

Clinical Profile of Blunt Trauma Chest: A Hospital based Study

Zahida Akhter¹, Showkat M Kakroo², Muzaffar Mushtaq³, Aijaz Ahmad Rather⁴, Waseem Ashraf⁵

ABSTRACT

Introduction: Blunt trauma to the chest is a very common occurrence in setting of traumatic incidents occurring with highest frequency in young adults between 15-35 years of age. Traumatic chest injuries lead to significant burden of mortality and morbidity in the young population. The most common modes of injury in such patients is motor vehicle accidents followed by other high energy traumatic scenarios like falls from height, contact sports, violence etc. This study was aimed at the evaluation and management of BCT with rib fractures and associated injuries.

Material and Methods: The present study was a retrospective cum prospective hospital based study done in SKIMS Medical College Hospital, Srinagar, J & K, India. Sixty four patients who attended the Emergency Department with history of blunt chest injury were included in the study. Patients of all genders between 18 and 65 years of age were included in the study. The data regarding age, gender, mode of injury, presence of thoracic injuries, abdominal injuries, skeletal injuries was gathered and tabulated.

Results: We observed a strong male preponderance with 45 out of 64 patients being male. Most common mode of injury was traffic accidents followed by falls from height, fall of heavy objects, hit by animals, violence and contact sports. Associated injuries were seen in both thoracic and extra-thoracic organs. Musculoskeletal injuries were also commonly seen. Patients were managed according to ATLS protocol; fifteen patients were managed with intercostal tube drainage four of which required thoracotomy, four patients required laparotomy for visceral injuries, four patients required fixation of vertebral fractures and musculoskeletal injuries were managed according to the orthopaedic protocols. In the present study four (6.25%) died as a result of massive thoracic injuries.

Conclusion: Blunt chest injury is a serious injury which can result in life threatening complications which need to be anticipated, identified and adequately managed to reduce the rates of poor outcome. Integrated management employing the general surgeon, anesthetist, orthopaedician, internist and relevant paramedics is essential. Strict adherence to ATLS protocol is imperative. Adequate fluid resuscitation, ventilatory support, O₂ inhalation, pulmonary physical therapy and efficient analgesia can lead to quick recovery and reduced rates of surgical intervention.

Keywords: Blunt Trauma Chest

INTRODUCTION

Injuries resulting from trauma of various sorts are one of the commonest causes of preventable or avoidable death across all ages and genders but it is the young adults between 15-35 years of age which form the bulk of the victims of traumatic death, being the most common cause of death in this age

group.^{1,2} Apart from mortality, trauma causes the highest amount of disability and number of healthy lives lost in this age group.³ Blunt trauma to the chest forms a common mode of injury in these patients which not only poses a risk to the airway, breathing and circulation but also to life itself.⁴ Twenty to 25% of deaths resulting from traumatic injuries occur because of chest injuries and the mortality from blunt chest trauma in US and Europe are reported to be as high as 60%.⁴ The most common form of chest injury seen in over two-thirds of patients are rib fractures^{5,6} forming 4-10% of admissions in trauma units.^{5,7} A huge majority (77%) of patients with rib fractures are managed without admission to the hospital.⁸ More than half of the rib fractures can be diagnosed on routine chest radiographs and only occasionally are special oblique films ordered.⁹ An indicator of severe trauma, rib fractures are associated with other visceral or skeletal injuries and in adult patients with BCT, the associated injuries have a stronger bearing on the overall mortality.¹⁰ The most common mechanism of injury in reported studies has been motor vehicle accidents (MVC), followed by fall from height, road side accidents, contact sports, extreme sports, interpersonal violence.

This study was aimed at the evaluation and management of BCT with rib fractures and associated injuries.

