

# A Clinical Study of Blunt Injury Abdomen in a Tertiary Care Hospital

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## Abstract

**Introduction:** Abdominal trauma is one of the most common causes among injuries caused mainly due to road traffic accidents. The rapid increase in motor vehicles and its aftermath has caused rapid increase in number of victims to blunt abdominal trauma. Motor vehicle accidents account for 75–80% of blunt abdominal trauma.

**Aims and Objectives:** This study aims to evaluate the impact of blunt abdominal trauma on intraperitoneal organs such as liver and spleen and hollow viscera such as stomach, small intestine, and large intestine evaluate various modes of presentation in early diagnosis.

**Materials and Methods:** This study is a prospective study of blunt abdominal injuries during the period from September 2017 to September 2019 in Mahatma Gandhi Memorial Hospital, Warangal. The number of cases studied is 59.

**Observations and Results:** From September 2017 to September 2019, the total number of blunt abdominal emergency operations carried out by various general surgical units in Mahatma Gandhi Memorial Hospital, Warangal.

**Key words:** Blunt injury abdomen, Mortality, Spleen

## INTRODUCTION

Abdominal trauma is one of the most common causes among injuries caused mainly due to road traffic accidents. The rapid increase in motor vehicles and its aftermath has caused rapid increase in number of victims to blunt abdominal trauma. Motor vehicle accidents account for 75–80% of blunt abdominal trauma.<sup>[1]</sup> Blunt injury of abdomen is also a result of fall from height, assault with blunt objects, sport injuries, industrial mishaps, bomb blast, and fall from riding bicycle.<sup>[1]</sup> Blunt abdominal trauma is usually not obvious. Due to the inadequate treatment of the abdominal injuries, most of the cases are fatal. The knowledge in the management of blunt abdominal trauma has progressively increasing due to the inpatient

data gathered from different parts of the world. In spite of the best techniques and advances in diagnostic and supportive care, the morbidity and mortality remain at large. The reason for this could be due to the interval between trauma and hospitalization, delay in diagnosis, inadequate and lack of appropriate surgical treatment, post-operative complications, and associated trauma especially to head, thorax, and extremities. In view of increasing number of vehicles and consequently road traffic accidents, this dissertation has been chosen to study the cases of blunt abdominal trauma with reference to the patients presenting at Mahatma Gandhi Memorial Hospital, Warangal.<sup>[2-4]</sup>

## Objectives of the Study

The objectives of the study were as follows:

1. To evaluate the impact of blunt abdominal trauma on intraperitoneal organs such as liver and spleen and hollow viscera such as stomach, small intestine, and large intestine.
2. To evaluate various modes of presentation in early diagnosis.
3. To evaluate various available investigations for the detection of intraperitoneal injuries.

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**Month of Submission :** 04-2021  
**Month of Peer Review :** 04-2021  
**Month of Acceptance :** 05-2021  
**Month of Publishing :** 06-2021

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4. To evaluate various modalities of treatment available for solid and hollow organ injuries with aim to reduce the mortality and morbidity.
5. To evaluate common complications.

## MATERIALS AND METHODS

### Source of Data

This study is a prospective study of blunt abdominal injuries during the period from September 2017 to September 2019 in Mahatma Gandhi Memorial Hospital, Warangal. The number of cases studied is 59.

### Methods of Collection of Data

Data were collected from the patients by their clinical history, clinical examination with appropriate investigations on those patients who were admitted. Post-operative follow-up was done to note for complications. After initial resuscitation of the trauma victims, a careful history was taken to document any associated medical problem. Routine blood and urine tests were carried out in all the patients. Documentation of patients, which included, identification, history, clinical findings, diagnostic test, operative findings, operative procedures, and complications during the stay in the hospital and during subsequent follow-up period, was all recorded on a specially prepared. Demographic data collected included the age, sex, occupation, and nature and time of accident leading to the injury.

After initial resuscitation and achieving, hemodynamic stability, all patients were subjected to careful examination, depending on the clinical findings; decision was taken for further investigations such as four-quadrant aspiration, diagnostic peritoneal lavage, X-ray abdomen, and ultrasound.

