

Spectrum of blunt abdominal trauma - Management and Complications



Medical Science

KEYWORDS : Abdominal trauma , conservative , complications , associated injuries , treatment

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ABSTRACT

Background: In view of increasing number of vehicles and consequently road traffic accidents, this study has been undertaken to evaluate cases of blunt abdominal trauma prospectively.

Aims: To evaluate the impact of blunt abdominal trauma on the intraperitoneal organs, various modes of presentation, various treatment modalities and complications.

Material and methods: This is a prospective study of 59 blunt abdominal injuries during the period from April 2013 to March 2014 in ASRAMS Hospital, Eluru. Postoperative follow up was done to note for complications. The decision for operative management depended on repeated clinical examination and results of diagnostic tests.

Results: The majority belonged to 11-20 years age group. 44 patients were operated and others were managed conservatively. Road traffic accident was responsible for 61% trauma. Majority presented with abdominal pain (86%) and tenderness (81%). Average latent period was between 16-20 hours. Associated extra abdominal injuries were found in 29 cases.

Conclusion: A thorough and repeated clinical examination leads to successful treatment in these patients. Multiple organs are usually involved in most of the cases rather than an isolated organ injury.

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 to 80 % of blunt abdominal trauma¹.

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 bicycle¹. Blunt abdominal trauma is usually not obvious. Hence, often missed, unless, repeatedly looked for. 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 in-patient 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 remains high. The reason for this could be due to the interval between trauma and hospitalization, delay in diagnosis, inadequate and lack of appropriate surgical treatment, postoperative complications and associated trauma especially to head, thorax and extremities.

AIMS

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

Study Design:

This study is a prospective study of blunt abdominal injuries during the period from April 2013 to March 2014 in ASRAM Hospital, Eluru. Number of cases studied were 59.

Methodology:

Data were collected from the patients by their clinical history, clinical examination with appropriate investigations on those patients who were admitted. Postoperative 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. 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.

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 was repeated as and when required. CT scan was done in 6 patients in our study. As most of our patients were from low socio economic group, it was possible to get CT scan done for only few selected patients.

Apart from routine investigations, abdomen x -ray was done. Few 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. Few 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.

RESULTS

The total number of operations carried out was 59.

A) AGE INCIDENCE:

TABLE 1

PERCENTAGE (%)	NO.OF PATIENTS	AGE GROUP (yrs)
1.7%	1	0-11
37.2%	22	11-20
33.8%	20	21-30
10%	6	31-40
6%	4	41-50
5%	3	51-60
3%	2	61-70

In this series, the majority of the patients belonged to 11-20 years age group,

B) SEX INCIDENCE:

TABLE 2

PERCENTAGE	NO OF PATIENTS	GENDER
90%	53	Male
10%	6	Female

In the 59 cases studied, 53 cases were males, with females accounting for 6 cases.

C) RATIO OF OPERATIVE TO CONSERVATIVE TREATMENT:

TABLE 3

PERCENTAGE	NO OF PATIENTS	
74%	44	Operative
26%	15	Conservative

44 patients with pneumoperitoneum or hemoperitoneum with hemodynamic instability underwent exploratory laparotomy. 15 patients were selected for nonoperative 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 hours of deterioration in their hemodynamic status and development of signs of peritonitis.

D) MODE OF INJURY:

TABLE 4

PERCENTAGE (%)	NO.OF CASES	CAUSE
61%	36	Road traffic accident
27%	16	Fall from height
12%	7	Blow to abdomen with blunt objects

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.

E) SYMPTOMS AND SIGNS:

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

TABLE 5

NO OF PATIENTS	SYMPTOMS AND SIGNS
51	Abdominal pain
8	Vomiting
32	Abdominal distension
3	Hematuria
34	Abdominal guarding and rigidity
52	Abdominal tenderness
19	Rebound tenderness
24	Pallor
48	Pulse>90/min
28	BP<90mm of Hg systolic
32	Free fluid
33	Absent bowel sounds

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

F) LATENT PERIOD:

Latent period is the interval between the time of injury to the time of surgery.

