

The Role of Laparoscopy in Abdominal Trauma-Review of The Literature



Medical Science

KEYWORDS : Diagnostic and therapeutic laparoscopy, blunt Abdomen trauma, minimal access surgery, Penetrating abdominal injury

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ABSTRACT

The introduction of intracavitary videoscopic technology led to a tremendous expansion of indication for minimal access procedure in all field of surgery including abdominal trauma. The laparoscopy has become an indispensable diagnostic tool in treatment of both blunt and penetrating traumatic injuries. Laparoscopy has been shown to be valuable in detecting occult diaphragmatic injuries in location where computed tomography (CT) scanning and diagnostic lavage have recognized limitation. It has also minimized unnecessary laparotomy. The liver and spleen injuries were treated conservatively by draining the hemoperitoneum with spraying of hemolock solution at the injury site, which promoted haemostasis and stopped oozing. Bleeding was controlled by use of clips, cauterization, ligation. Mesenteric tear, perforation of small intestine were treated by suturing, stapling, if segmental resection of bowel is needed, hand assisted mini laparotomy was done by extending the umbilical incision. The most important advantage of this technology is reduction of morbidity, shortening of hospitalization and cost effectiveness. It has proved to be robust alternative to conservative treatment or laparotomies in abdominal trauma and hemoperitoneum patient, who are hemodynamically stable. In future, new development in laparoscopy equipment and the introduction of computer technology including robotic devices are expected to have decisive influence on the treatment of trauma patients. The aim of this study was to assess the mode of injuries, incidence of organ involvement, potential to treat injuries such as small bleeding, liver tear, diaphragmatic tear etc. to reduce the incidence of negative laparotomy. In our series of 40 patients, who were hemodynamically stable, 20 patients (50%) were managed conservatively and 12 patients were treated operatively (30%), after diagnostic laparoscopy, 8 patients (20%) needed open laparotomy. It was concluded that diagnostic/therapeutic laparoscopy has reduced the number of negative laparotomy. After the procedure patients took oral fed early, much sooner mobilization of patients, shortened hospital stay, resume of work early and above all, the procedure also proved cost effective.

INTRODUCTION

In this modern era of urbanization and industrialisation there are variety of injuries caused by numerous forces like vehicular accident, social conflict, crime, terrorism, fall from height etc. Road traffic accidents (RTA) are the major cause of blunt abdominal injuries responsible for 45 to 50% of injuries (1). Assault, fall, automobile, pedestrian accidents and work related injuries are common (2). Blunt abdomen injuries result from compression, crushing, shearing or deceleration mechanisms. The frequent organs affected are the spleen (45-55%), the liver (35-45%) and retroperitoneum (15%). (3).

Management of abdomen trauma requires early resuscitation, early diagnosis early initial evaluation and perfect operational skill. In blunt abdominal trauma most commonly injured organs are liver, spleen, kidney, intestine, pancreas, stomach, urinary bladder and vessels (1, 3). Previously all abdominal injuries ended up in laparotomy and managed according to organ injury, however in such cases chances of negative laparotomy were high but Due to advancement in diagnostic field like USG, DPL, CT-Scan abdomen, the chances of negative laparotomy have significantly reduced and sometime managed conservatively.

With the advent of and development of new technology, laparoscopy minimally access surgery (MAS) has diagnostic as well definitive therapeutic role in blunt abdomen trauma. In the past, it was limited to only diagnostic procedure because of time consumption, need for specialized instruments and need of general anaesthesia. Now, with availability of anaesthetist, laparoscopy is being used more frequently for diagnosis as well as therapeutic measure in blunt abdomen trauma.