The decision for operative or non-operative management depended on the outcome of the clinical examination and results of diagnostic tests.

Patients selected for non-operative or conservative management were placed on strict bed rest, were subjected to serial clinical examination which included hourly pulse rate, blood pressure, respiratory rate and repeated examination of abdomen, and other systems. Appropriate diagnostic tests, especially ultrasound of abdomen, were repeated as and when required.

CT scan was done in 22 patients in our study. Apart from routine investigations, abdomen X-ray was done in 55 patients. Forty-one patients underwent four-quadrant aspiration. An aspiration of blood, which did not clot,

was taken as positive. When the aspirate clotted, the test was taken as negative. Twenty-one patients underwent diagnostic peritoneal lavage. DPL was done in patients who had equivocal signs or obscured by adjacent soft-tissue injury. The method was a semi-open technique through and infraumbilical incision, inserting an infant feeding tube, irrigating the abdominal cavity with ringer lactate solution, and aspirating. Ultrasound of abdomen was done in 33 cases.

### Observations and Results

From September 2017 to September 2019, the total number of blunt abdominal emergency operations carried out by various general surgical units in Mahatma Gandhi Memorial Hospital, Warangal, was 59.

### Age Incidence

| Age group | No. of patients | Percentage |
|-----------|-----------------|------------|
| 1–10      | 1               | 1.7        |
| 11–20     | 22              | 37.2       |
| 21–30     | 20              | 33.8       |
| 31–40     | 6               | 10         |
| 41–50     | 4               | 6          |
| 51–60     | 3               | 5          |
| 61–70     | 2               | 3          |
| 71–80     | 1               | 1.7        |

In this series, the majority of the patients belonged to 11–20 years age group followed by 21–30 years age group.

### Sex Incidence

| Gender | No. of patients | Percentage |
|--------|-----------------|------------|
| Male   | 53              | 90         |
| Female | 6               | 10         |

In the 59 cases studied, 53 cases were male, with females accounting for only about 6 cases.

### Ration of Operative to Conservative Treatment

|              | No. of patients | Percentage |
|--------------|-----------------|------------|
| Operative    | 44              | 74         |
| Conservative | 15              | 26         |

After a detailed clinical evaluation and suitable investigations, 44 patients with pneumoperitoneum or hemoperitoneum with hemodynamic instability underwent exploratory laparotomy. Fifteen patients were selected for non-operative management because they had no signs of peritonitis or they had hemoperitoneum without hemodynamic instability. Out of 15 patients, 2 patients required a delayed laparotomy after 48 h of deterioration in their hemodynamic status and development of signs of peritonitis.

### Mode of Injury

| Causative agent                    | No. of cases | Percentage |
|------------------------------------|--------------|------------|
| Road traffic accident              | 36           | 61         |
| Fall from height                   | 16           | 27         |
| Blow to abdomen with blunt objects | 7            | 12         |

Road traffic accident was responsible for 61% of blunt abdominal trauma cases, while fall from heights accounted for 27% of cases and blow with blunt object was responsible for 12% of injuries.

### Symptoms and Signs

The following table shows the incidence of various symptoms and signs with which the 59 patients studied presented with

| Symptoms and signs              | No. of patients |
|---------------------------------|-----------------|
| Abdominal pain                  | 51              |
| Vomiting                        | 8               |
| Abdominal distension            | 32              |
| Hematuria                       | 3               |
| Abdominal guarding and rigidity | 34              |
| Abdominal tenderness            | 52              |
| Rebound tenderness              | 19              |
| Pallor                          | 24              |
| Pulse >90/min                   | 48              |
| BP <90 mm of Hg systolic        | 28              |
| Free fluid                      | 32              |
| Absent bowel sounds             | 33              |

Majority of the patients presented with abdominal pain (86%) and abdominal tenderness (81%).

### Investigations

#### Plain X-ray abdomen

Plain X-ray of abdomen was done in 55 cases, out of the total 59 cases. This was not done in 4 patients as the patient's condition did not permit to shift them to the X-ray room or they died while being resuscitated for shock. Gas under diaphragm was found in 16 cases out of 21 bowel perforations detected at laparotomy.

