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Original Article

DIAGNOSTIC LAPAROSCOPY REDUCES THE RATE OF NEGATIVE LAPAROTOMY IN TRAUMA PATIENTS

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Abstract

Background: The last century has witnessed immense evolvement of management of patients with abdominal trauma. Moreover the recent trend has shifted to selective operative management rather than exploratory laparotomy in trauma patients with suspected intra-abdominal injuries and is considered more rational as well. Diagnostic laparoscopy is highly sensitive in detecting intra-abdominal injury with subsequent reduction in the rate of negative laparotomy and procedure related morbidity.

Objective: The study was carried out to find the role of diagnostic laparoscopy in abdominal trauma.

Methods: An observational study was carried out in the casualty block of Dhaka Medical College Hospital from 1st June 2015 to 30th March 2016. A total of 50 successive patients were assigned in this study. All of them were admitted with abdominal trauma and underwent diagnostic laparoscopy during the period of 10 months. The study was designed to find out whether laparoscopy can help in identifying intra-abdominal injuries with consequent avoidance of unnecessary operative explorations.

Results: Intra-abdominal injuries other than GIT perforation were diagnosed by laparoscopy with 100% accuracy but in case of bowel injury the diagnostic accuracy was 80%.

Conclusion: Diagnostic laparoscopy is the procedure of choice in doubtful intra-abdominal injuries with impressive accuracy except for bowel injury. Subsequently it reduced the need for negative laparotomies with their procedure related adverse effects.

Keywords: Diagnostic laparoscopy (DL), Negative laparotomy, Non-therapeutic laparotomy, FAST, DPL.

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Introduction

Patients sustaining blunt abdominal trauma may present with unstable haemodynamic status or peritonitis requiring urgent operative intervention. However, there might be obscure presentations in some cases demanding additional evaluation. Selective operative management of these patients is considered better approach[1].

The evaluation and management of abdominal trauma has evolved into refinement owing to the introduction of updated diagnostic and imaging procedures that includes focused ultrasonography (FAST), diagnostic peritoneal lavage (DPL), computed tomography (CT) and laparoscopy. Despite FAST being a very useful bedside armamentarium for evaluating trauma patients, it is hardly reliable for making the decision whether or not the patient being evaluated needs surgical exploration. On the other hand CT scan might direct the need for surgery in trauma patients. But its role is limited to diagnostic purposes only. On the contrary laparoscopy can precisely detect the extent of organ injury. In turn it helps to avoid unnecessary (non-therapeutic) laparotomies[2]. In addition it also allows laparoscopic repair of these injuries[2,3].

\Haemodynamic instability in a patient with abdominal trauma with or without peritonitis and a positive FAST or DPL requires immediate exploration. On the contrary patients without ongoing blood loss but with their suspicious or not assessable (comatose) clinical status or dubious CT scan findings are readily evaluated by laparoscopy[3]. However, indications for diagnostic laparoscopy can be widely varied from centre to centre. It may include suspected intra-abdominal injury after blunt trauma or sharp penetrating wounds with equivocal evidence of penetration of peritoneum, abdominal gunshot wounds with doubtful intraperitoneal trajectory and diagnosis of diaphragmatic injury from penetrating trauma to the thoraco-abdominal area[3].

For prediction of urgency of laparotomy, laparoscopy can achieve 75 to 100% sensitivity, specificity and diagnostic accuracy[3]. As a consequence when used for screening purposes, diagnostic laparoscopy has the minimum number of missed injuries reaching <1%. In conjunction with its diagnostic role, it has the advantage of therapeutic interventions as well. These include repair of diaphragm and hollow viscus injury, arrest bleeding from injured solid organs and mesenteric tear, suction of blood and placement of intraperitoneal drain[3].

Methods

This study was conducted in the casualty block of Dhaka Medical College Hospital during the period, from 1st June 2015 to 30th March 2016. After IRB approval, 50 patients were successively assigned in this study, who had doubtful findings on FAST or CT scan following abdominal trauma and required diagnostic laparoscopy as a part of their management. Patients with haemodynamic instability, features of peritonitis, severe head injury and extensive previous abdominal surgery were excluded from the study.