TABLE 6

PERCENTAGE	NO OF CASES	HOURS
7%	3	0-5
16%	7	6-10
30%	13	11-15
20%	9	16-20
11%	5	21-25
7%	3	26-30
2%	1	31-35
7%	3	36-40

Average latent period seen in the present study is between 16-20 hours.

Majority of patients (30%) were taken for surgery between 11-15 hours of latent period.

G) ASSOCIATED INJURIES:

TABLE 7

PERCENTAGE	NO OF CASES	Associated injuries
15%	9	Head
7%	4	Thoracic
17%	10	Orthopedic
10%	6	Soft tissue
10%	6	Combination

Associated extra abdominal injuries were found in 29 cases. The common extra abdominal injuries were chest injuries including rib fractures, extremity fractures, pelvic fractures and head injuries.

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. The following table shows the abnormal findings detected in x ray erect abdomen and their percentage.

TABLE 8

PERCENTAGE	NO. OF PATIENTS	ABDOMINAL X RAY
27%	16	Gas under diaphragm (GUD)
24%	14	Enlarged soft tissue shadow (ESTS)
7%	4	Ground glass appearance (GGA)
35%	21	No radiological abnormality (NRA)
7%	4	Not done (ND)

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.

TABLE 9

PERCENTAGE	NO. OF CASES	RESULT
66%	27	Positive
34%	14	Negative
	41	Total

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.

TABLE 10

PERCENTAGE	NO. OF CASES	RESULT
62%	13	Positive
38%	8	Negative
	21	Total

CT SCAN: CT scan was done in 6 cases, who were affordable and in whom their condition permitted.

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.

TABLE 11

PERCENTAGE	NO. OF PATIENTS	ORGAN INJURED
30%	10	Liver
43%	14	Spleen
6%	2	Kidney
21%	7	Free fluid without solid organ injury

ORGANWISE INJURY:

In the present series, small bowel was the most commonly involved organ. It was involved in 27% of cases, spleen in 25% and liver in 22% of cases.

TABLE 12

PERCENTAGE	NO. OF CASES	ORGAN INJURED
27%	16	Small bowel
25%	15	Spleen
22%	13	Liver
3%	2	Stomach
5%	3	Mesentery
2%	1	Omentum
7%	4	Bladder
2%	1	Urethra
3%	2	Colon
10%	6	Retroperitoneum

MULTIPLE ORGANS INJURED:

The following table shows the incidence of the multiple organ injuries in the present series.

TABLE 13

NO. OF CASES	ORGANS INJURED
1	Liver & spleen
2	Spleen & stomach
2	Intestine & mesentery
3	Spleen & retroperitoneum
2	Liver & retroperitoneum
1	Liver & intestine

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 spongiosan packing and rest of them were treated with spongiosan 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 2 layered closure, with only 2 patients requiring resection and anastomosis. Omental and mesenteric injuries were treated by simple suturing and ligating the bleeding points.

TABLE 14

PERCENTAGE	NO. OF PATIENTS	PROCEDURE
35%	15	Closure of perforation
23%	10	Splenectomy
7%	3	Splenorrhaphy
14%	6	Hepatorrhaphy
5%	2	Repair of mesentery
5%	2	Resection & anastomosis
7%	3	Bladder repair
2%	1	Colostomy
2%	1	Gastric perforation repair

POSTOPERATIVE COMPLICATIONS:

The following table shows the postoperative complications and their relative incidences in patients who underwent exploratory laparotomy.

TABLE 15

Percentage	Number of cases	POSTOPERATIVE COMPLICATIONS
13%	2	Wound dehiscence
20%	3	Wound infection
7%	1	Fecal fistula
33%	5	Respiratory complication
20%	3	Intra abdominal collection
7%	1	Duodenal fistula

MORBIDITY AND MORTALITY:

The mean range of stay of patients in the hospital ranged from 11-20 days (15 days). The range varied from 2 days to 60 days. The following table shows the duration of stay of patients with blunt abdominal trauma including those who died.

TABLE 16 HERE,

Percentage	Number of patients	Number of days
35%	21	1-10
46%	27	11-20
10%	6	21-30
5%	3	31-40
2%	1	41-50
2%	1	51-60

MORTALITY:

A total of nine patients died in the present study. Six patients belonged to operative group and died in the postoperative 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:

It can be seen from the above table that the majority of patients belonged to 11-20 years of age group, followed by 21-30 years age group. Therefore it can be concluded that the young and the productive age group people are the usual victims of blunt abdominal trauma.