#### Four-Quadrant Aspiration

Four-quadrant aspiration was done in 41 patients, among which 27 cases were positive and 14 cases were negative. Out of the 14 negative cases, 3 cases were false negative. On laparotomy, they were found to have hemoperitoneum. The following table shows the percentage of these cases.

| Result   | No. of cases | Percentage |
|----------|--------------|------------|
| Positive | 27           | 66         |
| Negative | 14           | 34         |
| Total    | 41           |            |

#### Diagnostic Peritoneal Lavage

Diagnostic peritoneal lavage was done in 21 cases, out of which 13 were positive and 8 were negative. All positive

cases showed significant injury at laparotomy. The following table shows the percentage of these cases.

| Result   | No. of cases | Percentage |
|----------|--------------|------------|
| Positive | 13           | 62         |
| Negative | 8            | 38         |
| Total    | 21           |            |

CECT was performed in 22 cases. CT scan shows splenic injury in 9 cases along with perisplenic collection, liver injury in 8 cases, pneumoperitoneum in 4 cases suggestive of hollow viscus perforation, and retroperitoneal hematoma in 4 cases.

### Ultrasound Examination

A total of 33 patients were subjected for ultrasound examination, out of which 26 patients had scan detected solid organ injuries for which they underwent laparotomy and found to have significant injuries. Seven patients had scan detected normal solid organs with free fluid and found to have hollow viscus injury at laparotomy. Pattern of abdominal injuries detected by ultrasound in 33 patients is shown in the following table.

| Organ injured                  | No. of patients | Percentage |
|--------------------------------|-----------------|------------|
| Liver                          | 10              | 30         |
| Spleen                         | 14              | 43         |
| Kidney                         | 2               | 6          |
| Free fluid without solid organ | 7               | 21         |

### Operative Procedures

The following table shows the various operative procedures carried out among the patients who underwent exploratory laparotomy. Liver injuries were usually graded as I and II. Out of the 13 patients with liver injury, only 6 patients underwent hepatorrhaphy with spongostan packing and rest of them were treated with spongostan packing alone. Out of 15 patients with splenic injury, 10 patients underwent splenectomy, 3 patients were treated by splenorrhaphy, and 2 were managed conservatively. Bowel perforations were treated with two layered closure, with only two patients requiring resection and anastomosis. Omental and mesenteric injuries were treated by simple suturing and ligating the bleeding points.

| Procedure                  | No. of patients | Percentage |
|----------------------------|-----------------|------------|
| Closure of perforation     | 15              | 35         |
| Splenectomy                | 10              | 23         |
| Splenorrhaphy              | 3               | 7          |
| Hepatorrhaphy              | 6               | 14         |
| Repair of mesentery        | 2               | 5          |
| Resection and anastomosis  | 2               | 5          |
| Bladder repair             | 3               | 7          |
| Colostomy                  | 1               | 2          |
| Gastric perforation repair | 1               | 2          |

### Morbidity and Mortality

The mean range of stay of patients in the hospital ranged from 11 to 20 days (15 days). The range varied from 2 to 60 days.

The following table shows the duration of stay of patients with blunt abdominal trauma including those who died.

### Mortality

A total of nine patients died in the present study. Six patients belonged to operative group and died in the post-operative period, majority of them due to peritonitis and septicemia. One patient died before surgery due to severe head injury. Two patients died while being managed conservatively.

This shows the disadvantages of conservative management like missed injuries and delayed treatment.

Therefore, the mortality in the present study is 15%.

## DISCUSSION

### Age Incidence

In our study, majority of patients belonged to 11–20 years of age group followed by 21–30 years age group. In Davis *et al.*<sup>[5]</sup> study, the majority of patients belonged to 21–30 years age group. Our study results are comparable to other studies. Therefore, it can be concluded that the young and the productive age group people are the usual victims of blunt abdominal trauma because they are active physically and socially. Therefore, they are more vulnerable for injuries.