Patients were prepared the same way as for laparotomy. Arrangements for immediate conversion or thoracotomy were readily accessible. Pneumoperitoneum was achieved with low CO_2 flow so as to quickly detect accidental tension pneumothorax in diaphragmatic injury while maintaining it at low pressures (8–12 mmHg). Open technique of insertion was used for a 30 degree laparoscope through a 10mm umbilical port. Two 5mm atraumatic bowel graspers were inserted via two paramedian 5mm ports on the umbilical line for visceral handling. An orderly approach of exploration was followed in accordance to the very basic principles of exploratory laparotomy.

While a structured data collection sheet was used to gather data on variables of interest from patient's hospital record file, they were transferred to computers for compilation and statistical analysis. Following univariate analyses of the data the results were taken in tabular format.

Results

In the present study 72% were male with most (26%) in the 11-20 years age group with a median age of 28 years. Blunt trauma (N=28) resulted from mostly RTA (N=12), whereas penetrating trauma (N=22) by physical assault (N=13). Abdominal pain along with distention was the principal symptoms in patients in the current study. In addition, their investigation (FAST, CXR and CT abdomen) findings included mild to moderate intra-peritoneal fluid collection (N=40) with or without solid organ trauma, bladder trauma and retroperitoneal haematoma. All patients underwent diagnostic laparoscopy which in turn revealed haemoperitoneum due to mesenteric tear, solid organ injury, hollow viscus injury and diaphragm injury. Multiple injuries were detected in thirteen patients. However, no intra abdominal injury was found in five patients resulting in 10% negative laparoscopy.

Table 1: Distribution of patients according to laparoscopic findings
(*There were multiple injuries in some patients)

Type of injury	Type of trauma		Total (n=50)
	Blunt	Penetrating	N(%)
	N(%)	N(%)	
Mesenteric tear	11(22%)	7(14%)	18(36%)
Liver injury	7(14%)	5(10%)	12(24%)
Splenic injury	5(10%)	4(8%)	9(18%)
Diaphragm injury	1(2%)	5(10%)	6(12%)
Retro-peritoneal Haematoma	4(8%)	5(10%)	9(18%)
Stomach perforation	1(2%)	2(4%)	3(6%)
Jejunal perforation	2(4%)	3(6%)	5(10%)
Pancreatic Injury	3(6 %)	1(2%)	4(8%)
Bladder wall haematoma	3(6%)	1(2%)	4(8%)
No injury	2(4%)	3(6%)	5(10%)

Although laparotomy with definitive procedures was done in 14 patients, the rest were managed conservatively (N=36) following laparoscopy. However 2 patients of conservatively managed group subsequently required exploratory laparotomy owing to delayed development of peritonitis with single small jejunal perforation in both cases. Patients with laparotomy had similar findings as found during laparoscopy.

Table 2: Distribution of patients according to management
(*Two patients from negative laparoscopy group underwent therapeutic laparotomy later)

Type of Management	Number of patients(n=50)
	N (%)
Negative laparoscopy	5(10%)
Non therapeutic laparoscopy	31(62%)
Therapeutic laparotomy due to:	
Diaphragmatic injury	6(12%)
Stomach perforation	3(6%)
Jejunal perforation	5(10%)
Peritonitis following DL	2(4%)

Negative laparoscopy: Laparoscopy where no intra-abdominal injury was found.
Non-therapeutic laparoscopy: Laparoscopy where organ injury found that did not require therapeutic intervention (solid organ injury & mesenteric tear without active bleeding, non expanding haematoma).

Table 3: Diagnostic accuracy of laparoscopy in various organ injury

Type of injury	Number of patients	Diagnosed by laparoscopy	Missed injury	Accuracy Rate
Solid organ injury	21	21	0	100%
Diaphragmatic injury	6	6	0	100%
Gastro-intestinal injury	10	8	2	80%
Pancreatic Injury	4	4	0	100%
Bladder injury	4	4	0	100%
Mesenteric tear	18	18	0	100%
Retro-peritoneal haematoma	9	9	0	100%

The average time duration for diagnostic laparoscopy was 45 to 60 minutes with mean hospital stay of 4 days in laparoscopy only group. Despite 2 missed injuries, almost all the intra-abdominal injuries were accurately detected by laparoscopy with a diagnostic accuracy of 80% for gastro-intestinal trauma and 100% for other intra-abdominal injuries. Overall accuracy of diagnostic laparoscopy was 96%.