Laparoscopy was first used for trauma patient in 1956 by Lamy who observed two cases of splenic injury. Since then Gazzaniga et al (4) noted that laparoscopy is useful for determining the need for laparotomy. In 1992, Berci et al (5) reported that he had reduced the number of nontherapeutic laparotomy performed for hemoperitoneum by 25%

through the use laparoscopy in 150 patients with blunt abdomen trauma. Chol et al reported reduced negative and nontherapeutic laparotomy rates in this identified population (6). He concluded that hemoperitoneum associated with stable vitals with liver injury, splenic injury, mesenteric injury or bladder injury can be managed very well by means of laparoscopy.

Advanced laparoscopic technique including bowel resection and anastomosis, ligation of blood vessels, can be utilized in blunt abdominal trauma, as good as in elective open surgery (7-10). One can visualize peritoneal cavity and act expeditiously if needed (i. e. laparotomy, laparoscopic intervention or observation) at time of laparoscopy (10). Laparoscopy certainly is cost effective, reduces the rate of negative laparotomy, reduces the patient stay in hospital and mortality, allows early mobilization and resumption of work.

Aims and objective:

To find out the role of laparoscopy (diagnostic as well as therapeutic) in management of blunt abdomen trauma (BTA);

1. To reduce the incidence of negative laparotomy;
2. To find out the limitation of laparoscopy in blunt abdomen trauma;
3. To know the mode of injury and incidence of organ involvement in blunt abdomen in developing country;
4. To review the method of patient selection, operative technique operative time, interoperative and postoperative complication; and.
5. To find out the impact of laparoscopy on patients with blunt trauma abdomen in terms of early rehabilitation, cost effectiveness and decreased hospital stay and lastly cost.

Material and Method

A diagnostic and therapeutic laparoscopy was carried out in all patients of blunt abdomen injury with hemoperitoneum, who were relatively stable hemodynamically after

resuscitation taken into study, admitted during April 2012 to March 2015. at NIMS medical college and attached hospital, Jaipur.

Management of trauma patients done in a systemic way according to ATLS protocol, which implied a rapid and proper examination, knowing the mechanism and severity of injury and a concise history, if possible, which all together provided a clue to possible injuries. Many diagnostic tools were used for quick assessment, like focused abdominal sonography (FAST), diagnostic peritoneal lavage (DPL) and computerized tomography scan (CT- scan). DPL and FAST provide a quick access to assess the internal bleeding and very specific but do not provide the information of the source of bleeding.

On the other hand, CT scan is found time consuming and needs transfer to the radiology department. It provides a sound knowledge of injury and source of bleeding and very specific in delineating solid organ injuries.

Of the above mentioned diagnostic tools each has its own drawback i.e. DPL and FAST are not informative in regards to parenchymal injuries. DPL, FAST and CTscan all can miss hollow viscous and diaphragmatic injuries.

If the patient presents a hemoperitoneum with hemodynamic instability, the procedure to follow is emergency laparotomy to check the bleeding. If on the other hand, the patient is hemodynamically stable, the course of action is controversial. Such patient usually receives emergency laparotomy and in 15 to 30% of the cases the operation is unnecessary, as there is spontaneous haemostasis of the lesion producing the hemoperitoneum.

Contraindication to laparoscopy in patients with BTA:

1. BTA with associated head injury with EDH/SDH (GCS scale < 13-15);
2. BTA with polytrauma (compound fracture, spine fracture, sever chest injury with $P_{O_2} < 90\%$;
3. BTA with hemodynamic instability;
4. BTA with difficult in endotracheal intubation; and.
5. Pregnancy etc.

All the patients with abdomen trauma and hemoperitoneum underwent diagnostic/therapeutic laparoscopy. A diagnosis of hemoperitoneum was suspected with a drop in hematocrit, which was corroborated in all cases by abdominal puncture-leavage and ultrasonography. Excluded were the patients with hemodynamic instability. The laparoscopy was performed under general anesthesia operating room.

