

# Laparoscopic exploration versus conservative treatment in stable blunt abdominal trauma patients

Abdelkader A. Abdelatif Mohammed, Khalied H. Gad, Amr M. M. El-hefny, Ahmed S. Saad

Department of General Surgery, the upper GIT Surgery unit, Ain Shams University, Cairo, Egypt

Correspondence to Abdelkader Ahmed Abdelatif Mohammed, M.B., B.CH, qalubia gov , khanka city (21) kobri al mohada st abuzabal, Cairo 13758, Egypt. Tel: +20 44577013; e-mail: abdelkaderahmed@ymail.com

**Received:** 5 September 2023

**Revised:** 20 September 2023

**Accepted:** 27 September 2023

**Published:** 7 December 2023

**The Egyptian Journal of Surgery** 2023, 42:1001–1006

## Background:

Laparoscopy is now a standard procedure in general surgery, and as technique and equipment advance, more complicated procedures are being carried out using this minimally invasive approach. With less patient morbidity, postoperative complications, and recovery time than open procedures, laparoscopic surgery aims to offer equal or better visualisation. Numerous laparoscopic procedures, such as cholecystectomy, gastroesophageal reflux procedures, and diagnostic laparoscopy, have demonstrably achieved this goal. Despite the advantages of laparoscopy in the trauma population, its complexity and potential hemodynamic instability due to intra-abdominal injury typically prevent its use. This cutting-edge technology may help carefully chosen trauma patients. According to estimates, 10% of all deaths worldwide were due to trauma.

## Methods:

This prospective study included 29 patients with history of blunt abdominal trauma and vitally stable following initial resuscitation admitted to Casualty and Emergency Unit, ainshams university hospitals and Elzhor Hospital port said, during the period from June 2022 to December 2022.

## Results:

The patients in study were 21 males (82 % of total) 10 males in (LE) representing approximately 77 % and 11 males in conservative group representing approximately (87 %), and 8 females (18 % of total) 2 females in (LE) and 6 in conservative group. As Regarding the hospital stay, in this study, the patients managed by (LE) had shorter hospital stay in relation to those managed conservatively, as the patients results revealed that the overall hospital stay for (LE) was significantly shorter, with an average of  $5.69 \pm 1.887$  days. In this study, the group that benefit the most from shortening the hospital stay was the patients with haemoperitonium with no definite injuries, followed by patients with splenic injuries, while differences in hospital stay in patients with hepatic injuries were not significant. All patients had access to follow-up information for three months after discharge. There were no infective or late hemorrhagic complications observed.

## Conclusion:

Laparoscopic exploration was found to be most beneficial in patients with blunt abdominal trauma who had a CT scan that revealed haemoperitonium but no organ injuries., and to less extent in cases with splenic injuries, while there was no significant data favoring (LE) on conservative treatment in patients with hepatic injuries.

## Keywords:

Laparoscopic Exploration, Conservative Treatment, Stable Blunt Abdominal Trauma

Egyptian J Surgery 42:1001–1006

© 2023 The Egyptian Journal of Surgery

1110-1121

## Introduction

Laparoscopy is now a standard procedure in general surgery, and as technique and equipment advance, more complicated procedures are being carried out using this minimally invasive approach. With less patient morbidity, postoperative complications, and recovery time than open procedures, laparoscopic surgery aims to offer equal or better visualization. Numerous laparoscopic procedures, such as cholecystectomy, gastroesophageal reflux procedures, Bariatric surgery, and diagnostic laparoscopy, have demonstrably achieved this goal.

Despite the advantages of laparoscopy in the trauma population, its complexity and potential hemodynamic instability due to intra-abdominal injury typically prevents its use. This cutting-edge technology may help carefully chosen trauma patients. According to estimates, 10% of all deaths worldwide were due to trauma [1].

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

No matter the level of socioeconomic development, trauma continues to be the leading cause of death in the first 40 years of life and is a serious public health concern everywhere [2].

The third frequently injured area is the abdomen. Traditionally, abdominal trauma is categorized as either blunt or penetrating. While blunt abdominal trauma is frequently overlooked because the clinical signs are less obvious, penetrating abdominal trauma can typically be diagnosed quickly and accurately. Blunt abdominal injuries are more common in rural areas than penetrating ones, which are more common in cities [3].

The assessment of hemodynamic stability is the primary initial concern in the evaluation of a patient with blunt abdominal trauma. In the hemodynamically unstable patient, a quick assessment of the presence of hemoperitoneum is necessary [4].

