SAS Journal of Surgery ISSN 2454-5104
SAS J. Surg., Volume-2; Issue-1 (Jan-Feb, 2016); p-53-59
Available online at http://sassociety.com/sasjs/

Original Research Article

Clinical Study, Evaluation and Management of Blunt Abdominal Trauma-Hollow Viscus and Solid Organ Injuries at Basaweshwar Teaching & General Hospital Attached to Mahadevappa Rampure Medical College, Gulbarga

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Abstract: To evaluate the impact of blunt abdominal trauma on hollow viscus and solid viscera and to evaluate the incidence, clinical presentation, various investigative and treatment modalities of blunt abdominal trauma. Background data: Blunt abdominal trauma is one of the most common injuries caused mainly by road traffic accidents. They are usually not obvious. Hence, often missed, unless, repeatedly looked for. 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. Materials & Methods: This is a prospective study of 60 cases done on patients presenting with blunt abdominal injury at the casualty of Basaweshwar Teaching and General Hospital attached to Mahadevappa Rampure Medical College, Gulbarga. Data were collected from the patients by their clinical history, examination and appropriate investigations. Post operative follow up was done to note for complications. Documentation of patients, which included, identification, history, clinical findings, diagnostic test, operative findings, operative procedures, complications during the stay in the hospital and during subsequent follow-up period, were all recorded on a proforma specially prepared. The decision for operative or non operative management depended on the outcome of the clinical examination and results of diagnostic tests. In results the majority of patients belonged to 21-30 years of age group followed by 11-20 years. Males were most commonly affected when compared to females and road traffic accident(66%) was the most common cause. Abdominal pain(85%) is the most common symptom followed by abdominal distension(55%) and abdominal tenderness(86%) was the most common presenting clinical sign. Operative management was seen in 56% and conservative management was seen in 43% of cases. Associated extra abdominal injuries were found in 30 cases.
Keywords: abdominal trauma, hollow viscus, solid viscera, clinical presentation

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. Unnecessary deaths and complications can be minimized by improved resuscitation, evaluation and treatment.

Rapid resuscitation is necessary to save the unstable but salvageable patient with abdominal trauma. Accurate diagnosis and avoidance of needless surgery is an important goal of evaluation. 'As the surgeon directs these activities he must seek the answers to two questions. First, does the patient need an abdominal operation?

Second, will the patient tolerate the time required for diagnostic manoeuvres before surgery is performed? However, most avoidable deaths result from failure to resuscitate and operate on surgically correctable injuries [1].

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 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 Basaweshwar hospital, attached to Mahadevappa Rampure Medical College, Gulbarga.

OBJECTIVES OF THE STUDY

1. To evaluate the impact of blunt abdominal trauma on hollow viscus and solid viscera.
2. To evaluate the incidence and clinical presentation of intra-abdominal injuries.
3. To evaluate various available investigations for detecting intra-abdominal injuries.
4. To evaluate the management (a)non-operative (b)operative
5. To evaluate the organs affected in blunt abdominal trauma and management of different organ injuries on laparotomy.
6. To evaluate the complications, morbidity and mortality following blunt abdominal injury.

MATERIALS AND METHODS

Source of data:

Study will be done on patients presenting with blunt abdominal injury at the casualty of Basaweshwar Teaching and General Hospital attached to Mahadevappa Rampure Medical College, Gulbarga. Number of cases studied is 60 cases.

Inclusion criteria:

1. Patients with history of Road traffic accidents, assault with blunt and heavy objects and fall from height.
2. Patients on whom there is a clinical suspicion of trauma to abdomen
3. Patients with history of hematuria, distension of abdomen without any specific etiology

Exclusion criteria:

Patients with penetrating injuries like stabbing and gunshot injuries are excluded from study.

Method 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, complications during the stay in the hospital and during subsequent follow-up period, were all recorded on a proforma 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 in trauma care unit, depending on the clinical findings; decision were 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, subjected to serial clinical examination which included hourly pulse rate, blood pressure, respiratory rate monitoring, Ryle's tube aspiration, analgesics and antibiotics and repeated examination of abdomen and other systems. Appropriate diagnostic tests especially ultrasound of abdomen was repeated as and when required.

