

ORIGINAL ARTICLE

LAPAROSCOPY FOR THE EVALUATION OF ANTERIOR ABDOMINAL STAB WOUNDS IN HEMODYNAMICALLY STABLE PATIENTS

By

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Aim: To evaluate the role of laparoscopy in the management of anterior abdominal stab injuries in hemodynamically stable patients.

Methods: This prospective study was done at The Department of Surgery, Minia University Hospital, between July 2006 and December 2007. It included 29 patients (24 males and 5 females). Patients were divided according to the laparoscopic findings to four groups: negative, positive nontherapeutic, positive therapeutic and laparotomy groups.

Results: Laparoscopy was positive in 27 of 29 patients (93.1%) and negative in two patients (6.9%). It was positive non therapeutic in 14 patients (48.2%), positive therapeutic in 3 patients (10.3%), and needed conversion to laparotomy in 10 patients (34.4%). Therapeutic laparoscopy was done in 3 patients (10.3%) and included: gastric repair in one patient, diaphragmatic repair in one patient, and bleeding control of liver injury in one patient. Laparoscopy was converted to laparotomy in 10 patients (34.4%). Laparotomy was avoided in a total of 19 (65.5 %) patients. There was no mortality and minimal morbidity. The mean follow up was 9±2 months.

Conclusion: Laparoscopy is safe and efficient in the management of the anterior abdominal stab injuries in hemodynamically stable patients. It is associated with minimal morbidity and no mortality. Laparotomy is still indicated in extensive injuries.

Keywords: Penetrating abdominal trauma, minimal invasive surgery, laparotomy.

INTRODUCTION

Patients with penetrating trauma to the anterior abdominal wall present a challenge, as trajectory is potentially tangential and may not penetrate the peritoneum.⁽¹⁻²⁾ This has been reported to be the case in up to 45% of hemodynamically stable patients without peritoneal signs.⁽³⁾ Proving that penetration did not occur negates the need for laparotomy. Current diagnostic modalities, including computed tomography (CT), ultrasonography (US), and diagnostic peritoneal lavage (DPL), are limited in the identification of peritoneal penetration, as a negative study does not exclude the diagnosis.⁽⁴⁾ Laparoscopy is an evolving technique for the evaluation of abdominal trauma.⁽⁵⁾ Despite logarithmic growth in other areas of surgery for the past 20 years, many early concerns about the safety, sensitivity, and specificity of the laparoscopy have limited its application in abdominal trauma⁴. In addition,

the complexity and potential hemodynamic instability associated with intra abdominal injury usually preclude the use of this modality.⁽⁶⁾

We aimed to evaluate the role of laparoscopy in the management of anterior abdominal stab injuries in hemodynamically stable patients.

PATIENTS AND METHODS

This prospective study was conducted at The Department of Surgery, Minia University Hospital, between July 2006 and December 2007. It included patients with anterior abdominal stab injuries who fulfilled the following criteria: Hemodynamic stability, intact sensorium without evidence of raised intracranial pressure, absence of contraindication for pneumoperitoneum, and ability to give informed consent for the study. The haemodynamically stable patient is

defined as a patient with a systolic blood pressure (SBP) >90 mmHg, a heart rate <120 beats per minute and without clinical signs of shock. Patients with hemodynamic instability were excluded from the study. Laparoscopy was done under general anesthesia according to the technique that was described by Claudia et al, 2004⁵. The patients were secured to the table to allow different positions to improve visualization. The patient's arms were extended out laterally on arm boards. This allowed access to the arms for anesthesia, to the chest for thoracostomy or thoracotomy, and to the abdominal wall if conversion to laparotomy was required. Standard laparotomy instruments were readily available for rapid conversion if needed. In selection of laparoscopic equipment, a 30-degree laparoscope was used to provide adequate visualization of the abdominal wall as well as visceral contents. With the exception of a periumbilical penetrating injury, a camera port was placed at the umbilicus. A 10-mm port with similar camera size was used. The umbilical trochar was placed by open technique. Peritoneal insufflation was done with the pressure of 15 mm Hg. Diagnostic exploration for peritoneal penetration or diaphragm injury was performed using a single camera port. If the examination was negative, the procedure could be terminated and the patient safely discharged, if no other injuries required hospitalization. If defects of the peritoneum or diaphragm were found but there were no obvious signs of visceral injury, systematic examinations of the supra- and infracolic compartments and the pelvis were performed. A thorough examination of the small bowel was done by 3 ports, which allows "running of the bowel" using atraumatic graspers to pass the bowel systematically hand to hand with circumferential examination. Exploration of the diaphragmatic hiatus, lesser sac, and posterior stomach requires an additional 2 ports in the upper abdomen for retraction. When indicated, methylene blue tinted saline was instilled through a nasogastric tube to ascertain posterior gastric integrity. Non-bleeding liver, splenic, omental, or mesenteric hematomas without bowel involvement were not followed by open laparotomy. Discovery of visceral injuries (holes in bowel, actively bleeding vessels) or secondary signs (foreign material, enteric fluid, bleeding without an obvious source) was followed by trial of laparoscopic repair, if failed, open laparotomy was indicated. Assurance of hemostasis and absence of missed injuries was confirmed by normal postoperative course. The results of laparoscopy were considered positive if peritoneal penetration was demonstrated. Therapeutic laparoscopy was defined as a laparoscopic exploration in which the surgical intervention influenced outcome, while a non-therapeutic laparoscopy was one in which the laparoscopic intervention did not influence outcome. Patients were divided according to the laparoscopic findings to: negative, positive no laparoscopic repair, positive laparoscopic repair, and positive converted to conventional repair. Demographic variables, operative interventions, and patient outcomes were examined. The patients were followed up every month for 9 months. They were examined clinically and

