

A Review on the Role of Laparoscopy in Abdominal Trauma

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ABSTRACT

Background: The trauma victims are considered the top critical patients and require a rapid decision in the management. As the main fear is bleeding, so most of them ended having laparotomy, although almost 40% ended having a less invasive management like using laparoscopy.

Materials and methods: The use of laparoscopy as a diagnostic (with the facility to be used as a therapeutic) option at the same setting can be considered a very good tool provided the patient is hemodynamically stable. Classically, standard three ports (extraport can be added according to therapeutic technique) are used. Most of the intestinal, mesenteric and diaphragmatic injuries can be detected and repaired successfully as well as some parenchymal injuries, provided not bleeding actively and, if necessary, using some tissue adhesives.

Results: The laparoscopic technique as a diagnostic as well as therapeutic tool (in some cases) can be used safely and with fewer complications as it reduces the significant number of negative laparotomies.

Conclusion: An access to the abdominal cavity laparoscopically can achieve good results in hemodynamically stable patients and avoids the morbidities related to laparotomy, decreases hospital stay and considered as a cost-effective tool.

Keywords: Abdominal trauma, Laparoscopy.

INTRODUCTION

The death rate due to trauma is increasing in the industrialized country, whether blunt or penetrating injury. Most of the victims are of young age groups. Most of the multiply injured patients dies before reaching hospital because of severe neurological or vascular injuries. Due to the increasing experience of the surgeon, minimal access surgery has found its way in the diagnosis as well as treatment of patients. As the patients are considered critical, so they need a rapid decision to be managed either surgically or conservatively. The hemodynamically unstable patients has a less chance of conservative approach, in reverse to that the stable one can be managed conservatively, although this is not applicable in all circumstances. In spite of using different tools to diagnose injuries, sometime a great challenge will phase the treating physician but that should not make a delay in proper management.¹

MATERIALS AND METHODS

The management of trauma patients should be through a systematic way according to ATLS protocol which implies a rapid and proper examination, knowing the mechanism and severity of injury, and a concise history, if possible which all together provides a clue to the possible injuries. Many diagnostic tools are available for quick assessment, like focused abdominal sonography for trauma (FAST), diagnostic peritoneal lavage (DPL) (Figs 1 to 3) and computerized tomography scan (CT scan).^{1,3}



Fig. 1: Diagnostic peritoneal lavage kit



Fig. 2: Technique of inserting DPL catheter



Fig. 3: Positive DPL test



Fig. 5: Focused abdominal sonography for trauma (FAST)

DPL and FAST provide a quick access to assess the internal bleeding and are very specific but not sensitive (do not provide the information of the source of bleeding). Usually, the unstable patients fall into this group and require urgent laparotomy.⁶

On the other hand, CT scan has to be used for stable patient as it is time consuming and needs transfer to the radiology department. It provides a sound knowledge of injury and the source of bleeding, and is very specific in delineating solid organ injuries.

Of the abovementioned diagnostic tools, each has its own drawback, i.e. DPL and FAST (Figs 4 to 7) are not informative in regards to parenchymal injuries. DPL, FAST and CT scan—all can miss hollow viscus and diaphragmatic injuries.

In some cases of stable blunt abdominal trauma, when the diagnosis is of uncertainty and most of the cases of penetrating injuries, the role of laparoscopy should be

considered strongly as among the best tool in diagnosis and sometimes treatment as well.

The standard three ports are used (one optical and two operating ports) (Fig. 8); a systematic clock wise diagnostic



Fig. 6: Fluid in the Morison pouch

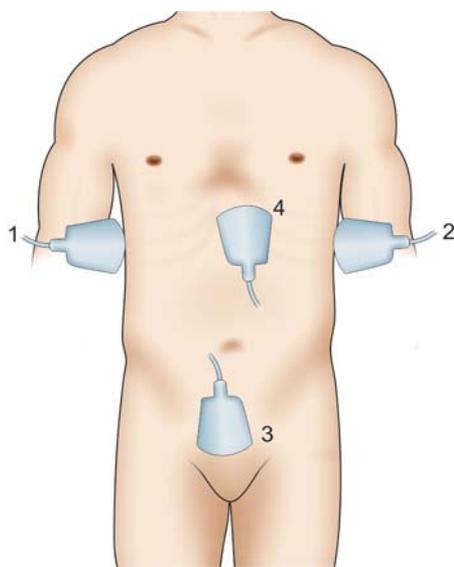


Fig. 4: Technique of FAST



Fig. 7: Fluid in the splenorenal pouch



Fig. 8: Three-port technique

exploration should be undertaken starting from right hypochondrial region, assessing all solid organs, lower esophagus, stomach, duodenum and rest of small bowel by running it from ileocecal valve to duodenojejunal junction, colon and rectum, mesentery as well as diaphragm as mostly missed by the noninvasive radiological tools.

