

Spectrum of hollow visceral injury due to isolated blunt trauma abdomen presented to a tertiary care trauma hospital of Pakistan

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Abstract

Objective: To evaluate the spectrum of isolated hollow visceral perforations in patients presenting with abdominal blunt trauma.

Method: The observational, analytical, cross-sectional study was conducted at the surgical ward of Mayo Hospital, Lahore, Pakistan from July 1, 2020, to June 31, 2021, and comprised patients who presented in the emergency department after blunt trauma to abdomen without any open wound. Findings of hollow visceral injury were confirmed on exploration laparotomy. Data was analysed using SPSS 26.

Results: Of the 216 patients, 173(80.9%) were male and 43(19.9%) were female. The overall mean age was 42 ± 9.7 years. Most of the blunt trauma abdomen cases were caused by motor vehicle accidents 59(27.3%). The most common hollow viscus affected was jejunum 42(19.4%), followed by transverse colon 29(13.4%). The most common type of injury observed was single complete disruption of hollow viscus 74(34.2%).

Conclusion: The most common hollow organ affected by blunt trauma to the abdomen was jejunum, followed by transverse colon, and motor vehicle accidents were the major cause of these injuries.

Keywords: Blunt trauma abdomen, Hollow viscera, Perforation, Motor vehicles, Peritonitis, Tertiary care hospital.

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Introduction

One of the most common presenting health issues at major tertiary care hospitals around the globe is injury,¹ which accounts for 10% of deaths worldwide, with 12.5% deaths in males and 7.4% deaths in females accounting for different types of injuries. The risk of death due to injury varies in different parts of the world and depends on conditions, like age, gender and region.²

Blunt trauma abdomen (BTA) is the leading cause of morbidity as well as mortality in all age groups.³ The true frequency of BTA in the United States is not very clear. Most of the data available is from major trauma centres, while data from other hospitals is not available.⁴ According to the National Centre of Injury Prevention and Control, it is obvious that trauma is the leading cause of death in patients aged 1-44 years.⁵

Motor vehicle accidents (MVAs) remain the most common cause of BTAs. With the improvement in science and technology in the motor vehicle industry, more safety mechanisms are being introduced, but still many accidents on the roads are caused by motor vehicles.⁶ It has been estimated that 33,244 MVAs took place in the US in 2019, leading to 36,096 deaths. In the US, there are about 11 deaths per 100,000 people and 1.11 deaths per 100 million miles travelled.⁷

The nature of hollow viscus injuries due to BTA varies a lot, ranging from a small mesenteric tear to multiple complete disruptions of the hollow organs.⁸ The nature of injury depends on the mode of trauma which depends on multiple factors, like speed of vehicle, accelerating or decelerating, height of the fall, physique and age of the patient. Most high-speed MVAs leave no obvious external injuries, but a simple bruise on the abdomen leads to catastrophic findings inside the abdomen on exploration.⁹

The data of MVAs from Asia showed that 1 person is killed on road every 40 seconds and more than 2,000 people are killed every week and 15,000 every month due to MVAs.¹⁰ In Pakistan, very few tertiary care hospitals deal with cases of major BTAs. However, data from these tertiary care hospitals is so small that no definite interpretation can be extracted.¹¹

The current study was planned to evaluate the incidence and mode of BTA cases presenting at a leading tertiary care hospital, and to assess the spectrum and nature of hollow viscus perforations in BTA cases.

Patients and Methods

The observational, analytical, cross-sectional study was conducted at the surgical ward of Mayo Hospital, Lahore, Pakistan from July 1, 2020, to June 31, 2021. After approval from the institutional ethics review board of the King Edward Medical University, Lahore, the sample size of 216 was raised using consecutive non-probability sampling technique. All consecutive patients of either gender aged

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>13 years were included who presented to the accident and emergency (A&E) department with isolated BTA injury and with clinical signs and symptoms of peritonitis, like tachycardia, hypotension, rebound abdominal tenderness/abdominal guarding and rigidity, with or without free gas under the right diaphragm. Computer tomography (CT) scan was done depending upon its availability. The confirmation of hollow viscus perforation was confirmed on exploratory laparotomy and such cases were included. The included patients had solid organ injury along with hollow viscera or mesenteric injury. Those with an open wound or penetrating injury due to any cause, like stab wound, gunshot wound or road traffic accident (RTA) on abdomen, head, neck, chest, upper or lower limbs with or without BTA were excluded.

