

## Role of laparoscopy in abdominal Trauma Patients

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**Abstract: Background:** Trauma is the main cause of morbidity and mortality worldwide and is still the most frequent cause of death in the first four decades of life. Moreover, it remains a major public health problem among all countries, regardless of the socioeconomic status. **Aim of the Work:** to evaluate the role of laparoscopy in minimizing the complications of exploratory laparotomy, especially when the results of laparotomy comes negative. **Patients and Methods:** This prospective cohort clinical study was conducted on 25 patients who presented to emergency unit with abdominal trauma (either blunt or penetrating) during the period between December 2017 and May 2018. **Results:** 7 cases (28%) had no detected intra-abdominal injuries and considered negative, the other 18 cases (72%) showed variety of intra-abdominal injuries and considered positive. Between the 18 positive cases 11 of them (61.1%) were dealt with laparoscopically and the other 7 cases (38.9%) required conversion to laparotomy. The use of laparoscopy in abdominal trauma patients appears as a safer alternative for exploratory laparotomy with 100% sensitivity in detecting intra-abdominal injuries, less complications rate and less post-op. hospital stay. In the hands of an experienced laparoscopic surgeon it can be safely used to repair those injuries laparoscopically. **Conclusion:** In a hemodynamically stable patient presented with abdominal trauma (either penetrating or blunt), Laparoscopy has both a diagnostic and therapeutic roles. [Ashraf O. Ali, Mohamed A. Rizk, Mina R. Tawfeek. **Role of laparoscopy in abdominal Trauma Patients.** *Nat Sci* 2019;17(5):15-21]. ISSN 1545-0740 (print); ISSN 2375-7167 (online). <http://www.sciencepub.net/nature>. 3. doi:[10.7537/marsnsj170519.03](https://doi.org/10.7537/marsnsj170519.03).

**Key words:** laparoscopy, abdominal Trauma Patients

### Introduction

Trauma is the leading cause of mortality in patients under 35 years old worldwide, and poses a major challenge to health care providers. Although geographical variations exist, blunt trauma accounts for 78.9 to 95.6 % of injuries around the globe. Between 9 and 14.9 % of all trauma cases involve the abdomen<sup>(1)</sup>.

Laparotomy is the standard approach for abdominal trauma but is associated with morbidity ranging from 20 to 22 % to 41.3 %, particularly when explorative laparotomy is negative<sup>(2)</sup>.

Non-therapeutic operations or negative laparotomies for penetrating trauma carry a significant complication rate with mortality of up to 5 % and morbidity as great as 20 %<sup>(3)</sup>.

With technical developments in imaging, and advances in surgical techniques, the rate of negative and therefore unnecessary laparotomy has been reduced. Laparoscopy in trauma can potentially further decrease the negative laparotomy rate<sup>(4)</sup>.

Although several diagnostic methods are available for evaluation of trauma patients, prompt recognition of intraabdominal injury still poses a significant clinical challenge, particularly in patients with diaphragmatic, mesenteric and/or small bowel injury. The presence of free fluid in the abdomen

without evidence of any organ injury must be clarified<sup>(5)</sup>.

Although the non-invasive methods provide high-quality information, there is still a degree of diagnostic uncertainty with blunt abdominal trauma, especially when the gastrointestinal tract, pancreas, and diaphragm are involved. This uncertainty in the diagnostic process was, and is, an important justification for exploratory laparotomies undertaken to avoid missed injuries. A considerable number of these laparotomies are unnecessary or nontherapeutic and have corresponding morbidity<sup>(6)</sup>.

Now, diagnostic and therapeutic laparoscopy for blunt and penetrating abdominal injuries could reduce the rate of non-therapeutic laparotomy to 1.8%<sup>(7)</sup>.

Patients who will undergo therapeutic laparoscopy for resolution of their abdominal trauma injuries will have decreased hospital stay, less wound infection, less post-operative pain, better cosmetic result and earlier ambulation<sup>(8)</sup>.

Initially, the evaluation of peritoneal violation in hemodynamically stable patients was seen as the greatest benefit of laparoscopy for trauma. Improvements in laparoscopic training and technology have enabled an increase in the use of diagnostic and therapeutic procedures in trauma patients<sup>(9)</sup>.

**Aim of the study**

The aim of the study is to evaluate the role of laparoscopy in minimizing the complications of exploratory laparotomy, especially when the results of laparotomy come negative.