### Sex Incidence

In our study, 53 out of 59 patients are male which corresponds to 90% which is slightly higher when compared to Davis *et al.* study. When compared to other studies, the incidence of males is much more than those of the females, as, in India, males are the chief bread earner for the family and are involved in outdoor activities most of the times. Increased incidence is mainly due to RTA because of greater exposure of males on streets, personal, and behavioral characteristics such as alcoholism and rash driving.

### Ratio of Operative to Conservative Management

| Treatment    | Present study (%) | Davis <i>et al.</i> <sup>[5]</sup> (%) | Khanna <i>et al.</i> <sup>[6]</sup> (%) |
|--------------|-------------------|--|---|
| Operative    | 74                | 77                                     | 58                                      |
| Conservative | 26                | 23                                     | 42                                      |

The above table shows that there is an increasing trend toward conservative management; however, the present

study shows that 26% of patients were subjected for non-operative management. Davis *et al.*<sup>[5]</sup> showed 23% and Khanna *et al.*<sup>[6]</sup> showed that 43% of patients were subjected for conservative management. Non-operative management is gaining increasing acceptance mainly because of the easy availability of CT scan. With the aid of CT scan, it is possible to accurately grade the extent of injury to solid organs such as liver and spleen. Minor lacerations and capsular tears, difficult to diagnose clinically, can be easily demonstrated by CT scan and selected for non-operative management.

Guidelines for conservative management are as follows:

1. If the patient is hemodynamically stable.
2. Minimal intraperitoneal collection.
3. Lower grade solid organ injury, for example, Grades 1 and 2.

The disadvantages of non-operative management are those of missed injuries and delayed treatment resulting in excessive morbidity and even mortality.

### Mode of Injury

In our study, road traffic accident is the most common mode of injury accounting for 61% of cases, comparable to Devis *et al.* study (70%) and Khanna *et al.* (57%). This is due to the rapid development in technology, in all fields including automobile industry where the first priority has been given to speed rather than safety. Next to RTA is fall from height (27%) followed by blow to abdomen (12%).

### Signs and Symptoms

In the present study, abdominal pain was the most common presenting complaint accounting for 85% and abdominal tenderness was the most common sign accounting for 88% of cases. However, the signs and symptoms in abdominal injuries are notoriously unreliable and are often masked by concomitant head injuries, chest injuries, and pelvic fractures. Significant injuries to the retroperitoneal structures may not manifest signs and symptoms immediately and be totally missed even on abdominal X-rays and DPL predisposing the patients to grave consequences of missed injuries.

In Davis *et al.* study, generalized abdominal tenderness and abdominal guarding were the most frequent physical findings, both signs being present in more than 75% of all patients. Rebound tenderness and abdominal rigidity were present in 28% of patients. About 12% of the patients were in hypovolemic shock on admission. One hundred and ninety (43%) of the total patient population had no specific complaints and no signs or symptoms of intra-abdominal injury when they were first seen in the emergency room, but 44% eventually required exploratory laparotomy, and



64 (34%) had an intra-abdominal injury. This emphasizes the importance of careful and continuing observation of individuals with blunt abdominal trauma.

### Latent Period

Latent period is the interval between the time of injury and the time of surgery. About 30% of patients were taken for surgery between 11 and 15 h and 16% of patients between 6 and 10 h of injury. This time lag is due to the site of accidents, which are usually rural, and the time taken to transport them to the hospital. Two patients (4%) were taken for surgery after 5 days of injury as they were initially put on conservative management. Since their condition deteriorated on repeated clinical examinations, they had to be taken up for delayed exploratory laparotomy.

### Associated Injuries

In our study, associated extra-abdominal injuries were found in 29 cases. The common extra-abdominal injury was extremity fractures, pelvic fractures accounting for 17%, followed by head injuries (15%), soft-tissue injury, and chest injuries including rib fractures. There were no associated injuries in 30 patients. The above table shows the comparison of the present study incidences of associated injuries with other studies.