RESULTS

From December 2013 to September 2015, 60 patients with blunt abdominal trauma admitted to trauma care unit of Basaweshwar Hospital were studied

Table-1: Age incidence

Age group(yrs)	No. Of Patients	Percentage (%)
0-11	1	1.6%
11-20	20	33.3%
21-30	23	38.3%
31-40	7	11.6%
41-50	4	6.6%
51-60	3	5%
61-70	2	3.3%

In this series majority of patients belonged to 21-30years (38.3%) age group followed by 11-20 years (33.3%) age group.

Table-2: Sex Incidence

Gender	No. of Patients	Percentage
MALE	54	90%
FEMALE	6	10%

In this study 54 cases were male accounting 90% and only 6 cases were female accounting 10% of study population.

Table-3: Mode of injury

Causative agent	No. Of cases	Percentage
Road traffic accident	40	66.6%
Fall from height	9	15%
Blow to abdomen with blunt objects	11	18.3%

In this study the most common cause was road traffic accidents accounting (66.6%) followed by blow to abdomen with blunt objects accounting (18.3%) and fall from height accounting (15%) of cases.

Table-4: Symptoms

Symptoms	No. Of patients	Percentage
Abdominal pain	51	85%
Vomiting	8	13.3%
Abdominal distension	33	55%
Hematuria	2	3.3%

In the present study abdominal pain (85%) was the most common symptom, followed by abdominal distension (55%), vomiting(13.3%) and hematuria(3.3%).

Table-5: Signs

Signs	No. Of patients	Percentage
Abdominal tenderness	52	86.6%
Guarding & rigidity	35	58.3%
Pulse > 90/min	48	80%
BP < 90mm systolic	28	46.6%
Absent bowel sounds	34	56.6%

In the present study abdominal tenderness seen in 52 patients (86.6%) was the most common sign at the time of admission. Next common sign was pulse > 90/min seen in 48 patients(80%) followed by guarding & rigidity seen in 35 patients(58.3%), absent bowel sounds seen in 34 patients(56.6%) and Blood Pressure < 90mm Hg systolic(46.6%) was seen.

Table-6: Associated Injuries

	No. Of cases	Percentage (%)
Head	7	11.6%
Orthopaedic	5	8.3%
Thoracic	6	10%
Soft tissue	12	20%
Combination	4	6.6%

Associated extra abdominal injuries were found in 30 cases. The common among extra abdominal injuries in this study were soft tissue injuries (20%) followed by head injuries, chest injuries such as rib fractures, extremity fractures and pelvic fractures were seen.

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

Table-7: Latent Period

Hours	No. Of cases	Percentage (%)
0-5	3	6%
6-10	8	16%
11-15	15	30%
16-20	10	20%
21-25	6	12%
26-30	3	6%
31-35	3	6%
36-40	2	4%

In this study majority (30%) of patients were taken for surgery between 11-15 hours of latent period. The second most common latent period was between 16-20 hours (20%).

Table-8: Ratio of Operative to Conservative Management

	No. Of patients	Percentage
Operative	34	56.6%
Conservative	26	43.3%

After a detailed clinical evaluation and suitable investigations, 34 patients with pneumoperitoneum or hemoperitoneum with hemodynamic instability underwent exploratory laparotomy. 26 patients were selected for non operative management because they had no signs of peritonitis or they had hemoperitoneum without hemodynamic instability.

Plain X ray abdomen:

Plain x ray abdomen was done in all the 60 patients. Following table shows The abnormal findings detected on plain x ray abdomen.

Table-9: Investigations

Feature	No. of patients	Percentage (%)
Gas under diaphragm (GUD)	14	23.3%
Enlarged soft tissue shadow (ESTS)	12	20%
Ground glass appearance (GGA)	6	10%
No radiological abnormality (NRA)	26	43.3%
Multiple air fluid levels (MAFL)	2	3.3%

Four quadrant aspirations were done in 25 patients, among which 15 cases were positive and 10 cases were negative. Out of the 10 negative cases, 2 cases were false negative. On laparotomy, they were found to have hemoperitoneum.

Table-10: Four quadrant aspiration

Result	No. Of cases	Percentage
Positive	15	60%
Negative	10	40%
Total	**25**	

Diagnostic peritoneal lavage was done in 18 cases, out of which 11 were positive and 8 were negative. All positive cases showed significant injury at laparotomy. The following table shows the percentage of these cases.

