Laparotomy

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INTRODUCTION

Laparoscopic surgery, also called minimal access surgery (MAS) or keyhole surgery, is a modern surgical technique, in which operations are performed far from their location through small incisions (usually 0.5–1.5 cm).[1] The key element in laparoscopic surgery is the use of a laparoscope long fiber-optic cable system which allows viewing of the affected area by snaking the cable from a more distant but more easily accessible location.[2] Road traffic accidents are the most common cause of abdominal injuries. For abdominal trauma patients require early diagnosis, prompt resuscitation, rapid initial evaluation, and management guided by perfect surgical skills.[3] In abdominal trauma, most commonly injured organ is spleen (45–55%), liver (30–35%) followed by intestine, kidney, pancreas, stomach, urinary bladder, etc.[4] Previously, all trauma patients ended up in laparotomy and were managed according to the nature of injuries, and in such cases, possibility of negative laparotomy was relatively high. With new research and advancements in the diagnostic field such as ultrasonogram and CT scan abdomen, chances of negative laparotomy have significantly reduced. Furthermore, with the advent

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of laparoscopy and MAS, there newer roles have been defined in diagnosis and definitive surgical management of abdominal trauma.[5] Diagnostic laparoscopy (DL) for the evaluation of injuries in patients with abdominal trauma has been shown to decrease the morbidity and mortality associated with mandatory laparotomy.[6] Hence, following study was undertaken to find out the role of minimal invasive surgery in the diagnosis and management of abdominal trauma.

Aims and objectives

1. To study the role of DL in reassessing solid organ injury, diagnosing occult injuries, and selecting patients for conservative or operative line of management in cases of abdominal trauma with equivocal findings on CT scan
2. To study the role of therapeutic laparoscopy in a select group of cases where it can follow the initial DL and avoid laparotomy.

MATERIALS AND METHODS

Study site

The prospective study source of data will be from patients a presenting with abdominal trauma in the emergency at MLB Medical College Jhansi (Trauma Centre). The duration of the study was from May 2021 till December 2022.

Study population

All age groups who are admitted in general surgery with abdominal trauma was studied.

Sample size

We concluded that total study size of 152 patients for the assessment of diagnostic and therapeutic laparoscopy.

Inclusion criteria

- Patients presenting with signs and symptoms of abdominal trauma to our hospital.

Exclusion criteria

- Severe head injury
- Severe chest trauma
- Polytrauma
- Uncontrolled coagulopathy
- Hemodynamically unstable patients
- Patients with a history of multiple previous laparotomies.

Method of collection of data

Collection of data in the form of clinical history, physical examination, relevant laboratory investigations, imaging modalities, surgical procedure, i.e., laparoscopy.

Mode of selection of cases and methods of analysis

Data were collected in a pre-tested pro forma, meeting the objectives of the study. The data for the purpose of study include various parameters such as age, sex, and clinical features. The analysis of data was made with appropriate statistical parameters.

Statistical analysis

Quantitative data will be analyzed using mean, SD, and percentage. Qualitative data will be analyzed using the Chi-square test; sensitivity and specificity will be used as statistical measure of performance. $P<0.05$ will be considered statistically significant SPSS 16.0 will be used as statistical software.

RESULTS

In our study total size of 152 patients were taken for the assessment of diagnostic and therapeutic laparoscopy. Among this, 130 (85.53%) were male patients. Females were 22 (14.47%). Most of the abdominal trauma caused by road traffic accidents 116 (76.32%). Other mode of injuries are assault, fall from height, gunshot injuries, and working machine-related injuries. Most commonly involved age groups are young adults between 21 and 30-year age group (42.76%). Most commonly injured organ is the spleen, i.e., 45 cases (30%) followed by liver, i.e., 23 cases (18.63%). In our study, we concluded that laparoscopic surgery can be considered an alternative option over conventional laparotomy.

DISCUSSION

This prospective study was designed to determine that laparoscopy is a safe and accurate method for abdominal evaluation in the trauma patients from our institute M.L.B. Medical College Jhansi, Uttar Pradesh. We conducted a prospective observational study of 152 patients. Among this, 130 (85.53%) were male patients. Females were 22 (14.47%). Most of the abdominal trauma caused by road traffic accidents 116 (76.32%). Other modes of injuries are assault, fall from height, gunshot injuries, and working machine-related injuries. Most commonly involved age groups are young adults between 21 and 30-year age group (42.76%). Most commonly injured organ is the spleen, i.e. 45 cases (30%) observed in our study. Liver is the second most common organism involved, i.e., 23 cases (18.63%) in trauma followed by spleen. Other injured organs are small bowel, large bowel, pancreas, and mesentery.

In the earliest work on laparoscopy in abdominal trauma, Gazzaniga et al., (1976)[7] evaluated 37 patients; in 14 of these patients, laparotomy was avoided because of a

negative DL. There were no false-negative investigations. They concluded that the use of DL in abdominal trauma was useful to decrease the rate of negative laparotomy.