## Patients and Methods

### Patients:

This prospective cohort clinical study included 25 patients who presented to emergency unit with abdominal trauma (either blunt or penetrating) during the period between December 2017 and May 2018.

### Inclusion criteria:

- A) Age group: 15-55 years.
- B) Medically free patients.
- C) Isolated abdominal trauma, or a poly-traumatized with no emergency involving orthopaedic, vascular, neurological or cardiovascular point of view.
- D) hemodynamic stability: pulse not exceeding 100 beats / min., blood pressure not less than 100 systolic or 60 diastolic, no hypothermia.

### Exclusion criteria:

- A) Hemodynamic instability.
- B) Gunshot wounds.
- C) Pregnant women.
- D) Bleeding per rectum.
- E) Haematemesis.
- F) Signs of peritonitis (abdominal rigidity and tenderness).
- G) Patients unfit for general anaesthesia.
- H) Patients who refuse to give consent to undergo laparoscopy.

### Methods of the study:

Patients presenting with abdominal trauma were evaluated as following:

The primary survey was done simultaneously with resuscitation including rapid evaluation and management of airway, breathing, circulation, disability and exposure.

Then detailed history is obtained from the patient In form of:

**Personal history:** including age, sex, Marital status, occupation.

**Present history of trauma:** Mode of trauma, type of trauma to the abdomen (blunt or penetrating), presence of symptoms related to abd. Trauma (Pain, Tenderness, Gastrointestinal hemorrhage) and duration since trauma.

**Past history of medical importance:** such as diabetes, hypertension, infectious diseases, previous operations or drugs.

Then **General examination** was done including data about Pulse, Temperature, Blood Pressure, presence of pallor and body built.

Followed by **local examination** to detect:

- a - Presence of signs of peritonitis (rigidity and tenderness)

- b - Presence of signs suggesting blunt trauma to the abdomen like bruises, ecchymosis, seat belt marks or driving wheel marks.

- c - Presence of signs suggesting retroperitoneal haemorrhage as grey's turner or Cullen's sign.

- d - Presence of stab injury and its site.

A ryle's tube was inserted if a gastric or duodenal injuries are suspected and a urinary catheter to monitor urinary output.

**Investigations** are carried out including:

A) Imaging: 1) Focused assessment sonography for trauma (Fast scan) to determine the presence of free fluid in the abdominal cavity and assess its quantity and location.

2) Plain erect x-ray of the abdomen to detect presence of free air denoting injury of a hollow viscus.

3) CT scan is performed usually in cases with blunt abdominal trauma. it can provide valuable information on the size, number, and extent of pathological changes

B) Laboratory: CBC and Blood sampling for blood transfusion.

**Informed consent** regarding the laparoscopic intervention and the potential need for conversion to laparotomy with the risk of associated complications was obtained from each patient.

### The procedure:

Laparoscopic intervention is done under general anaesthesia, patient is lying in supine position and securely fixed to the operating table to allow tilting in different directions to obtain perfect visualization of each organ.

The area of the abdomen is sterilized using povidone-Iodine (Betadine).

Instruments for laparotomy must be available to allow rapid conversion to laparotomy if necessary.

The usual used approach for diagnostic and therapeutic laparoscopy is started by insertion of the initial trocar (usually 10 mm) at the umbilicus using the open method. Then, Pneumoperitoneum is established slowly and cautiously by Co2.

After initial inspection of the abdominal cavity (which is usually started in cases with penetrating trauma by inspecting the site of expected peritoneal violation), then two more working trocars (5–10 mm) are inserted.

The abdomen is evaluated for possible injuries not initially detected, usually the operating surgeon start from the right upper quadrant inspecting the liver, the gall bladder and the diaphragm then moving in a clockwise manner to evaluate the stomach and transverse colon and then Omentum is mobilized caudally to allow visualization of the spleen. Those organs are evaluated while the patient is in reverse Trendelenburg position. The surgeon then inspects the splenic flexure, descending and sigmoid colons toward

the pelvis reaching the right lower quadrant to look at the cecum and ascending colon.

In order to complete the examination of abdominal organ the position of patient is converted to trendelenburg to inspect and evaluate the rectum, bladder, and pelvic organs.