The patient is positioned in decubitus supinus with leg apart and secured to the operation table in case of possible changes in position. Nasogastric and vesical tubes were inserted to decompress the stomach and bladder. The surgeon stood initially between the patients legs, with the video-monitor at the right, from where he could change the position if necessary. A 12-15 mm Hg pneumoperitoneum was created using veress needle. A 10 mm umbilical trocar was inserted for the straight telescope. Other port site created under vision form within. Two 5mm trocar were inserted in right and left lateral quadrant for manipulation, retraction, aspiration, irrigation, coagulation etc. Extra port made according to organ of injury and difficulty in the management. Usually subxiphoid 5mm in epigastrium and in lower abdomen inserted in case of pelvic organ injury.

First abdominal cavity is systematically examined, the hemoperitoneum was aspirated and lesion causing the

bleeding is located. Necessary extra trocar were inserted, depending on site of lesion. The criteria for immediately converting to open exploration are shown below. . If the bleeding stopped spontaneously, no further action was needed. In the event of bleeding, we performed hemostasis with diathermy, if it was oozing, hemostasis with clips and endoloop type ligation if it profuse.

Cause of conversion to exploration:

- Uncontrollable bleeding;
- Injury or subcapsular hematoma at the splenic hilum;
- Deep hepatic injury;
- Splenic or hepatic rupture;
- Hollow organ injury, difficult to treat with laparoscopy; and.
- Non visualisation of origin of hemoperitoneum.

Post operatively we performed serial hematocrit, and checked arterial blood pressure, pulse, drainage debit, indicating laparotomy when there was a degeneration in hemodynamic constant or high drainage debit and blood transfusion when hematocrit dropped below 23-25% Ultra sonography control were performed at 24 & 48 hour, at the time of discharge and 15th and 30th day post operatively.

Any bowel perforation detected were simple suture (3-0 vicryl or silk) or closed by linear stapling GIA ® in the course of procedure. If segmental resection was needed, in mini-laparoscopy was performed by extending the umbilical port to permit laparoscopy-assisted extracorporeal surgery. Bleeding in torn mesentery was controlled by suture ligation or cauterization (Ligasure ® or harmonic Scalpel) For large volumes of spilled spillage or hematoma (mostly clots) not amenable to aspiration by endosuction, evacuation was achieved by direct insertion of silastic tube through a 12mm port.

Observation:

In our present series of 40 cases of hemodynamically stable patients were taken into study, excluding 14 patients which were hemodynamically unstable. 32 patients were managed laparoscopically. Only eight cases were converted into open laparotomy.

INDICATION FOR LAPAROSCOPY:

1. Hemodynamically stable;
2. Some abdominal injury;
3. DPA (diagnostic peritoneum aspiration) positive;
4. USG/FAST Positive;

In our study male patients were more in number than female. The highest number of cases blunt injury occurred in the age group of 21- 30 yrs (40%) followed by 31-40 yrs (32.5%)

TABLE-1
AGE DISTRIBUTION

S.NO.	AGE (YR)	NO. PATIENTS	PERCENTAGE
1	0-10yr	02	5%
2	11-20yr	05	12.5%
3	21-30yr	16	40%
4	31-40yr	13	32.5%
5	41-50yr	2	5%
6	51-60yr	2	5%

The common cause of blunt abdominal trauma was road traffic accidents (65%) followed by assault (12.5%), fall from height (12.5%), and least were crush injury (10%). Among the road traffic accident cases, majority of the victims were hit by motor car/Bus/Truck.

TABLE-2
DISTRIBUTION OF BLUNT INJURY ABDOMEN

MODE OF INJURY	MALE	FEMALE	TOTAL	PERCENT-AGE
Road Traffic Accident	16	10	26	65%
Assault	4	1	5	12.5%
Fall from Height	2	3	5	12.5%
Crush Injury	3	1	4	10%
Work Related Injury	-	-	-	-

Among the abdominal organs liver, spleen, kidney, small bowel and mesentery were injured in reducing number followed by stomach, colon and urinary bladder.