Table-11: Diagnostic Peritoneal Lavage

Result	No. Of cases	Percentage
Positive	11	61.1%
Negative	7	38.9%
Total	**18**	

All the 60 patients were subjected to ultrasound examination, out of which 26 patients had scan detected solid organ injuries for which they underwent laparotomy or conservative management accordingly. Ultrasound detected bladder injuries in 2 patients and other cases reported free fluid without solid organ injury.

Table-12: Ultrasound Examination

Organ injured	No. Of patients	Percentage (%)
Spleen	14	23.3%
Liver	12	20%
Bladder	2	3.3%
Free fluid without solid organ injury	32	53.3%

CT scan was done in 10 patients. Since most of the patients were not affordable, only those who were affordable were subjected to CT scanning and following organs were involved.

Table-13: CT scan

Organs injured	No. Of patients	Percentage
Spleen	3	30%
Liver	2	20%
Retroperitoneum	3	30%
Dilated bowel loops with free fluid	2	20%

In this series, small bowel was the most commonly involved organ. It was involved in 30% of cases.

Table-14: Organ wise Injury

Organ involved	No. Of cases	Percentage
Small bowel	18	30%
Spleen	16	26.6%
Liver	14	23.3%
Mesentry	5	8.3%
Omentum	1	1.6%
Bladder	2	3.3%
Retroperitoneum	3	5%
Stomach	1	1.6%

In this series of 60 cases 34 patients underwent emergency exploratory laparotomy and following procedures were performed. In 14 cases of liver injury 4 cases underwent hepatorraphy with sponge packing and rest was treated with conservative management. Out of 16 cases with splenic injury 3 patients underwent splenectomy and 4 patients underwent spleenorraphy. Bowel perforations were closed with Graham's omental patch, with 4 patients requiring resection and anastomosis. Omental and mesenteric injuries were treated by simple suturing and ligation of bleeding points.

Table-15: Operative Procedures

Procedure	No. Of patients	Percentage
Closure of small bowel perforation	15	44.1%
Splenectomy	4	11.7%
Spleenorraphy	3	8.8%
Hepatorraphy	4	11.7%
Repair of mesentry	2	5.8%
Resection and anastomosis	4	11.7%
Closure of gastric perforation	1	2.9%
Omental ligation	1	2.9%

Following post operative complications were seen in patients who underwent exploratory laparotomy. Among the operated cases 13 patients had post operative complications.

Table-16: Post operative complications

Post operative complication	No. Of patients	Percentage
Wound infection	4	11.8%
Wound dehiscence	2	5.9%
Pelvic abscess	1	2.9%
Anastomotic leakage	2	5.9%
Respiratory complications	3	8.8%
Faecal fistula	1	2.9%

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

Table-17: Morbidity

No. Of days	No. Of patients	Percentage
1 to 10	19	31.6%
11 to 20	29	48.3%
21 to 30	7	11.6%
31 to 40	3	5%
41 to 50	1	1.6%
51 to 60	1	1.6%

A total of 6 patients died in the present study. 5 patients belonged to the operative group and died in the post operative period. One patient died while being managed conservatively. Mortality is this study was 10%.

Table-18: Mortality

Cause of death	No. Of cases
Sudden cardiac arrest	2
Septicaemia	3
ARDS	1

Organ injury	Death	Cause of death
Spleen	1	Sudden cardiac arrest
Liver	1	ARDS
Small bowel	4	1- sudden cardiac arrest 3- septicemia
	Total – 6 cases	

DISCUSSION

Age wise distribution:

In the present study most of patients (38.3%) were in the age group between 21 -30 yrs. Moreover most of the patients were in the first four decades of life indicating trauma is more common in the younger age group.

This study is comparable with Reina Khadilkar *et al.;* [2] which showed maximum number of cases was between 21 -30 yrs of age group (48%) as of this present study. In Davis et *al.;* [3] study majority of patients belonged to 21 – 30 yrs of age group.

Sex wise distribution:

In the present study 90% of cases were male and 10% were female. This is comparable with Reina Khadilkar et al [2] which also showed blunt abdominal trauma was more common in males. This is also comparable to Tripathi *et al.;* [4] , Gupta S *et al.;* [5] and Davis *et al.;* [3] which also showed it is more common in males.

Mode of injury:

In the present study Road traffic accidents (66.6%) are the most common mode of Blunt abdominal injuries. Reina khadilkar *et al.;* [2] and Mohapatra *et al.;* [6] also reported 62% cases of blunt injury abdomen were due to RTA. Another study by Curie *et al.;* [7] also reported 58.6% cases of blunt injury to abdomen were due to RTA.