Using two atraumatic forceps the small intestine is evaluated starting from the ileocecal region, they are examined in the oral direction to the Treitz ligament after mobilization of the omentum cranially. The lesser sac may be opened to evaluate the duodenum, posterior gastric wall, and pancreas if any suspected injury may be present but not routinely done.

The therapeutic intervention depends on: the type and site of injury, the equipments available, the skills and preferences of the operating surgeon.

For example if there is a small laceration in a hollow viscus like small intestine or the stomach, It is usually dealt with using vicryl or PDS 3/0 stitches. while if there is a bleeding source from a solid organ like the liver, it is dealt with either by using tamponading with a hemostatic agent like Gel foam or surgical, coagulation or stitching.

Also Diaphragmatic injuries may be repaired depending on their size, by sutures or appropriate prosthetic materials.

Cases were converted to laparotomy if there is continuous intraabdominal bleeding that could not be controlled quickly or multiple complex injuries, hemodynamic instability detected during laparoscopic intervention, and intraoperative visualization problems or surgeon's preference.

The patients in our study are classified To two groups:

-ve group: they show no internal injury.

+ve group: they show internal injuries either dealt with laparoscopically or by open laparotomy.

**Post-op:** the patients were given I.V fluids and antibiotics and followed up to different durations according to the findings and the therapeutic interventions done.

The time for starting oral feeding differs according to the type of intra-abdominal injury.

After discharge they were given clinic appointments for follow up.

## Results

### Demographic data:

#### Sex distribution:

This study included 20 males (80%) and 5 females (20%).

#### Age distribution:

The age range of the patients is between 16 and 55 years with mean age of  $31.95 \pm 10.64$ .

14 patients (56%) were in the age group between 15-30 years while 11 patients (44%) were in the older

age group between 31-55 years old. patients with abdominal trauma older than 55 years old were excluded from the study.

All of the patients included in the study were hemo-dynamically stable with no signs nor symptoms suggesting peritonitis.

All patients according to the inclusion and exclusion criteria of the study were not patients with any chronic diseases.

#### Type of Trauma:

Between the 25 patients included in this study 21 of them were exposed to penetrating trauma (84%), 4 of them were exposed to blunt trauma (16%).

#### Classification according to the region of abdomen affected by trauma:

The 21 cases affected by penetrating trauma can be classified according to the site of stab wound. The most commonly affected area is epigastric region with 9 cases (42.9%).

**Table (1):** Distribution of penetrating trauma patients according to the site of injury

Abd. Region	Num. of cases	percentage
Rt. Hypochondrium	4	19%
Epigastric	9	42.9%
Lt. Hypochondrium	2	9.5%
Rt.Lumbar	1	4.8%
Umbilical	4	19%
Lt.Lumbar	1	4.8%

While there was no cases included in the study affecting the Rt. And Lt. Iliac regions nor the hypogastric region.

In the 4 cases presented with blunt abdominal trauma two of them presented with external bruising and abrasions. The other two cases showed noexternal injuries.

#### Classification according to the laparoscopic Findings:

The patients involved in our study were 25. 7 of them showed no signs of internal injury (only needed diagnostic laparoscopy) and were considered as the Negative group. The other 18 cases showed variety of injuries and were considered the positive group.

Between the 18cases showing findings 11 of them were dealt with laparoscopically while the other 7 cases needed conversion to exploratory laparotomy.

#### Classification according to the finding in relation to the type of trauma:

Between the 21 cases Affected by penetrating trauma 7 of them showed no findings, while 14 cases showed variable findings (10 were repaired laparoscopically while the other 4 cases needed conversion to laparotomy).

All the four cases which presented with blunt trauma showed findings and three of them required conversion to laparotomy while only one was repaired laparoscopically.

**Classification according to injured organs:**

Between the 18 positive cases, 14 of them showed isolated organ injury (77.8%) and 4 cases showed multiple organ injuries (22.2%).

The penetrating trauma was responsible for 3 cases with multiple organ injuries while blunt trauma is responsible for 1. While the 14 isolated organ cases can be subdivided to 11 cases caused by penetrating trauma and 3 cases caused by blunt trauma.

The most involved organ was the small intestine with 6 cases (33.3%) followed by the stomach with 5 cases (27.8%).

**Table (2):** Percentage of each organ affection in the patients included in the study

Organ	Num. of cases	Percentage
Small intestine	6	33.3%
Stomach	5	27.8%
Liver	4	22.2%
Diaphragm	2	11.1%
Transverse colon	2	11.1%
Duodenum	1	5.6%
Mesenteric vessel	1	5.6%
Kidney	1	5.6%

The Most commonly affected organ in blunt trauma was small intestine in two cases (50%).