Violating the peritoneum in the penetrating wound injury is an indication for laparoscopic exploration, and sometime local wound exploration is not informative due to the tangential track of the injury, provided the peritonitis is excluded because that declares a delayed presentation which needs aggressive surgical intervention and toileting.

A retrospective cohort study made for about 86 patients who sustained abdominal stab wound and were divided into two groups, resulted in reducing nontherapeutic laparotomy and avoiding its complications in most of the hemodynamically stable cases.²

In some other studies, an extensive review is made on the effect of laparoscopy as a diagnostic and therapeutic tool in the management of diaphragmatic ruptures, and considered the best line of management,⁴ even a rare case of traumatic intrapericardial diaphragmatic injury and herniation were managed successfully.

Although it is out of debate that video-assisted laparoscopy and thoracoscopy should be conducted for stable patient, some study has shown beneficial even for unstable cases, provided it is utilized properly in experienced hand.

DISCUSSION

The American College of Surgeon, committee on trauma has standardized the management of patients sustaining trauma whether blunt or penetrating after an accident happened to the orthopedic surgeon Dr Jim Styner who crashed his small plane into the rural area in 1976. After that a new program was developed in 1978 (the year of 1st ATLS course).

The standard method of resuscitating trauma patient is to follow ABCDE protocol (airway, breathing, circulation, disability and exposure). Treating airway has number one priority because if the patient can respond well, it indicates almost near normal ventilation and oxygenation as well as normal level of consciousness (GCS of 15/15). In resuscitating these patients, the 1st hour from the time of accident is uniquely important which is called golden hour, due to the importance of managing the life-threatening injury in that particular time, and within these critical minutes airway management should be the first task of the paramedics or physician. When life-threatening injuries, like tension pneumothorax, massive hemothorax, injury to the thoracic aorta and ruptured bronchopulmonary tree, have happened, the resuscitation has to be as fast as airway, because some of them affects the airway, oxygenation and ventilation at the same time. Bleeding is always considered as a threatening signal towards death, that is why it is the most stressful one to be managed, here is the arena where surgeon has to act quickly and properly as minutes will be counted rather than hours, and when the case is not hemodynamically stable, the option of laparoscopic approach does not exist and should not be attempted because it is time consuming and leads to many cardiorespiratory derangements in an already compromised victim.

Still as part of primary resuscitation, the last but not the least is neurological assessment as neurogenic shock should be kept in mind and not to be confused with the hypovolemic one, and examining (exposing) the patient in a warm environment to avoid hypothermia.

The revolution in surgery nowadays is towards minimal access approach, neither the less, this has also taken over in traumatology for selected cases (stable patients whether sustained blunt or penetrating injuries). Not only that, some trauma centers have made their own approach in handling these cases with the use of video-assisted techniques.

Previously there were literatures not supporting to the use of laparoscopy in trauma due to complications, including missed intestinal injuries, trocar and needle-related enteral and vascular injuries as well as gas embolism, but this has dramatically reduced as the new techniques and triangulations with ergonomics has respected.¹ Some authors have reported gas embolism in cases of inferior vena cava laceration,⁸ this was the lead point to the gasless technique. Tension pneumothorax has also been reported in cases of diaphragmatic injuries.⁹

Sometime inspite of using all the high quality investigations and imaging techniques, intra-abdominal injuries remain as a great challenge to be diagnosed, and so that is why still laparotomy is performed as a standard line of treatment. Provided the patient is stable, this is the field where laparoscopy has a great role. Although it is

not used routinely, a significant number of therapeutic procedures were applied like repair of injured diaphragm (Figs 9A and B) using suture, stapler or even mesh, closure of bowel perforation, resection anastomosis of injured intestine, control of parenchymal injuries using adhesives, energy sources, splenectomy and even distal pancreatectomy.⁷

Although in our review, we have shown that laparoscopy can be used for both penetrating and blunt trauma in a hemodynamically stable case, nowadays most of the level 1 trauma centers all over the world have developed their own program in dealing mostly with penetrating injury as it seems more promising to be the standard in the near future than for blunt injuries.