by ultrasonography.

Statistical analysis: All collected data were tabulated. Numerical data expressed as mean \pm standard deviation, and categorical data were expressed as number and percent (%). T-student test was used to compare numerical data, and Chi-square test was used to compare categorical data. P-value was considered to be significant if it was < 0.05.

RESULTS

From July 2006 to December 2007, 29 patients underwent laparoscopic management of anterior abdominal stab injuries. The mean age was 35.4 \pm 11.3 years. The patients were 24 males and 5 females. There were 22 assaults, 5 unintentional injuries, and 2 self-inflicted wounds. There were 6 patients with concurrent superficial limb wounds, 4 patients with superficial neck and chest injuries. Laparoscopy was positive in 27 of 29 patients (93.1%). The findings were listed in Table 1. It was positive nontherapeutic (no surgical intervention) in 14 patients (48.2%), positive therapeutic in 3 patients (10.3%), and needed conversion to laparotomy in 10 patients (34.4%). In 14 patients (48.2%) with positive non-therapeutic laparoscopy, the injuries were; mesenteric haematoma in 2 patients (6.8%), retroperitoneal haematoma in 3 patients (10.3%), non-bleeding liver injuries in 4 patients (13.7%), and minimal hemoperitoneum without identifiable source in 5 patients (17.2%). Laparoscopy was negative (no peritoneal penetration) in 2 patients (6.8%). laparoscopic treatment was performed (therapeutic laparoscopy) in 3 patients (10.3%) and included gastric repair in one patient, diaphragmatic repair in one patient, and bleeding control of liver injury in one patient. Laparoscopy was converted to laparotomy in 10 patients (34.4%). The injuries were perforated small intestine in 5 patients, 4 of them had intestinal tears required resection reanastomosis and the remaining one patient had intestinal perforation treated by primary repair, and splenic injuries in 3 patients, treated by splenectomy, and 2 patients with bleeding mesenteric tears treated by sutures, Table 2. Laparotomy was avoided in a total of 19 (65.5 %) patients. Mean operative time was 65 \pm 39 min. The mean length of hospital stay for patients requiring laparotomy was significantly longer than those undergoing laparoscopy alone (6.2 Vs 3.1 days; P<0.05). The mean ICU stay was significantly longer for patients requiring laparotomy versus laparoscopy alone (3.7 \pm 2.1 Vs 0.5 \pm 0.6 days; P<0.05).

Postoperative complications occurred in two patients (6.8%) in form of wound infection. In the conversion group, postoperative complications were seen in 7 patients (24.1%): 3 had wound infection, 2 had chest infection, one had urinary tract infection, and the last one had deep venous thrombosis (DVT). The P value was < 0.05. There was no mortality. The mean length of follow up was 9 \pm 2 months.

Table 1. Type of laparoscopic operations and injuries identified during laparoscopic explorations.

Variable	Injuries	Number	Percentage
Negative	None	2	6.8
Positive non therapeutic:	Mesenteric hematoma	2	6.8
	Retroperitoneal hematoma	3	10.3
	Non-bleeding liver tears	4	13.7
	Minimal hemoperitoneum	5	17.2
Positive laparoscopic repair:	Gastric repair	1	3.4
	Liver injury control	1	3.4
	Diaphragmatic repair	1	3.4

Table 2. Type of operations and injuries identified during laparotomy after initial laparoscopic exploration.