Laparoscopic evaluation of the abdominal cavity has been proven to be sensitive and specific in the trauma setting (sensitivity, 94%; specificity, 98%) [5].

---

## Methods

This prospective randomized study included 29 patients with a history of blunt abdominal trauma and vitally stable following initial resuscitation admitted to Casualty and Emergency Unit, Ain Shams University Hospitals and Elzhor Hospital port said, during the period from June 2022 to December 2022, were selected randomly and divided into two groups.

Group (A) included 13 patients treated with Laparoscopic Exploration (LE).

Group (B) included 16 patients handled conservatively, with close monitoring of vital signs, urine output, laboratory testing, and repeated abdominal ultrasonography (US) imaging.

After discharge, patients in both groups were followed-up on to detect late complications after 3 months.

Inclusion criteria for the patients to be included in the study: patients with history of blunt trauma to the abdomen, either isolated or as a part of multiple trauma and age, sex, and mechanism of injury had no rule in patient selection.

Exclusion criteria for other trauma patients not included in the study: patients with history of

penetrating trauma to the abdomen, patients with history of blunt trauma to the abdomen that remains vitally unstable after initial resuscitation and early FAST positive patients.

All patients of the study underwent immediate initial resuscitation and primary assessment, followed by thorough history taking and general and local examination and routine laboratory (complete blood count (CBC), liver function, kidney function, serum sodium and potassium, prothrombin time, and concentration).

### Laparoscopic exploration (LE)

Technique: all of the patients had anesthetized. To better visibility, the patient must be secured to the table and the horizontal plane must be manipulated. Arm boards should be used to extend the patient's arms laterally. This allows access to the arms for anesthesia, the chest for thoracostomy or thoracotomy, and the abdomen wall if a laparotomy is necessary. Skin preparation should not only involve the abdomen, but also the neck, knees, and the level of the table on either side. This provides quick access to any bodily cavity, as well as access for resuscitative lines and/or vascular harvest. If a quick changeover is required, standard laparotomy instruments should be readily available.

In all cases, a 30° laparoscope was employed to enable appropriate visibility of the abdominal wall as well as visceral contents. Typically, a 10 mm port with a camera of equal size is utilized. To detect any hissing sound when opening the peritoneum and to avoid mistake between peritoneal penetration with a Veers needle and a penetrating injury, the needle was placed openly.

Peritoneal insufflation must be done with caution and in close collaboration with the anesthesia team in order to monitor airway pressures and physiologic factors. The pressure of abdominal insufflations was limited to 15 mmHg. Following insufflations, two 5 mm ports were put in pararectal location 5 cm above the umbilicus as functioning ports.

Exploration starts by aspiration of any blood collection, followed by inspection of solid organs, diaphragm, stomach, intestine, urinary bladder and the parietal layer of the abdominal wall. A significant challenge during LE for abdominal trauma is a thorough examination of the small bowel by 'running of the bowel' using atraumatic graspers to pass the bowel systematically hand to hand with circumferential

**Table 1 Patient characteristics regarding type of management laparoscopic exploration group (A) patients versus conservative treatment group (B) patients**

	Group A	Group B	P-value
Number of patients	13	16	NA
Age (mean±SD)	24.08±10.6	29.56±10.9	0.292
Sex			
Male	11 (85%)	10 (63%)	0.238
Female	2 (15%)	6 (37%)	
Mood of trauma			
Fall from a height	2 (15.4%)	1 (6.3%)	0.409
Kick to abdomen	1 (7.7%)	0	
Motor car accident	9 (69.2%)	13 (75%)	
Motorcycle accident	1 (7.7%)	3 (18.8%)	

**Table 2 Associated injuries of blunt solid organ injury patients**

Associated injuries	Group A	Group B	Total	P-value
Urinary Tract Injury	1 (8%)	2 (13%)	3 (10%)	0.672
Extremity injuries	1 (8%)	5 (31%)	6 (21%)	0.119
Chest trauma	0	4 (25%)	4 (14%)	0.107
Pelvic fracture	0	3 (19%)	3 (10%)	0.232
Head injury	0	1 (6%)	1 (3%)	1.000
Diaphragmatic Injury	1 (8%)	0	1 (3%)	0.448
Injured organ				
Liver	6 (46%)	6 (38%)	12 (41%)	0.638
spleen	5 (39%)	4 (25%)	9 (31%)	0.436

examination. Exploration of the diaphragmatic hiatus, lesser sac, and posterior stomach requires an additional 2 ports in the upper abdomen for retraction.