Symptoms:

In the present study most common symptom was abdominal pain (85%) followed by abdominal distension (55%) and vomiting. Another study by Tripati *et al.*[4] also reported pain abdomen in 91% of their patients.

Signs:

In the present study abdominal tenderness (86%) is the most common clinical sign followed by pulse >90 (80%). Systolic BP<90 mm hg was considered shock and most patients with pulse > 90 and systolic BP <90mm hg underwent emergency laparotomy and had significant injuries. Bowel sound was sluggish or absent in 56% of patients.

This study in comparable to study by Tripati *et al.;*[4] which reported Tenderness as most common sign in 80% of their patients and shock in 37.2% of their patients. Another study by Mohapatra *et al.*[6]*;* also reported tenderness as most common sign in 70.85% of patients and 13.9% of patients with shock.

Latent period:

Latent period is the interval between the times of injury to the time of surgery. In this study majority (30%) of patients were taken for surgery between 11 – 15 hours of latent period. The second most common latent period was between 16 –20 hours (20%). This time lag is due to the site of accidents, which are usually rural, and the time taken to transport them to the hospital. Some patients were put on conservative management initially and since their condition was deteriorating they were taken for delayed exploratory laparotomy.

Associated injuries:

Associated extra abdominal injuries were seen in 30 patients. In that head injury was seen in 11.6% of cases, orthopaedic in 8.3% of cases, thoracic injuries in 10% of cases and soft tissue injuries in 20% of cases. In a similar study by Davis *et al.;*[3] also showed 9% of head injury 27% thoracic and 15% orthopaedic injuries. Khanna *et al.;* [8] also showed similar results.

Ratio of operative to conservative:

In the present study 56.6% of patients underwent operative management and 43% underwent conservative management. This is comparable with Gupta *et al.;*[5] study which showed 36% conservative

management and 63% operative management. Davis *et al.*[3]*;* showed 77% operative and 22% 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 like 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. The disadvantages of non operative management are those of missed injuries and delayed treatment resulting in excessive morbidity and mortality.

Plain X ray abdomen:

In the present study plain x ray abdomen was done in all the patients. In which 23% were showing gas under diaphragm indicating pneumoperitoneum, 20% were showing enlarged soft tissue shadow and around 43% were showing no significant radiological abnormality.

Another study (Mohapatra *et al.;*)[6] reported accuracy of x-ray erect abdomen to be 100% in detecting Hollow viscous injuries. Davis *et al.;*[3] 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:

Four quadrant aspirations were done in 25 patients, among which 15 cases (60%) were positive and 10 cases were negative. Out of the 10 negative cases, 2 cases were false negative. On laparotomy, they were found to have hemoperitoneum. In the present study sensitivity is 88% and specificity is 100%. This is comparable to another study (Mohapatra *et al.;*)[6] which showed diagnostic aspiration to be accurate in 95%cases. Gupta *et al.;* [5]also showed similar results

Diagnostic peritoneal lavage:

Diagnostic peritoneal lavage was done in 18 cases, out of which 11 were positive and 8 were negative. All positive cases showed significant injury at laparotomy. Specificity was 100% in this study for DPL. When compared to four quadrants aspiration this yielded better results.

Ultrasound examination:

All the 60 patients were subjected to ultrasound examination, out of which 26 patients had scan detected solid organ injuries for which they underwent laparotomy or conservative management accordingly. But ultrasound was not sensitive in detecting retroperitoneal and hollow viscus injuries. In this study free fluid was seen in 53% of cases followed by spleen in 23% and liver in 20%. Sensitivity of USG in detecting solid injuries in this study was 87%. This is comparable to other studies like Reina Khadilkar *et al*.;[2] showed USG as reliable investigation for solid organ injuries

CT scan:

CT scan was done in 10 patients. Since most of the patients were not affordable, only those who were affordable were subjected to CT scanning. Since only 10 patients were subjected to CT scanning it is not comparable with other studies.

Organ wise injury:

In this study small bowel was most commonly involved in 30% of patients in which 15 patients had hollow viscus perforation. In small bowel perforations jejunal perforation was seen in maximum number of cases in this study followed by duodenal perforation and ileal perforation. This result is compared to a study done by Allen and Curry which showed small bowel was involved in 35.3% of cases.