After taking informed consent, the patients were taken for exploratory laparotomy and stoma formation under general anaesthesia. On exploration, the nature of the injury was noted whether it was single or multiple injury and simple perforation or complete disruption of the hollow organ. Also, the hollow organ/mesentery affected was also noted.

Data was analysed using SPSS 26. Qualitative statistics were analysed and expressed as frequencies and percentages. Quantitative correlations among the variables were determined using chi-square test. $P < 0.05$ was taken as statistically significant.

Results

Of the 216 patients, 173(80.9%) were male and 43(19.9%) were female. The overall mean age was 42 ± 9.7 years (range: 15-76 years). The largest age group was 30-39 years 58(26.8%), followed by 13-19 years 26(12%) and 40-49 years 24(11.11%). Most BTA cases were caused by MVAs 59(27.3%) and motorcycle accidents 43(19.9%) (Table 1).

The most common hollow viscus affected was jejunum 42(19.4%), followed by transverse colon 29(13.4%) (Figure 1). The most common type of injury observed was single complete disruption of hollow viscus 74(34.2%) (Table 2).

Table-1: Mode of blunt trauma abdomen injury to the included patients.

Mode of Injury	n (%)
Motor vehicle accident	59 (27.3)
Motorcycle accident	43 (19.9)
Vehicle pedestrian collision	23 (10.6)
History of accidental fall	29 (13.4)
Trauma during sports	21 (9.7)
Structural collapse	14 (6.5)
Trauma by animals	11 (5.1)
Trauma during fight	16 (7.4)
Total	216 (100)

Stomach 11(18.64%) and jejunum 12(20.34%) were affected mostly in MVAs (Figure 2).

Jejunum was also affected mostly in motorcycle accidents 11(25.58%). Vehicle and pedestrian collision affected stomach, jejunum, mesentery of small intestine, transverse colon and sigmoid colon equally; 3(13.4%) each. Sports injuries caused majority of perforations in jejunum and transverse colon 4(19.5%). Transverse colon and ileum were affected mostly in hollow viscus perforations due to fights 4(25%).

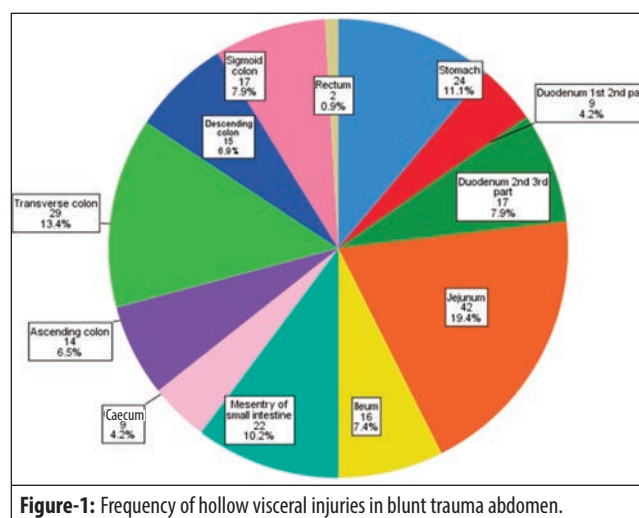


Figure-1: Frequency of hollow visceral injuries in blunt trauma abdomen.

Table-2: Type of hollow viscera injuries presented in patients with isolated blunt trauma abdomen.

Type of Injury	n (%)
Serosal tears of hollow viscous	47 (21.7)
Single perforation less than 1 cm	27 (12.5)
Single complete disruption of hollow viscous	74 (34.2)
Multiple perforations less than 1 cm	7 (3.2)
Multiple complete disruptions of hollow viscous	26 (12.0)
Mesenteric injury without hollow viscous injury	35 (16.2)
Total	216 (100)

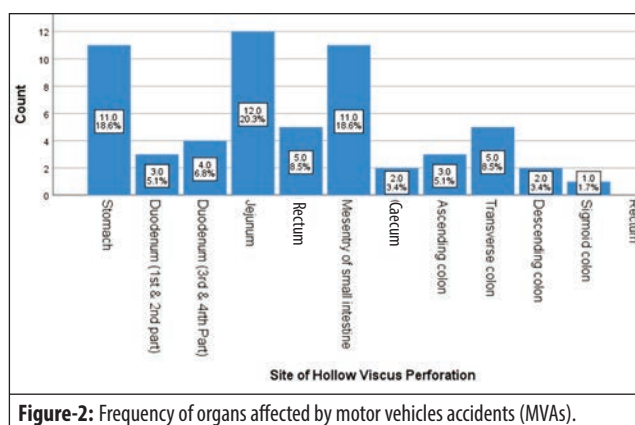


Figure-2: Frequency of organs affected by motor vehicles accidents (MVAs).