US and computed tomography (CT): after resuscitation of the blunt trauma victims and stabilization of the vital signs by the trauma surgeon's team, abdominal US and CT scans were performed for all cases, who were vitally stable all through while clinically those patients were found to be suspicious of having an intra-abdominal injury.

Conservative treatment included close follow-up the patient with continuous monitoring of the vital signs (blood pressure, pulse, temperature, and respiratory

**Table 3 Grading of liver injuries in both groups**

Patient No.	Group A	Patient No.	Group B
1	Segment 5 hematoma	2	Segment 5 hematoma
3	Segment 6 tear	4	Segment 4 hematoma
8	Segment 5 tear	5	Segment 6,7 tear
9	Segment 5 hematoma	7	Segment 7 hematoma
10	Segment 6,7 hematoma	8	Segment 6 hematoma
13	Segment 5 hematoma	12	Segment 7 tear

rates), urine output, daily laboratory tests (CBC, liver function, kidney function). The follow-up of the solid organs trauma was done by US to determine resolution of the trauma and the success of conservative treatment.

Follow-up information was obtained from all patients 3 months after discharge in order to detect infective, late hemorrhagic, or adhesive problems.

## Results

During the study period 29 patients with history of blunt abdominal trauma and vitally stable following initial resuscitation admitted to Casualty and Emergency Unit, Ain Shams University Hospitals and Elzhor Hospital Port Said. Thirteen (44.8%) were managed by LE and 16 by conservative treatment. Males were the majority in both groups (11, 84.6%- group A; 10, 62.5%-group B). Mood of trauma were similar in both groups. Motor car accidents was predominating (9, 69.2%-group A; 12, 75%-group B) followed by Motorcycle accidents (1, 7.7%-group A; 3, 18.8%-group B) followed by falls from height (2, 15.4%-group A; 1, 6.3%-group B) and Kick to abdomen (1, 7.7%-group A; 0-group B) (Table 1).

The A group shows six patients with liver injury from 13 total about 46% and the B group shows six patients from 16 total about 38% with all 12 patients with liver injury from 29 patients included in the study about 41% (Tables 2 and 3).

The A group shows five patients with Splenic injury from 13 total about 39% and the B group shows four patients from 16 total about 25% with all nine patients with Splenic injury from 29 patients included in the study about 31% (Tables 2 and 4).

Regarding hospital stay, group A shows hospital stay range from 4 days to 10 days with 10 patients below 7 days, one patient stay 7 days, one patient stay 8 days, and one patient stay 10 days. Group B shows hospital

**Table 4 Grading of splenic injuries in both groups**

Patient No.	Group A	Patient No.	Group B
2	Grade III splenic tear	1	Grade II splenic tear
5	Grade III splenic tear	6	Grade III splenic tear
6	Grade II splenic tear	11	Multiple splenic tears
7	Grade II splenic tear	13	Shattered lower splenic pole
11	Sub capsular splenic hematoma		

**Table 5 Hospital stay in two groups**

Group	Hospital Stay		Total	Pearson Chi-Square ( <i>P</i> -value)	Fisher's Exact Test ( <i>P</i> -value)
	<7	>=7			
<b>A</b>					
Count	10	3	13		
Expected Count	6.3	6.7	13.0		
% within Group	76.9%	23.1%	100.0%		
<b>B</b>					
Count	4	12	16		
Expected Count	7.7	8.3	16.0	0.005	0.009
% within Group	25.0%	75.0%	100.0%		
<b>Total</b>					
Count	14	15	29		
Expected Count	14.0	15.0	29.0		
% within Group	48.3%	51.7%	100.0%		

Using: *t*-Independent Sample *t*-test for mean and SD;  $\chi^2$ : Chi-square test and Fisher's exact test for number and percentage%. *P*-value greater than 0.05 is insignificant. NA, not applicable.

stay range from 5 days to 14 days with four patients below 7 days and 12 patients range from 7 days to 14 days.