TABLE-3
INCIDENCE AND PATTERN OF ORGAN INJURY

S.No.	ABDOMINAL VISCERAL ORGAN INJURED	NUMBER	PERCENT-AGE
1	Liver	12	30%
2	Spleen	11	27.5%
3	Kidney	4	10%
4	Pancreas	-	-
5	Mesenteric Tear	4	10%
6	Small Bowel	4	10%
7	Stomach	1	2.5%
8	Colon	1	2.5%
9	Other-retroperitoneal Bladder Injury No Injury	3	7.5%

In the present series, out of the 40 cases of laparoscopy, 20 (50%) were managed conservatively, 12 (30%) operatively and 8 cases (20%) were subjected to open laparotomy.

TABLE-4
MODE OF MANAGEMENT

LAPAROSCOPY			OPEN LAPAROTOMY	TOTAL
CONSERVATIVE (NON OPERATIVE)	OPERATIVE	TOTAL		
20 (50%)	12 (30%)	32 (80%)	8 (20%)	40 (100%)

The simple suturing was done in 6 cases (30%), bleeding was controlled in 7(35%), irrigation & drainage done in (15%), segmental resection, loop colostomy, laparoscopic assisted segmental resection of bowel and stapling of perforated small bowel in each one (5%).

TABLE-5
OPERATIVE PROCEDURE IN PATIENT UNDER SURGERY

PROCEDURE	NUMBER
Exclusive Laparoscopy	
Simple Suture (Suture Endo GIA)	3
Bleeding Control (Suture/Ligasure®)	4
Irrigation And Drainage	3
Stapling of Small Intestine	1
Segmental Resection of Bowel (Laparoscopic Assisted (Mini Laprotomy)	1
OPEN LAPAROTOMY	
Simple Closure (Suture)	3
Bleeding Control	3
Segmental Resection	1
Loop Colostomy	1

Reasons for conversion to open laparotomy were uncontrolled bleeding in three cases, voluminous hematoma, adhesions for prior surgery, spillage of large amount each one case. The oedematous bowel in two cases.

TABLE-6
REASON FOR OPEN CONVERSION

PROCEDURE	NUMBER
Uncontrolled Bleeding	3
Voluminous Haematoma	1
Adhesion From Prior Surgery	1
Spillage of Large Amount	1
Oedematous Bowel (Poor Visibility)	2

DISCUSSION

The committee of American College of Surgeon, on trauma has standardized the management of patients sustaining trauma whether blunt or penetrating. The standard method of resuscitation trauma patient is to follow ABCDE (Airway, Breathing, Circulation, disability and exposure). In resuscitation of these patient, the first hour from time of accident is uniquely important specially when life threatening injuries like tension pneumothorax, massive hemothorax, injury to thoracic aorta and rupture bronchial tree, resuscitation has to be fast. Bleeding is always considered as a threatening signal towards death. Surgeon has to act quickly and properly as minutes will be counted rather than hour.

The revolution in surgery now a days is towards minimal access approach, never the less, this has also taken over in traumatology for selected cases (stable patients).

Previously there were literature not supporting to the use of laparoscopy in trauma due to complication including missed intestinal injuries, (injury to duodenum: pancreas, retroperitoneal injuries), trocar and needle injuries related to entral and vascular injuries as well as gas embolism, but this has drastically reduced as new techniques and triangulations with ergonomics has respected.

In 1996, Gazzaniga et al (4) presented the result of clinical observation of diagnostic laparoscopy used in patients after penetrating and blunt abdominal injuries. In the following years a lot of reports appeared confirming the benefits of laparoscopy in patients with penetrating trauma. In 1997, Zantut & ivatury et al (12) showed an indubitable advantage of diagnostic laparoscopy in the possibility to assess the kind of injury, its location and severity and often creates a possibility to treat minor injuries without laparotomy, which negative or non therapeutic application can be avoided.