The diaphragm was involved in one case, while the kidney was involved producing a zone 2 retroperitoneal hematoma accompanied with mesenteric vessel injury in one case.

**Classification according to the method of repair:**

In our study **Therapeutic laparoscopic intervention** was effective in 11 patients (44%):

- Two cases with ant. wall stomach tear repaired by stitching using PDS 3/0.
- Four cases with injury to the small intestine (repaired with interrupted stitches using prolene 3/0 or PDS 3/0).
- One with diaphragmatic injury (repaired by prolene 1 stitches).
- Three cases with liver laceration (two of them being dealt with using gel foam and only one needed stitches).
- One case showing injuries to a mesenteric vessel (dealt with using thermal coagulation).

Our study included 6 cases showing variable injuries to the small intestine. 4 cases were managed laparoscopically by interrupted stitching using PDS 3/0, while the other 2 cases required conversion to laparotomy to perform resection anastomosis.

**Discussion**

Mandatory surgical intervention for abdominal trauma yields a high rate of negative laparotomies in the absence of visceral injuries. Laparoscopy is an alternative diagnostic procedure inspecting for blunt or penetrating intra-abdominal injuries, or for signs of perforation of the peritoneum and excluding significant intra-abdominal injuries.<sup>(10)</sup>

Obviously, a negative or non-therapeutic laparotomy may be detrimental to patients. It is connected with possible occurrence of complications, which according to different sources may affect from a few up to as many as 40% of those operated on<sup>(11)</sup>.

The revolution in surgery nowadays is towards minimal access approach, this has also taken over in traumatology for selected cases.

The necessity of urgent explorative laparotomy as a standard procedure in the treatment of abdominal trauma (penetrating and blunt) is controversial<sup>(11)</sup>.

An indubitable advantage of a diagnostic laparoscopy is the possibility to assess the kind of injury, its location and severity, and often it creates a possibility to treat minor injuries without laparotomy, which is why negative or non-therapeutic application can be avoided<sup>(4)</sup>.

In a prospective study performed by **Faruk Karateke** to compare the outcomes of hemodynamically stable patients with suspected intra-abdominal injuries due to abdominal trauma who underwent either Exploratory laparotomy (EL) or Diagnostic laparoscopy (DL). Data extracted for analysis included demographic information, operative findings, rate of non-therapeutic laparotomy, length of hospital stay, mortality, and postoperative complications. Fifty two hemodynamically stable patients were admitted to the trauma service<sup>(12)</sup>.

There were 45 male (86.5%) and 7 female (13.5%) patients<sup>(12)</sup>.

*Our study included similar gender distribution results with 20 males (80%) and 5 females (20%).*

The average age in that study was 34.5 years old (18- 60 years)<sup>(12)</sup>.

*Also that comes consistent with an average of 31.95 years old (16-55 years) with a standard deviation of 10.64 in our study.*

In that study 26 (50 %) patients underwent EL, and 26 (50 %) patients underwent DL. Re-exploration by laparotomy was required in 9 of the 26 cases (34.6 %)<sup>(12)</sup>.

*Those results also comes consistent without study in which re-exploration by laparotomy was needed in 7 cases of the 18 cases with findings (38.9%).*

**Colwell and Moore** explained that there are now several steps towards managing such an acute

emergency and calls immediate laparotomy an, “obsolete” intervention. Criteria for immediate laparotomy include hemodynamic instability, unequivocal peritoneal signs on physical examination, signs of gastrointestinal hemorrhage as well as evisceration of bowel or mesentery<sup>(13)</sup>.

*We used the same criteria suggested by them as exclusion criteria and as indications for immediate laparotomy for our study in addition to pregnancy, gunshot wounds and being unfit for general anesthesia.*

**Marwan and Zafar** agree with that in their studies as they consider hemodynamic instability and shock as contraindications for laparoscopy. Other contraindications include diffuse peritonitis, penetrating anal or vaginal injuries, pregnancy, evisceration, or evidence of end-organ injury (e.g., hematuria, hematemesis, sanguineous nasogastric tube output, etc.)<sup>(14)(15)</sup>.