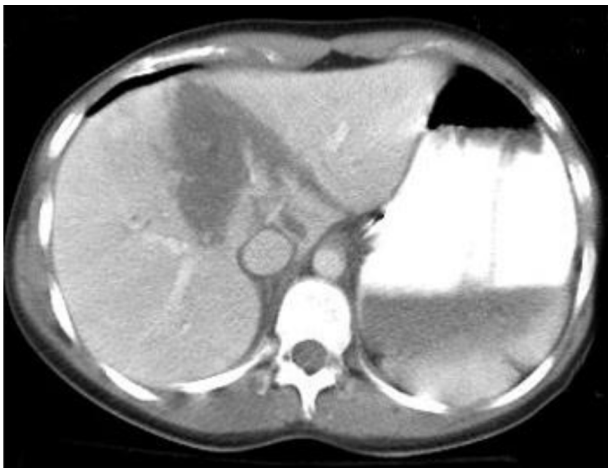
Since  $\chi^2$  *P*-value=0.005 and Fisher's exact test *P*-value=0.009, we concluded that there are strong association between group and hospital stay factors (Table 5).

**Discussion**

Blunt abdominal trauma is a common presentation in emergency departments, and its management remains a significant challenge. Stable patients with blunt abdominal trauma pose a dilemma in terms of deciding whether to proceed with LE or adopt a

conservative approach. Laparoscopy has gained popularity in recent years as a minimally invasive diagnostic and therapeutic tool, providing visualization and intervention in abdominal trauma [6].

**Figure 1**



Computed tomography scan of Grade III-IV intraparenchymal hepatic laceration with no hemoperitoneum associated with this injury.

**Figure 2**



Computed tomography scan of grade IV intrahepatic hematoma with no hemoperitoneum.

**Figure 3**



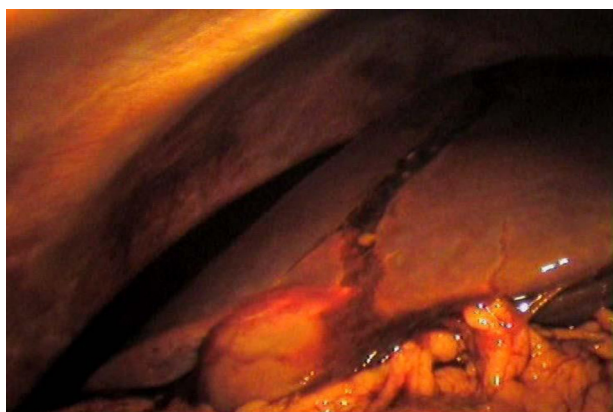
Computed tomography scan of grade IV hepatic laceration of the right lobe.

Figure 4



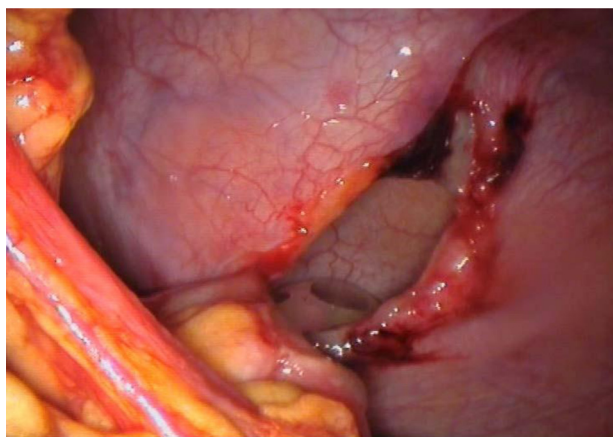
Computed tomography scan of grade III splenic upper pole laceration with perisplenic blood collection and a small left lobe hepatic hematoma.

Figure 5



Large hepatic laceration reaching gall bladder fossa.

Figure 6



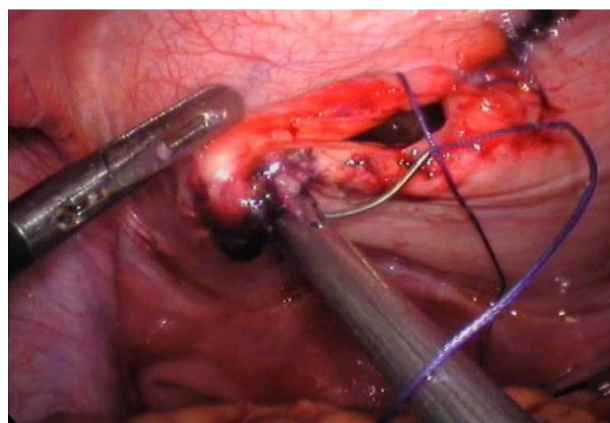
Urinary bladder tear with momentum sealing it.

In this study, we aimed to explore the benefits and limitations of LE compared with conservative treatment in stable patients with blunt abdominal trauma.