Variable	Operation	No.	%
Small bowel injuries	Small bowel resection	4	13.7
	Primary closure	1	3.4
Splenic injury	Splenectomy	3	10.3
Mesenteric injury	Ligation of the bleeder	2	6.8

DISCUSSION

Trauma laparotomy is commonly used for the evaluation of intra-abdominal injury.⁽⁶⁾ However, complications following negative or nontherapeutic laparotomy can be as high as 20%.⁽⁷⁾ Consequently, it is advantageous to avoid a negative laparotomy provided a reliable and accurate alternative diagnostic procedure is available.⁽⁸⁾ Penetrating abdominal trauma is associated with a high incidence of intraperitoneal injury.⁽⁹⁾ The threshold for laparotomy has typically been high, and the use of investigative tools such as local wound exploration, CT scanning, selective observation remains topics of debate.⁽¹⁰⁾ Examination of the abdomen is inaccurate in inebriated or intoxicated patients.⁽¹¹⁾ Diagnostic peritoneal lavage might interfere with CT scan because of undrained lavage fluid.⁽¹⁰⁾ CT scan is not the first line investigation in abdominal stab wounds because of lacking of the sensitivity, specificity, and the potential for delay in definitive management. The delay in the treatment is associated with an increase in morbidity and mortality. Consequently, CT scan although helpful, is not necessarily the most accurate.⁽¹²⁾

In the present study, laparoscopy has the advantage of identifying defects of the peritoneum and diaphragm and mesenteric and omental injuries. In addition, the magnification of laparoscopy allowed the judgment of stability of hemostasis.

The nontherapeutic exploratory laparotomy can be avoided in up to 75% of patients, it is reasonable to know

that reduction of hernias, adhesions, and intestinal obstruction has resulted despite lack of long term followup.⁽¹³⁾ In the current study, laparoscopy had a diagnostic accuracy of 92.5% and avoided laparotomy in 65 % of patients. Laparoscopy is both sensitive and specific in the setting of penetrating abdominal trauma.⁽¹⁴⁾ The use of laparoscopy was associated with a decrease in laparotomy rate. However, it was positive nontherapeutic in 48.2% of patients in our study. This raises a question about the real benefits for those patients from laparoscopy. This point is the main concern of use of laparoscopy in abdominal trauma. However, there is no other method to exclude this subgroup. As the delay in the diagnosis is associated with rise in the morbidity and mortality, we considered the benefits of early diagnosis outweigh the drawback of delayed diagnosis.

The injury spectrum found was diverse.⁽¹⁵⁾ Hollow viscous injury was the most common diagnosis found and can be one of the most difficult to make preoperatively.⁽¹⁶⁾ In addition, an aggressive laparoscopic approach can allow rapid diagnosis and treatment of these injuries and prevent the morbidity associated with a delay in diagnosis.⁽¹⁷⁾

The mean operative time for therapeutic laparotomy patients is significantly greater than that for laparoscopy patients.⁽¹⁸⁾ In the present study, the mean operative time was 55±18 minutes. It was significantly shorter in comparison to patients who underwent laparotomy (P <0.05)

The mean ICU stay was significantly shorter in the laparoscopy group as compared to laparotomy group, 1.43±0.20 vs. 5.0±0.82 (p < 0.0001).⁽¹⁹⁾ In addition, patients who underwent laparoscopy were discharged after an average of 1.6 (1-3) days, while those who underwent laparotomy were discharged after an average of 7.6 (2-15) days.⁽¹⁸⁾ In the present study, the mean ICU stay was 0.7±0.1 days. It was significantly shorter in comparison to patients who underwent laparotomy, 3.1±1.9 (P<0.05). Mean hospital stay was 3.2±1.3 days in patients with laparoscopy alone versus 6.5±2.4 days in laparotomy patients with a significant decrease of hospital stay (P <0.05).

Feliz et al.,⁽²⁰⁾ detected no mortality and minor perioperative morbidity and no injuries were missed as a result of laparoscopic explorations. In the present study, postoperative complications occurred in 2 patients (6.8%), both of them had chest infection, and the mortality rate was 0%. No patients who underwent laparoscopy died.⁽²¹⁾ In this study, our data reflect that laparoscopy in trauma is a safe method for the evaluation and treatment of anterior abdominal stab injuries in hemodynamically stable patients. Laparoscopy serves as a diagnostic tool in stab abdominal trauma that reduces the morbidity of a negative laparotomy.⁽²²⁾ Laparoscopy in our study resulted in a sensitivity for abdominal injury exceeding 93%, with a specificity of 100%. There were no missed injuries. This represents a zero false-negative rate. Furthermore, it proved to be a safe modality without direct operative or postoperative morbidity and, it provides the potential to be therapeutic in selected cases.

In conclusion, laparoscopy is safe and efficient in the management of the anterior abdominal stab injuries in hemodynamically stable patients. It is associated with minimal morbidity and no mortality. Laparotomy is still indicated in extensive injuries.

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