In the largest study on laparoscopy in PT, Ivatury's group, Zantut et al., (1997)[8] reported a multicenter retrospective study of 510 hemodynamically stable patients who underwent DL for PT (penetrating trauma) The inclusion criterion for the study were a hemodynamically stable patient who had penetration of the anterior fascia by a stab wound or a gunshot wound with a possible intraperitoneal injury. Negative or nontherapeutic laparotomy was avoided in 303 (59.4%) patients, of whom 26 patients received a therapeutic laparoscopic intervention.

In Kaban et al.,[9] laparoscopy resulted in sensitivity for abdominal injury exceeding 90%, with a specificity of 100%. Furthermore, it proved to be a safe modality without direct operative or postoperative morbidity.

Sex distribution ratio (Table 1) in our study males is affected more than females. 85% are males. This may be due to the involvement of male mainly into travelling and alcohol abuse.

Age distribution (Table 2) in our study the most common age group involved is 21–30 years; the median age group in our study is 30 years.

Mode of injury (Table 3) in the present study it shows that the abdominal trauma is mainly due to road traffic accidents 116 (76.32%) This may be due to increased transportation and mobilization of people from here to there mainly through the vehicles.

Table 1: Gender-wise distribution

Gender	Laparoscopy, n (%)	Laparotomy, n (%)	Total, n (%)	χ^2, P
Male	108 (87.1)	22 (78.57)	130 (85.53)	1.34,
Female	16 (12.9)	6 (21.43)	22 (14.47)	0.25
Total	124 (100)	28 (100)	152 (100)	(NS)

NS: Not significant

Table 2: Age-wise distribution

Age group (years)	Laparoscopy, n (%)	Laparotomy, n (%)	Total, n (%)	χ^2, P
0–10	3 (2.42)	2 (7.14)	5 (3.29)	12.0,
11–20	10 (8.06)	4 (14.29)	14 (9.21)	0.03
21–30	57 (45.97)	8 (28.57)	65 (42.76)	
31–40	21 (16.94)	5 (17.86)	26 (17.11)	
41–50	16 (12.9)	4 (14.29)	20 (13.16)	
51–60	11 (8.87)	0	11 (7.24)	
>60	6 (4.84)	5 (17.86)	11 (7.24)	
Total	124 (100)	28 (100)	152 (100)	

Incidence and pattern of organ injury (Table 4). Splenic injury is most commonly seen in abdominal trauma in this present series followed by liver.

Mode of management: In this present series, laparoscopy is used as a diagnostics as well as therapeutic tool for patients with abdominal trauma. Here, 152 cases were studied, out of which only 28 were converted into exploratory laparotomy. All patients underwent emergency ultrasonography and CT scan abdomen (in hemodynamically stable patients). If the CT scan abdomen was inconclusive or noted some solid organ injury or hollow viscus perforation, in hemodynamically stable patient's diagnostic and therapeutic laparoscopy was done. Among this, CT scan was inconclusive in 15 patients to detect the hollow viscus injury where DL was done which was suggestive of hollow viscus injury, so therapeutic laparoscopy also done. In our study, 45 patients had splenic injury in the form of contusion, laceration, or tear with no active bleeding from the sight of injury with non-expanding hematoma in surrounding. All these cases managed laparoscopicaly. Among this, three cases only needed open splenectomy. 23 liver injury cases were managed laparoscopically. Others were small and large bowel, mesenteric tear, and pancreatic injury. Most of the cases 124 (81%) managed laparoscopically, only 28 cases needed exploratory laparotomy.

Diagnostic accuracy of laparoscopy

Diagnostic accuracy in our study is of 97% which is correlating with the other series (89–97%) (Table 5). Hence, laparoscopic has got tremendous role in the diagnosis of abdominal trauma.

Number of port's used

In present study, we had used 3–5 ports. Most commonly 3 in number, out of which 2 are of 5 mm 1 is of 10 mm which is common in all cases. Umbilical port is usually of 10 mm. 4th and 5th trocar usually needed in complex injuries to left lobe of liver, posterior pole of spleen or for diaphragmatic or stomach or small bowel injuries for better visualization. It is usually taken in subxiphoid/eipgastic region.

Chol and Lim[10] series number of port used were three-umbilical port (10 mm), right and left port-5 mm, 10 mm and 12 mm.

Total duration of surgery

Average duration of surgery is 60 min, approximately 60 min to 90 min. Patients had less surgical stress and less post anesthetic complications compared with open surgery, where surgery time average is 140 min. In Chol and Lim[10] series average duration of surgery was 142 min.