B.Kirshtein et al (13) carried out diagnostic laparoscopy (DL) in 277 consecutive patients with acute abdominal conditions and obtained a correct diagnosis in 98.65% cases. In 75% of cases, procedure was completed laparoscopically, 12.5% required targeted incision and 12.5% of patients underwent formal laparotomy.

Berci et al (5) reported their retrospective experience in 150 diagnostic laparoscopy in blunt abdominal trauma patients in emergency room/intensive care unit using local anaesthesia and intravenous sedation. Their management decision, immediate laparotomy (19%), observation (25%), or early discharge (56%) based on laparoscopic findings were remarkably accurate. They concluded that diagnostic laparoscopy for trauma patients is highly sensitive, safe and decrease non therapeutic laprotomy.

Ivatury et al (14) prospectively performed diagnostic laparotomy in 100 hemodynamically stable patients with penetrating abdominal injuries and compared them with 407

laparotomies without diagnostic laparoscopy. Authors concluded that diagnostic laparoscopy helped in avoiding unnecessary laparotomies, accurate in detecting solid organ and diaphragmatic injuries. Overall sensitivity and specificity of diagnostic laparoscopy were 87% and 100% respectively, low sensitivity (18%) for hollow viscous and retroperitoneal injuries.

Jason & smith et al (15). Presented a series of 969 cases in which cause of trauma was 61% from road traffic trauma, 7% fall from height, 24% from assault, 8% were other injuries. In our series the most common cause of trauma was R.T.A. in 65% cases.

The present series is comparable to Mausami et al (16) who showed that liver was the commonest organ involved (62.27%) followed by spleen (30.91%), small intestine (18.8%), kidney (18.8%). In our series liver injury was (30%) followed by spleen (27.5%).

Pascal fabiani et al (2002) (17) who made a study on therapeutic use of laparoscopy have reported that out of 32 cases, 6 were treated by conservative means and by laparoscopy surgery 20 (62.5%) patients were treated. Only 6 patients underwent laparotomy. In our series 80% of patients were treated by laparoscopy.

Gustevo Kuster et al (18) finds, out 97.9% diagnostic accuracy in series of 140 patients. Similarly, Hamish faster find 89% diagnostic accuracy in a series of 227 patients, while in our series diagnostic accuracy was 80%.

Townsend et al (19) studied the incidence of negative laparotomy in series of 118 patients and reported that only 4 cases had negative laparotomy. In our series, the incidence of negative laparotomy was nil.

Parcel et al (17) showed the of conversion to open laparotomy was (18.85%), which is quite mimics our 'study in which we had conversion rate of 20%.

Conclusion

1. Road traffic Accident are the most common cause of abdominal injury. Liver, spleen are most commonly injured solid organs. Solid organ and hollow viscera at points of fixation are more prone to injure in blunt abdominal injury.
2. Highest incidence is seen in males in 2nd and 3rd decade of their life.
3. Diagnostic laparoscopy gives a definitive line of management, like conservative, therapeutic laparoscopic management or open laparotomy.
4. Laparoscopy is newly emerging diagnostic as well as therapeutic modality in management of blunt abdomen injury, which has gained acceptance world wide, subjective to availability of equipment and skilled team.
5. Laparoscopy provides early intake and early mobilization of the patient which help in his/her fast recovery, early resumption of work and was found cost effective.
6. Laparoscopy significantly reduces the number of negative laparotomy.
7. In selected cases laparoscopic repair can also avoid laparotomy.
8. Limitation of laparoscopy are that it can not be performed in patients who are hemodynamically unstable. Another limitation is, it is difficult to visualize second part of duodenum, pancreas, posterior wall of stomach, posterior pole of spleen and retroperitoneum. Hence chances of missed injuries are more, if these organs gets injured in blunt abdomen injury. Barring these

limitations, It is recommended in the laparoscopic management of abdominal trauma.

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