Discussion

There are multiple causes of blunt trauma to the abdomen. The most common pathophysiological mechanisms responsible for BTA include deceleration injuries, crush injuries and the rupture phenomenon.¹² Blunt abdominal injuries can be classified into 2 primary mechanisms; one caused by compression forces, and the other due to deceleration forces. Compression forces are those caused by direct blows or external compression against a fixed object, like lap belt or spinal column.¹³ Compression forces cause temporary increase in the intraluminal pressure which ultimately burst, causing peritonitis. The mechanism of deceleration forces is stretching and linear shearing between relatively fixed and free objects.¹⁴

In one study, the peak age group with BTA was 14-30 years. Also, there was equal incidence of hollow viscus perforation in both adult and paediatric age groups. The male-to-female ratio was 60:40.¹¹ These results are almost similar to those of the current study.

According to World Health Organisation (WHO) data, fall from height of <5 metre is the leading cause of injury, followed by MVAs. These injuries included all types of injuries, including BTA.¹⁵ According to data from the US in 2018, more than 150,000 people died due to any form of injury like MVAs, fires, falls, poisoning and suicides. In 2019, more than 30,000 million people visited the emergency department of hospitals in the US with complaints of injury.¹⁶

The first case of abdominal hollow viscus injury due to BTA was observed in 1837 in the US. Many studies have shown the mechanism of hollow viscus perforations due to BTA.¹⁷ According to Madhusudhan et al., the most common hollow viscus perforation found during BTA was duodenum and ileocolic junction, while Mallik et al. showed ileum as the most common viscera damaged.^{18,19} The current study showed that the most common hollow viscus affected due to BTA was jejunum 42(19.4%), followed by transverse colon 29(13.4%). The reason for jejunum to be affected more in BTA cases is relatively being fixed at the duodenojejunal (DJ) junction which on deceleration cause the proximal jejunum to get avulsed from it fixed DJ point. The same mechanism of injury is also applied to transverse colon which has two fixed points, hepatic flexure on the right and splenic flexure on the left, and in between there is free mobile part of transverse colon. This free mobile part of the transverse colon on experiencing deceleration forces get avulsed between the right and left fixed parts.²⁰

The nature of hollow viscera injury depends on many factors. In majority cases, the injury on the most fixed part of gut, like DJ junction and duodenum, causes complete

disruption, while in a few cases there is only small perforation.²¹ The duodenal injuries are considered difficult to diagnose in clinical examination and they present late. CT scan if available is the investigation of choice in the emergency department to diagnose such injuries. Moreover, simple serosal tears are easy to manage. A study showed that the repair of serosal tears was safer compared to leaving the serosal tears as such in terms of post-operative adhesion obstruction for a follow-up period of 5 years.²²

The type of mesentery injury is also important as the vertical tear on the mesentery needs just repair, while transverse tear of mesentery needs to remove the avascular segment of intestine. A study in Singapore showed that trauma was the leading cause of death in patients aged 1-44 years. The trauma included stab wounds, traffic accidents and fall from heights. Among them, 79% cases had presented with BTA.²³ Studies in India showed that blunt trauma was the more commonly encountered injury in patients aged 21-30 years and, among the mode of injury, MVA was the major BTA cause, followed by motorcycle accidents. Motorcycle injuries are more common in the young aged 15-22 years.²⁴ The current study, done at one of the major trauma care tertiary-level hospitals of Pakistan, also showed that most BTA cases presented due to MVAs (27.3%) followed by motorcycle injuries (19.9%).

There are certain limitations to the current study. It was done at a single centre, while different trauma centres in Pakistan may have data supportive of different findings. A large multicentre study is needed to authenticate the current findings. Moreover, *the sample size was not calculated for this study which could have a negative effect on the power of the study.*

Conclusion

The majority of BTA cases belonged to the younger age group driving motor vehicles. The most common viscera involved was jejunum, followed by transverse colon. Majority of visceral injuries were single hollow viscus perforation with complete disruption.

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Conflict of Interest: None.

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