Failure of laparoscopy and conversion to laparotomy

In our study, only 28 cases required conversion to laparotomy. Hence, the rate of failure of laparoscopy and

Table 3: Mode of injury

Mode of injury	Laparoscopy, n (%)	Laparotomy, n (%)	Total, n (%)	χ^2, P
RTA	93 (75)	23 (82.14)	116 (76.32)	17.89, 0.003
Assault	12 (9.68)	2 (7.14)	14 (9.21)	
Fall from bike	7 (5.65)	0	7 (4.61)	
Fall from height	10 (8.06)	0	10 (6.58)	
Gunshot injury	0	3 (10.71)	3 (1.97)	
Working machine	2 (1.61)	0	2 (1.32)	
Total	124 (100)	28 (100)	152 (100)	

RTA: Road traffic accident

Table 4: Type of organs involved

Injured organ	Laparoscopy, n (%)	Laparotomy, n (%)	Total, n (%)	χ^2, P
Splenic injury	30 (24.19)	0	30 (19.74)	HS
Splenic injury grade 4	5 (4.03)	0	5 (3.29)	
Splenic laceration	10 (8.06)	0	10 (6.58)	
Ascending colon injury	5 (4.03)	0	5 (3.29)	
Gastric and ileal perforation	0	1 (3.57)	1 (0.66)	
Gastric and jejunal perforation	0	2 (7.14)	2 (1.32)	
Gastric perforation	0	1 (3.57)	1 (0.66)	
Ileal perforation	15 (12.1)	2 (7.14)	17 (11.18)	
Jejunal perforation	7 (5.65)	0	7 (4.61)	
Jejunal perforation with mesenteric tear	3 (2.42)	0	3 (1.97)	
Large bowel perforation	0	6 (21.43)	6 (3.95)	
Large cecal perforation	0	4 (14.29)	4 (2.63)	
Large colon perforation	0	1 (3.57)	1 (0.66)	
Large duodenal perforation	0	2 (7.14)	2 (1.32)	
Large gastric perforation	0	5 (17.86)	5 (3.29)	
Large ileal perforation	0	1 (3.57)	1 (0.66)	
Sigmoid colon perforation	5 (4.03)	0	5 (3.29)	
Large jejunal perforation	0	2 (7.14)	2 (1.32)	
Liver injury	23 (18.55)	0	23 (15.13)	
Mesenteric tear	11 (8.87)	1 (3.57)	12 (7.89)	
Pancreatic injury	10 (8.06)	0	10 (6.58)	
Total	124	28	152 (100)	

HS: Highly significant

Table 5: Distribution according to hospital stay

Hospital stay (days)	Mean±SD	95% CI	Unpaired t value	P
Laparoscopy	4.56±1.27	4.34–4.78	14.19	<0.0001
Laparotomy	9.78±1.85	9.45–10.10		

CI: Confidence interval, SD: Standard deviation

conversion to open laparotomy in our study is 18.42%. In Pascal et al.,[11] study rate of conversion to open laparotomy was 18.8%.

Blood loss and Number of blood transfusions

On an average blood loss in our study in laparoscopy is 160.52±47.75 (Mean ± SD) ml., amount of blood required for any laparoscopic surgery in the present study is approximately 1unit (1 unit=350 cc) of whole blood on an average is required in each patients who is hemodymically found to be stable. In open surgery, average blood loss is 427.5±101.42 (Mean±SD) And 2 units of blood transfusion in laparotomy.

Postoperative management

Most of the patients kept NBM for 3–4 days day 3rd we started liquids orally. Only few complicated patients kept NBM for 5–6 days. Almost 80% of patients made mobile on 3rd POD with or without drain *in situ* which is helpful in early recovery which is the main advantage of patients treated laparoscopically. In a study by Pascal et al.,[11] patients made mobile on average 4th+1 POD. Drain removal done approximately in 50% of cases on 3rd POD, 36% cases on 4th POD. Most of the patients were discharge between 4th and 8th days. Mostly are on 7th day. Stitches are removed in 80% of patients in 8th POD, while in others stitches removed in follow up. Other study like Chol and Lim[10] mentioned mean hospital stay of 9.8 days while Pascal et al.,[11] has mentioned 4 days of hospital stay.

Limitations of the study

This was a single-centered study.

CONCLUSION

- Males are commonly involved than females. In our study, most common cause of abdominal trauma was road traffic accidents
- Abdominal injuries are becoming more common than before with road traffic accidents
- Over all spleen and liver are commonly injured solid organ, other solid organs such as pancreas and hollow viscera - small bowel and large bowel, and mesentery are also commonly injured
- All the patients were informed about the procedure and were assured regarding surgery and after proper pre-anesthetic checkup and all routine investigations were taken for surgery
- Laparoscopy is newly emerging diagnostic as well as therapeutic modality in the management of blunt and penetrating abdominal injury which is getting acceptance worldwide, subject to availability of equipments and skilled team
- Laparoscopy provides early oral intake and early mobilization of the patient which helps in fast recovery and early resumption of work
- Laparoscopy significantly reduces the number of negative laparotomies. In selected cases, laparoscopic repair (e.g. Bowel perforation) can also avoid laparotomy
- Postoperative complications are less, early mobilization, early return to work, less chances of incisional hernia, less incidence of surgical site infection, and lesser blood loss are other advantages over conventional laparotomy.

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Authors Contribution:
AG- Definition of intellectual content, literature survey, prepared first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation and submission of article; **CG-** Concept, design, clinical protocol, manuscript preparation, editing, and manuscript revision, design of study, statistical analysis and interpretation, review manuscript, review manuscript, literature survey, coordination and manuscript revision.

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