Regarding the hospital stay duration within two groups, group A and group B. In group A those managed by LE, out of a total of 13 patients, 10 patients had a hospital stay of less than 7 days, while three patients had a stay of 7 days or more within group A. In group B those managed by the classic conservative management, there were four patients with a hospital stay of less than 7 days and 12 patients with a stay of 7 days or more which was statistically significant, and this result conigned with another study Abdelshafy *et al.* [7] with decreased postoperative ICU stay and total hospital stay.

A study done by Koto *et al.* [8] on laparoscopy for traumatic abdominal trauma revealed that the mean period of patient hospital stay was 11 days.

Figure 7



Repair of the bladder tear laparoscopically.

Figure 8



Splenic tear sealed by large hematoma.



Regarding the distribution of liver injury within the two groups, there is no notable difference in the distribution of liver injury between group A and group B.

In the same line, Abdelshafy *et al.* [7] Found that liver injury in laparoscopic and laparotomy was 24, 20%, respectively with no significance in injured liver.

The analysis examined the relationship between different modes of trauma. The results indicated that there was no significant association between the modes of trauma and the grouping variable. In the same line Abdelshafy *et al.* [7] revealed that there was no significant differences were found between the two groups regarding the mode of trauma.

The analysis examined the presence of therapeutic laparoscopy in relation to group A and group B. Out of the 13 patients in group A, three underwent therapeutic laparoscopy.

As mentioned by Yehia *et al.* [9] laparoscopy is useful for decrease the need for laparotomy for patients with blunt abdominal trauma. In the study done by Okuş *et al.* [10] revealed that nonoperative treatment in abdominal trauma is safe and effective. Patients with clinical stability and normal physical examination findings can be treated nonoperatively with close monitoring.

Study limitations: it is important to note that the analysis is limited to the given sample size, which may not be representative of the entire population. Further research with larger and more diverse samples is necessary to validate these findings and provide a more comprehensive understanding of the association between therapeutic laparoscopy and the grouping variable.

---

## Conclusion

LE was found to be most significant for blunt abdominal trauma patients with CT scan showing hemoperitoneum and no organ injuries, and to a lesser extent in cases with splenic injuries, while there was no significant data favoring LE on conservative treatment in patients with hepatic injuries Figs. 1–8.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no Conflicts of interest.

---

## References

- Gao Y, Li S, Xi H, Bian S, Zhang K, Cui J, Chen L. Laparoscopy versus conventional laparotomy in the management of abdominal trauma: a multi-institutional matched-pair study. *Surg Endosc* 2020; 34:2237–2242.
- Ki D, Lee S. Analyzing the effects of Green View Index of neighborhood streets on walking time using Google Street View and deep learning. *Landsc Urban Plan* 2021; 205:103920.
- Wandling MW, Hungness ES, Pavey ES, Stulberg JJ, Schwab B, Yang AD, Nathens AB. Nationwide assessment of trends in choledocholithiasis management in the United States from 1998 to 2013. *JAMA surgery* 2016; 151:1125–1130.
- Shreffler J, Smiley A, Schultz M, Ross A, Baker J, Nash N, Huecker M. Patients with abrasion or ecchymosis seat belt sign have high risk for abdominal injury, but initial computed tomography is 100% sensitive. *J Emerg Med* 2020; 59:491–498.
- Koganti D, Hazen BJ, Dente CJ, Nguyen J, Gelbard RB. The role of diagnostic laparoscopy for trauma at a high-volume level one center. *Surg Endosc* 2021; 35:2667–2670.
- Sözen S, Kanat B, (Eds). *Trauma and Emergency Surgery. XX: BoD-Books on Demand*; 2022.
- Abdelshafy AA, Nagy ME, Elshinawi ME, Ouf TI. Role of laparoscopy in blunt abdominal trauma: a comparative prospective cohort study between laparoscopy and laparotomy in patients with blunt abdominal trauma. *Egypt J Surg* 2020; 39:926–931.
- Koto MZ, Matsevych OY, Mosai F, Patel S, Aldous C, Balabyeki M. Laparoscopy for blunt abdominal trauma: a challenging endeavor. *Scandinavian Journal of Surgery* 2019; 108:273–279.
- Yehia M, Khalifa S, Atia M, AbdAlla A, Ali R. Role of Laparoscopy in Bluntabdominal Trauma. *Zagazig Univ Med J* 2013; 19:1–7.
- Okuş A, Sevinç B, Ay S, Arslan K, Karahan Ö, Eryılmaz MA. Conservative management of abdominal injuries. *Turkish J Surg/Ulusal cerrahi dergisi* 2013; 29:153.