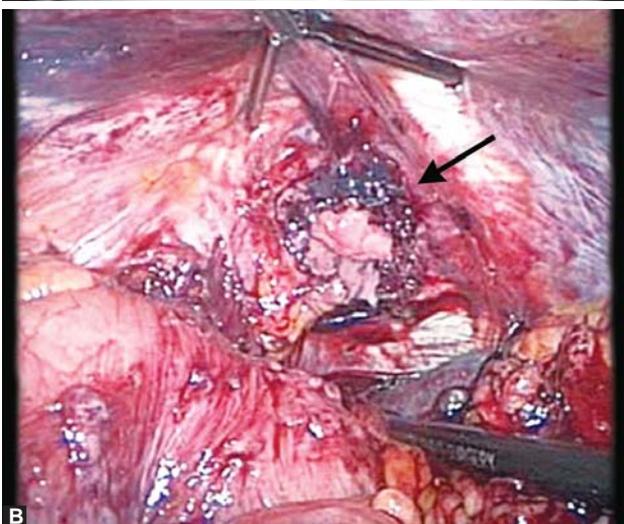
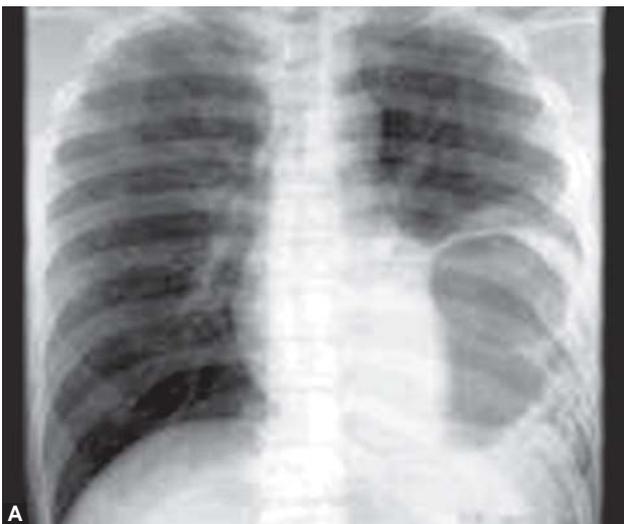
Cardiorespiratory derangement can be expected in laparoscopic surgery as creating pneumoperitoneum using carbon dioxide decreases the venous return by compressing the vena cava and thus pooling blood in the lower part of body, splinting the diaphragm also leads to improper ventilation and oxygenation. So, if this is the case for a patient undergoing an elective surgery (the derangements can be compensated during surgery by anesthetist), why to

double the risk in a compromised unstable patient, this is a question that has been answered by many pioneers of trauma surgery and has been uncovered in so many literatures, that the case should undergo laparotomy rather than video-assisted surgery.⁵

Conducting the laparoscopic surgery for trauma patients is better to be under low pressure pneumoperitoneum as it will be tolerated rather than the routine 14 mm Hg pressure.

In treating injuries, many techniques have been described. For example, in splenic injury (Fig. 10) (stable case), tissue adhesive has been used with good result as well as for hepatic injuries (Fig. 11), even sometime partial splenectomy can be conducted depending on the skill of operating surgeon. Diaphragmatic rupture and tears are treated by using suture, stapler or even sometime a properly sized synthetic mesh. Mesenteric tears are dealt with depending on its size and bowel affection, it ranges from simple closure of the defect to bowel resection and anastomosis.⁷

Diaphragmatic injury is a matter of concern as the signs and symptoms may be delayed regardless of the mechanism



Figs 9A and B: Diaphragmatic injury (arrow)



Fig. 10: Splenic injury



Fig. 11: Hepatic injury

of injury, in that view the key hole approach is the best way for repair.

CONCLUSIONS

It is safe and technically feasible to use laparoscopy as a diagnostic and therapeutic tool in the management of selected hemodynamically stable cases.¹⁰

The data has shown that it decreases the rate of negative laparotomy when applied properly in experienced hand, as the surgeon has a great role in utilizing video-assisted technique for trauma cases when there is a good familiarity with the procedure and improvement in the skills, including ergonomics, port positioning and depth perception, is respected.

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