Discussion

Male are the more active part of population in our country engaged in outdoor activities for financial purposes. Consequently they are more prone to sustain physical trauma especially abdominal trauma. That explains the male-female ratio of patients in this study (72:28), which correlates to sex distribution ratio in VD Gohil et al series (76:24) [4]. Younger age group were the greater victim of trauma owing to their more involvement in high risk physical activities. The present study demonstrates that blunt abdominal trauma cases were much more common than their penetrating counterpart. As a whole abdominal trauma was most commonly inflicted by physical assault (42%) followed by RTA (30%) which rather differs with the findings by studies that depicts RTA to be the principal factor[4,5]. The difference may be due to the fact that both series included only blunt abdominal trauma in their studies.

Based on clinical suspicion, all the patients of current study had their initial evaluation by FAST, CXR and abdominal CT scan. Subsequently the diagnosis was ascertained by either laparoscopy or exploratory laparotomy. While some of the patients with pneumoperitoneum were confirmed on CXR, others with solid organ trauma, bladder trauma and retroperitoneal haematoma had FAST and CT-Scan for their diagnosis. But laparoscopy diagnosed solid organ and hollow visceral injuries as well as diaphragm and mesenteric injury more precisely than other diagnostic tools. Commonest laparoscopic finding of present study was mesenteric tear followed by liver and splenic injury. But the most commonly injured organ was liver followed by spleen[4] and in another study[6] commonest injured organ was spleen. Meanwhile mesenteric tears as well as other solid organ injuries in the current study were associated with absence of active bleeding, whereas retro-peritoneal haematomas were non-expanding, which altogether were managed conservatively. However, two patients from these group required exploratory laparotomy later for missed jejunal perforations. On the contrary, laparotomy with definitive repair was taken in cases with diaphragmatic injury, stomach and small bowel perforations. Although other studies demonstrated that these types of injuries (diaphragmatic injury, GIT perforations and UB injuries) can be repaired laparoscopically, it demanded the presence of expert manpower[4,7].

The mean duration for diagnostic laparoscopy in current study was 45 to 60 minutes. This time was slightly more than (45-50 minutes) owing to lack of expert manpower[4].

However, it was less than YB Chol et al series (142 minutes)[7] due to the fact that they performed most therapeutic interventions by laparoscopy. The average duration of hospital stay of the patients with diagnostic laparoscopy only was 4 days in contrast to 6 days for the patients with subsequent laparotomy, indicating late recovery for the later group.

While no complication was observed in diagnostic laparoscopy only group, the rest with additional laparotomy had superficial wound infection in 5 patients and burst abdomen in 1 patient, attributed to the contaminated nature of the surgery, peritoneal spillage and late presentations.

The incidence of negative laparoscopy in this study was 10%, which was 8% and 18.8%[4,8]. Overall diagnostic accuracy in current study was 96% being marginally better than VD Gohil et al series (92%) and Hamish Foster et al series (89%)[5,9].

This study may have some limitations. This was an observational study, conducted on a small population in a single institution. A multicenter randomized prospective study with a larger sample size would suffice to evaluate the role of laparoscopy as both diagnostic and therapeutic interventions.

Conclusion

Despite some exceptions laparoscopy can pinpoint abdominal injuries with higher accuracy. However its diagnostic pitfall includes lower sensitivity for hollow viscus injury. Still then, it can reduce the duration of surgery, operative trauma, post operative pain and complications and the need for unnecessary laparotomy. Simultaneously laparoscopy offers the additional benefit of therapeutic intervention. With the provision of availability of expert hands, it can be turned into the most efficient diagnostic and therapeutic tool in abdominal trauma.

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