MATERIAL AND METHODS

This study was a retrospective cum prospective observational study that was done in the SKIMS Medical College Hospital, Srinagar, J & K, India. Sixty-four patients admitted in the A&E of SKIMS Medical College Hospital with blunt trauma chest over a period of two years from 1st January 2017 to 31st December 2018 were included in the study. The admitted patients were attended according to the ATLS protocol, using

¹Assistant Professor, Department of General Surgery, SKIMS Medical College Hospital, Srinagar, Jammu and Kashmir, ²General Surgeon, District Hospital Ganderbal, Jammu and Kashmir, ³Senior Resident, Department of Orthopaedics, SKIMS Medical College Hospital, Srinagar, Jammu and Kashmir, ⁴Head, Department of General Surgery, SKIMS Medical College Hospital, Srinagar, Jammu and Kashmir, ⁵Senior Resident, Department of General Surgery, SKIMS Medical College Hospital, Srinagar

Corresponding author: Dr Muzaffar Mushtaq, MBBS, MS Orthopaedics, Senior Resident, Department of Orthopaedics, SKIMS Medical College Hospital, Srinagar, Jammu and Kashmir, India

How to cite this article: Zahida Akhter, Showkat M Kakroo, Muzaffar Mushtaq, Aijaz Ahmad Rather, Waseem Ashraf. Clinical profile of blunt trauma chest: a hospital based study. International Journal of Contemporary Medical Research 2019;6(5):E4-E7.

DOI: <http://dx.doi.org/10.21276/ijcmr.2019.6.5.8>

an integrative management by a team of specialists including general surgeon, orthopaedician, physician and anesthetist. We included patients of all genders between the age of 18 years and 65 years. Children below 18 years were excluded as the incidence of rib fractures and associated thoracic and extra-thoracic injuries vary widely from the adult populations, and patients above 65 years were excluded because of high prevalence of osteoporosis leading to rib fractures following trivial injury. Data was collected regarding the age, gender, mode of injury, number of rib fractures, associated pulmonary injuries, other skeletal injuries, management, complications and mortality. The data was converted into a spreadsheet in MS Excel and statistical analysis done using SAS Software Version 9.2.

RESULTS

We observed 64 patients with BCT after excluding children below 18 years and elderly above 65 years of age. We found a strong male predilection with 45 (70.3%) patients being

Injury	Number	Percentage of total (n=64)
Fracture Clavicle (Ipsilateral) Conservative Operative	16	25%
Head injury	11	17.2%
Fracture Proximal Humerus	12	18.75%
Vertebral Fractures	8	12.5%
Fracture Pelvis	7	10.9%
Elbow fractures (Olecranon, radial head, Distal humerus)	2	3.13%
Fracture Lower limb Femur Tibia-fibula Ankle Calcaneum	10 6 3 2 2	15.6%

Table-4: Associated Musculoskeletal Injuries

MOI	Male	Female
Traffic Accident	30	11
Pedestrian	11	4
Driver	8	X
Front Seat passenger	2	3
Bike driver	7	X
Pilon passenger	1	3
Rear Passenger	1	1
Fall from height	6	5
Fall of heavy weight	3	1
Hit by a domestic animal	2	2
Assault	2	X
Sports	2	X

Table-1: Mechanism of Injury

Injury	Number of patients	Percentage
Lung contusion	24	37.5%
Pneumothorax	18	28.13%
Hemothorax/Hemopneumothorax	15	23.44%
Flail chest	8	12.5%
Multiple rib fractures(>2)	58	90.6%

Table-2: Associated Thoracic Injuries

Abdominal Injury	Number of Patients	Percentage of total (n=64)
Splenic Injury Grade 1-3 (Conservative) Grade 4,5 (Splenectomy)	12 9 3	18.75%
Liver Injury Grade 1-3 (Conservative) Grade 4,5	3 3 X	4.69%
Retroperitoneal hematoma	3	4.69%
Renal parenchymal injury	1	1.6%
Mesenteric tear	1	1.6%
Gut perforation	1	1.6%
Total	21/64	32.8%