Spleen is the second most commonly involved organ in this study seen in 16 patients(26.6%) out of which 7 patients underwent operative management and 9 patients had conservative management. Splenectomy was done in 3 patients and spleenorraphy in 4 patients. Another study by R.Curie *et al.;*[7] reported 27.5% of cases had splenic injuries, out of which 15% were operated. Reina Khadilkar[2] also reported 30% of splenic injury in their study.

Liver injuries were seen in 14 patients (23.3%) out of which 4 patients underwent operative management and 10 underwent conservative management. All 4 patients under went hepatorraphy. Davis *et al.;* reported liver injuries in 16% of population in their study and Khanna et al[8] reported 37% of liver injuries.

Bladder injuries were seen in only 2 patients (3.3%) and retroperitoneal injuries in 3 patients (5%). All these patients underwent conservative management. Reina khadilkar[2] also reported 4% retroperitoneal injuries in their study. Study by Curie *et al.*[7]*;* showed 3.4% of bladder injuries and 1.3% of retroperitoneal haemotomas.

Mesenteric involvement was seen in 5 patients (8.3%) for which repair of mesentry and resection& anastomosis was done accordingly. This is comparable to Davis *et al.*[3]*;* study which showed 3.4% of cases of mesenteric tear. Gastric perforation and omental involvement was seen in 2.9% of patients respectively.

Post operative complication:

In this study wound infection is the most common complication seen in 4 patients (11.8%) followed by respiratory complications (8.8%) followed by wound dehiscence, pelvic abscess, faecal fistula and anastomotic leakage. Another study by Davis *et al.;* showed wound infection as a complication in 15% of

the cases. Reina khadilkar *et al.*[2]*;* showed respiratory complication as the most common complication.

Morbidity:

The duration of stay for most of the patients in this study was between 11-20 days with mean of 15 days for those who underwent operative management and a mean of 8.5 days for conservative management. Reina khadilkar *et al.;*[2] showed 8.78 days for patients managed conservatively and 16.62 days for patients managed operatively.

Mortality:

A total of 6 patients died in the present study. 5 patients belonged to the operative group and died in the post operative period. One patient died while being managed conservatively. Therefore mortality in this study was 10%. Gupta et al[5] showed 11% mortality in their study. Another study by Davis et al[3] showed 13% mortality.

SUMMARY AND CONCLUSIONS

In this prospective study of 60 cases conducted in Basaweshwar Teaching and General Hospital, following conclusions were made

- Males are most commonly affected. People belonging to young age group of 21-30 were most commonly affected.
- Road traffic accident forms the most common mode of injury.
- Abdominal pain is the most common symptom seen in 85% of patients.
- Abdominal tenderness is the most common presenting sign seen in 86% of patients.
- A thorough and repeated clinical examination and appropriate diagnostic investigations lead to successful treatment in these patients.
- Associated extra abdominal injuries were found in 30 cases. The common among extra abdominal injuries in this study were soft tissue injuries (20%) followed by head injuries, chest injuries such as rib fractures, extremity fractures and pelvic fractures were seen.
- Majority (30%) of patients were taken for surgery between 11 – 15 hours of latent period. The second most common latent period was between 16 – 20 hours (20%).
- Plain x ray abdomen erect was sensitive in detecting hollow viscus injuries
- Four quadrant aspirations is a simple and an important tool for diagnosis. But better results are given by Diagnostic peritoneal lavage.
- Ultrasound examination gives a clear picture of solid organ injury and free fluid.
- The most common injured viscera in the present study is small bowel and
- They were managed by closure of perforation and resection and anastomosis.
- The second most common organ involved is spleen and were managed by splenectomy, splenorraphy and conservative management.
- Liver is the third most organs involved and were managed conservatively and with hepatorraphy and packing.
- Retroperitoneal hematoma was seen in a small proportion of patients which also included renal injuries were managed conservatively.
- Bladder injuries were seen in few patients and were managed conservatively with Foley's catheterisation and observation.
- Postoperative complications like wound infection, wound dehiscence, respiratory complications, pelvic abscess and faecal fistula were seen.
- The duration of stay for most of the patients in this study was between 11-20 days with mean of 15 days for those who underwent operative management and a mean of 8.5days for conservative management.
- Mortality in this study was 10%.

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