In published studies the benefits of diagnostic laparoscopy in some patients with abdominal trauma were emphasized. **Fabian** published a prospective study including 182 haemodynamically stable patients, who underwent diagnostic laparoscopy. Patients after penetrating trauma constituted the majority; 55% had stab wounds and 36% had gunshot wounds. Blunt trauma constituted 9% of all the cases<sup>(9)</sup>

*Our study included 25 patients, stab wounds constituted the majority by 21 cases (84%) too, and blunt trauma was seen only in 4 patients representing (16%) of all cases. While patients with gunshot wounds were excluded from our study.*

**Chol and Lim** performed a laparoscopic evaluation of 78 hemodynamically stable patients. This group reported no missed injuries, no mortality, and an 83% success rate in their ability to provide definitive surgical treatments ranging from gastrorrhaphy to small bowel resection to pancreatectomy<sup>(16)</sup>.

*In our study laparoscopy as a diagnostic tool showed great results with no missed injuries, no mortality but we detected lower rate (61.1%) of definitive laparoscopic repair of laparoscopically detected injuries.*

In a prospective study performed by **Demaria and Dalton** including 76 patients after penetrating abdominal trauma. It was observed that over half of the patients who underwent diagnostic laparoscopy avoided laparotomy. At the same time, the number of non-therapeutic laparotomies was reduced and the length of hospital stay and hospitalization time were decreased<sup>(17)</sup>.

*In our study we found better results as 18 patients (72%) avoided laparotomy. and 11 cases (61%) with findings were treated laparoscopically*

*avoiding laparotomy. we also found significant reduction in length of post-op. hospital stay.*

Our results comes consistent with another study which was a prospective study performed by **Ahmed** that noted that in haemodynamically stable patients after abdominal trauma, laparoscopy helped to avoid laparotomy in 77% of the cases. In 33% of patients no peritoneal penetration was confirmed and in almost 1/3 of cases no organ injuries were observed. Only half of the patients with organ injuries required conversion to laparotomy, which constituted 23% of all the cases covered in the study<sup>(18)</sup>.

*Our study gives similar results as 28% of our patients showed no intra-abdominal injury and no further intervention was needed. And only 38.9% of patients with organ injuries required conversion to laparotomy who also constituted 28% of all cases covered in the study.*

After implementation of exploratory laparoscopy for penetrating injuries, **Kawahara** reported a 73.3 % reduction in laparotomy with definitive laparoscopic repair in 22.7 % of cases. These authors proposed a standardized examination system, leading to no missed injuries with an accuracy of 98.7, 97.6 % sensitivity, and 100 % specificity<sup>(19)</sup>.

*Our study results showed results similar to kawahara with 72% reduction in laparotomy with definitive laparoscopic repair in 44% of all cases subjected to the study. Our study also showed 100% sensitivity in organ injuries detection and 100% specificity.*

*Laparoscopic therapeutic intervention in our study varied from simple closure of a serosal tear using stitches, control of omental bleeding using thermal coagulation, repair of diaphragmatic tear using Prolene or pds stitching, control bleeding from a liver tear using hemostatic agents (gel foam) or stitches to gastrorrhaghy of stomach tear at the anterior wall.*

**Ditmars and Bongard** presented the results of a study including 106 patients after penetrating abdominal trauma. They observed that in 40% of cases laparoscopy confirmed peritoneal penetration and at the same time only half had therapeutic laparotomy performed. At the same time, in almost 2/3 of patients laparoscopy excluded intra-abdominal injuries and they managed to avoid laparotomy<sup>(20)</sup>.

*Between the 21 cases affected by penetrating trauma in our study 33.3% showed no organ injury avoiding laparotomy. 66.7% showed internal organ injury and only 4 cases (28.5% of the cases with findings) needed conversion to laparotomy.*

In a study performed by **Morsi Mohamed et al.** at El-zagazig university on 65 abdominal trauma patients (44 cases (67.5%) affected by penetrating

trauma and 21 cases (32,5%) affected by blunt trauma) (21).

*While our study included 25 patients (21 cases (84%) affected by penetrating trauma and 4 cases (16%) affected by blunt trauma).*

They found 18 cases to be negative (27.7%). They avoided laparotomy in 81.5% (53/65) of cases (21).

*We found near similar results with 7 negative cases (28%). We also avoided laparotomy in 72% (18/25) of cases.*

In their study Therapeutic laparoscopy was effective in 15 patients (23%): six patients with stomach penetrations, four with liver lacerations, three with diaphragmatic injuries, and two with splenic lacerations. (21).