SEX INCIDENCE:

RATIO OF OPERATIVE TO CONSERVATIVE MANAGEMENT:

there is an increasing trend towards conservative management, however the present study shows that 26% of patients were subjected for non operative management. Davis et al⁵ showed 23% and Khanna et al⁶ showed that 43% of patients were sub-

jected for conservative management. Nonoperative 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 like liver and spleen. Minor lacerations and capsular tears, difficult to diagnose clinically can be easily demonstrated by CT scan and selected for nonoperative management. The disadvantages of non operative management are those of missed injuries and delayed treatment resulting in excessive morbidity and even mortality.

MODE OF INJURY:

Road traffic accident is the most common mode of injury. 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.

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. But 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 al⁵ study, 43% of patients had no specific complaints and no signs or symptoms of intra abdominal injury when they first presented to the emergency room. But 44% of those patients eventually required exploratory laparotomy and 34% of patients had an intra abdominal injury. This emphasizes the importance of careful and continuing observation and repeated examination of individuals with blunt abdominal trauma.

LATENT PERIOD:

Latent period is the interval between the time of injury to the time of surgery. 30% of patients were taken for surgery between 11-15 hours and 16% of patients between 6-10 hours 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. 2 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:

Associated extra abdominal injuries were found in 29 cases. The common extra abdominal injuries were extremity fractures, pelvic fractures, head injuries and chest injuries including rib fractures.

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. So the sensitivity of plain x ray abdomen in detecting the pneumoperitoneum is 76% in the present study. Davis et al⁵ 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.

FOUR QUADRANT ASPIRATION:

In the present study 69% of patients were subjected for four quadrant aspiration as against 44% in Davis et al study. 27 cases were found to be positive and 14 cases were negative. Out of these 14 cases, 4 cases were false negative in the present study. Therefore the sensitivity of this investigation in the present study is 90%. Correct results (positive or negative), as determined by subsequent laparotomy, were obtained in 86% of cases in Davis et al⁵ study.

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. When compared to four quadrant aspiration this yielded better results. The sensitivity of DPL in the present study is 100%. But the sample is very small to compare the results with other studies.

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. Therefore ultrasound is more reliable in detecting solid organ injuries and free fluid in the abdomen. In Yoshi H et al study, the sensitivity of ultrasound in detecting injuries in blunt abdominal injury patients is about 94.6%.

ORGANWISE INJURY:

Contrary to these international series where spleen is the most common viscera injured, in the present series, GIT is the most commonly involved organ. Small bowel was involved in 27% of cases, followed by spleen (25%), and followed by liver (22%).

MULTIPLE ORGANS INJURED:

The following table shows the incidence of the multiple organ injuries in the present series.

TABLE 17

Number of cases	Organs Injured
1	Liver & spleen
2	Spleen & stomach
2	Intestine & mesentery
3	Spleen & retroperitoneum
2	Liver & retroperitoneum
1	Liver & intestine

In Michael L Nance et al²⁶ study, 1.9% kidney injuries, 9% of liver injuries, 26.2% of pancreatic injuries and 7.9% of splenic injuries had associated hollow viscus injuries.

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 al⁶ 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.

MORTALITY:

A total of nine patients died in the present study. Six patients belonged to operative group and died in the postoperative 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%. This is comparable with other series published in our country (Khanna et al⁶).

SUMMARY AND CONCLUSIONS

Males are predominantly affected. Age group of 11-20 years were the commonly affected group coincidentally these also belonged to lower socio economic status.

2. Road traffic accident forms the most common mode of injury. 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 be undertaken.

3. A thorough and repeated clinical examination and appropriate diagnostic investigations lead to successful treatment in these patients.

4. Though conservative management is successful in carefully selected patients, operative management remains the mainstay 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. But 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.

12. Multiple organs were involved in most of the cases rather than an isolated organ injury.

10. Associated extra abdominal injuries like head, thoracic and orthopedic injuries should always be looked for and respective treatments should be started immediately.

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