### Investigations

#### Plain X-ray abdomen

Plain X-ray of abdomen was done in 55 cases, out of the total 59 cases. Gas under diaphragm was found in 16 cases out of 21 bowel perforations detected at laparotomy. Hence, the sensitivity of plain X-ray abdomen in detecting the pneumoperitoneum is 76% in the present study. Davis *et al.*<sup>[5]</sup> reported that in their series, abdominal X-ray was abnormal in 21% of cases; pneumoperitoneum was detected in 6% of cases and dilated bowel loops in 6% of cases.

#### Ultrasound Examination (Fast)

A total of 33 patients were subjected for ultrasound examination, out of which 26 patients had scan detected solid organ injuries for which they underwent laparotomy and found to have significant injuries. Seven patients had scan detected normal solid organs with free fluid and found to have hollow viscus injury at laparotomy. Therefore, ultrasound is more reliable in detecting solid organ injuries and free fluid in the abdomen. In Yoshi *et al.* study, the sensitivity of ultrasound in detecting injuries in blunt abdominal injury patients is about 94.6%.

#### CT Scan Abdomen

CECT was done in 22 cases. CT was done in patients in whom ultrasound showed significant findings. Computed

tomography (CT) can provide reliable information on hemoperitoneum, extent of solid organ injuries. CT detected four cases of retroperitoneal organ injuries, most cases of hollow viscus perforation and ongoing bleeding by means of radiographic blush. Two patients had combined liver and spleen injury.

### Operative Procedures

In the present study, closure of bowel perforation was done in 15 patients, colostomy in 1 patient, repair of mesentery in 2 patients, splenectomy in 10 patients, splenorrhaphy in 3 patients, hepatorrhaphy in 6 patients, and resection and anastomosis in 2 patients.

In Khanna *et al.*<sup>[6]</sup> study, closure of bowel perforation was done in 13 patients, colostomy in 2 patients, repair of mesentery in 9 patients, splenectomy in 4 patients, splenorrhaphy in 1 patient, and hepatorrhaphy in 6 patients.

## SUMMARY AND CONCLUSIONS

This was a prospective study of 59 cases of blunt abdominal trauma in Mahatma Gandhi Memorial Hospital, Warangal. From this study, the following conclusions can be made.

1. Males are predominantly affected. It is mostly seen in the age group of 11–20 years which form the young and reproductive group. These patients are usually from lower socioeconomic income group.
2. Road traffic accident forms the most common mode of injury. Hence, measures should be taken to prevent these accidents and care of the victims at the accident site. Well-established trauma care centers should be established at least at every district hospital. Measures for early transport of the patients from the accident site to the trauma center should be undertaken.
3. A thorough and repeated clinical examination and appropriate diagnostic investigations lead to successful treatment in these patients.
4. Although conservative management is successful in carefully selected patients, operative management remains the main stay of treatment.
5. Plain erect X-ray abdomen is a valuable investigation taken for gastrointestinal injuries.
6. Ultrasound examination gives a clear picture of solid organ injury and free fluid.
7. Four-quadrant aspiration is a simple and an important tool for diagnosis. However, better results are given by diagnostic peritoneal lavage.
8. The most common injured viscera in the present study is small bowel and they were managed by simple suturing.

9. Splenic injury is the second most commonly injured organ and majority of them were managed by splenectomy. Few of them were managed by splenorrhaphy.
10. Liver injuries occupy the third position and were managed by hepatorrhaphy and spongostan packing.
11. Retroperitoneal hematoma was seen in a small proportion of patients associated with renal injuries and pelvic fracture. Only minor renal injuries that were encountered were treated conservatively.
12. Multiple organs were involved in most of the cases rather than an isolated organ injury.
13. Associated extra-abdominal injuries such as head, thoracic, and orthopedic injuries were found in 29 cases in the present study. These greatly influenced the morbidity and mortality of the patients.
14. Post-operative complications such as wound infection, dehiscence, respiratory infections, and fecal fistula are common in blunt abdominal trauma.
15. The present study showed a mortality of 15%.

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**How to cite this article:** Sujatha D, Venkanna M. A Clinical Study of Blunt Injury Abdomen in a Tertiary Care Hospital. Int J Sci Stud 2021;9(3):130-135.

**Source of Support:** Nil, **Conflicts of Interest:** None declared.