*In our study Therapeutic intervention was effective in 11 patients (44%): - two cases with ant. wall stomach tear repaired by stitching using PDS 3/0.*

*-Four cases with injury to the small intestine (repaired with interrupted stitches using prolene 3/0 or PDS 3/0).*

*- One with diaphragmatic injury (repaired by prolene 1 stitches).*

*-Three cases with liver laceration (two of them being dealt with using gel foam and only one needed stitches).*

*-One case showing injuries to a mesenteric vessel (dealt with using thermal coagulation).*

They had to convert 12 cases (18.5%) to open laparotomy (5 caused by blunt trauma and 7 caused by penetrating trauma) (21).

*While our conversion rate was 28% with 7 cases out of the 25.*

Conversion rates seem to depend strongly on the policies adopted in the respective hospitals, as some centers indicate routine laparotomy while others proceed to laparoscopy in comparable patients. Two systematic reviews, the first was done by **Zafar** and the other by **Johnson** reported overall conversion rates of 10.7 and 20.2 %, respectively (7) (15).

In a study performed by **Lin** the laparoscopic approach decreased non-therapeutic laparotomies in abdominal stab wounds from 57.9 to 0 %, and the accuracy of diagnostic laparoscopy was 100 % (22).

*We achieved the same great results with total avoidance of non-therapeutic laparotomies in cases with both penetrating and blunt trauma with 100 % accuracy of diagnostic laparoscopy.*

In a study conducted by **Lim** over a duration of 7 years and published at 2015 the conversion rate to laparotomy was 18% (23).

*Our study showed mildly higher result with 28% conversion rate.*

*The 7 cases that needed conversion to laparotomy in our study were 4 cases with multiple organ injuries as follows:*

*1 – one case showed transfixing injury to the duodenum, liver tear and diaphragmatic tear.*

*2 – two cases showed injuries of both the stomach and transverse colon.*

*3 – one case that presented with a zone 2 retroperitoneal hematoma and mesenteric vessel bleeding. the mesenteric vessel was dealt with laparoscopically with ligation but laparotomy was needed for partial nephrectomy.*

*The other three cases which needed laparotomy were 2 cases that required resection anastomosis of small intestine and the last one was an anterior gastric wall tear that underwent laparotomy according to the surgeon's preference.*

**Uranus and Dorr** mentioned that minimally invasive surgery has become a useful tool in the management of trauma. Laparoscopy can detect and repair injuries to the hollow viscus and diaphragm and exclude the risks of nontherapeutic laparotomy. Further advantages are reduced morbidity, shortened hospital stay, and lower cost (24).

*And our study results support that, as the average hospital stay in diagnostic laparoscopy when the findings comes negative was 2.4 days, while when therapeutic laparoscopic intervention was performed the average hospital stay was 3.8 days, Increasing up to average of 5.8 days in the cases converted to laparotomy.*

*Also, there was no post-op. complications in all the cases that were managed laparoscopically.*

In a recently published study (2018) performed by **Matsevych et al.** a total of 318 patients were approached with laparoscopy over the 4-year period. All patients were managed along the Advanced Trauma Life Support guidelines and were considered to be stable after initial resuscitation. Thirty-five patients presented with BAT (11%) and 283 with PAT (89%). Eight (22.9%) patients were converted to laparotomy in the BAT group and 33 (11.7%) patients in the PAT group. The other 277 patients were managed with fully laparoscopic or laparoscopic-assisted techniques (25).

*Our study was done on 25 patients over 6 months duration. We managed all our patients along ATLS guidelines and being hemodynamically stable was a must to be included in the study.*

*4 patients presented with BAT (16%) and 21 patients with PAT. 3 patients was converted to laparotomy in the BAT group (75%), and 4 patients in the PAT group (19%). the other 18 patients were managed with fully laparoscopic techniques.*

## Conclusion

- In a hemodynamically stable patient presented with abdominal trauma (either penetrating or blunt), Laparoscopy has both a diagnostic and therapeutic roles.
- Its most important role is to reduce the non-therapeutic laparotomies with its subsequent morbidity plus reduction of post-op. hospital stay and post-op. complications.
- And in the hands of experienced surgeons it also provides a safe and efficient alternative to repair the injuries resulting from trauma.

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