Table-3: Associated Abdominal Injuries

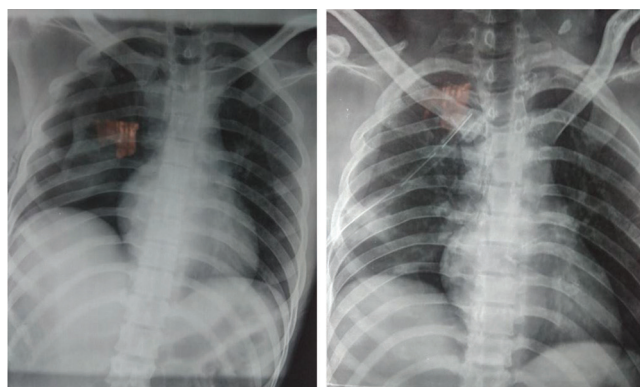


Figure-1: (Above) Multiple rib fractures with Right pneumothorax, before and after ICTD

male and 19 (29.7%) females.

Most patients (58) that were admitted in the A&E had more than two rib fractures. Only six patients had a single rib fracture but needed admission because of other accompanying injuries (table-1).

Rib fractures with associated thoracic injuries: Most common associated chest injury was lung contusion in 24 patients, followed by pneumothorax, hemo/hemopneumothorax and flail chest. In many patients these injuries occurred concomitantly with strongest association being between lung contusion and pneumothorax (table-2).

Most rib fractures and lung contusions were managed with conservative treatment in accordance with the ATLS protocol, including supplemental O₂ inhalation, IV fluid replacement, adequate analgesia, antibiotics if needed and close observation. Three patients who were intubated for low GCS because of associated head injury were mechanically ventilated. The management of pneumothorax and hemo/pneumothorax depended upon the extent of injuries. In 18 patients with simple pneumothorax, three were managed conservatively while the rest (15) were managed with ICTD inserted via the 5th ICS in triangle of safety. Four patients with massive hemothorax required subsequent thoracotomy at a higher centre, while the rest were managed with ICTD.

Flail chest was associated with pneumothorax in four patients which was managed with ICTD and close observation, four patients with flail chest had associated hemothorax only two of which underwent a thoracotomy at the referral Department of CVTS SKIMS, while the other two were managed with ICTD and observation.

In multiple patients with high energy trauma injuries to the abdominal viscera were also observed. The most common was splenic injury, expectedly associated with lower rib fractures of left side, closely followed by liver injury with lower rib fractures of right side. Other visceral injuries like renal injury, mesenteric injury, gut injury were uncommonly seen (table-3).

Most solid organ injuries were amenable to conservative management. Four patients required laparotomy, three required splenectomy for grade 4,5 splenic trauma, one of them also had a mesenteric tear which was repaired concomitantly and one required laparotomy for gut perforation requiring repair.

Apart from thoracic and abdominal injuries, skeletal injuries and head injuries were also encountered in association with BCT. Most common associated injury was fracture clavicle, followed by head injury, vertebral fractures, pelvic fracture, and extremity fractures. Among fractures of the extremity, upper limb fractures were more common than lower limb fractures e.g fractures of proximal humerus and fractures around elbow. Most spinal injuries were located in the thoracic and thoraco-lumbar region (between T8-L2); both stable and unstable injuries were observed. Three patients with spinal column injuries had neurodeficit while the rest had intact neural functions. Four patients with spinal fractures were operated with fixation with posterior instrumentation, while others were managed conservatively. Extremity fractures were managed as per the orthopedic protocol. Majority of clavicle fractures were managed conservatively, while four of them required operative fixation. Many patients sustained multiple skeletal injuries (table-4).

Complications

A number of complications were observed in the patients some of which occurred at the time of admission, some early in the course of treatment and some delayed. Most common complication seen at the time of initial contact was shock with 27 patients presenting with a systolic BP of <90mmHg. In the first week of admission atelectasis and pneumonia were the most common complications seen in 21 and 18 patients respectively. Pleural effusion developed in 15 patients, 11 of which had an underlying lung contusion. Features suggestive of ARDS developed in 5 patients and three of them had associated long bone fractures (two femur, one tibia-fibula).

Mortality

Four patients (6.25%) died during the course of the observation, all males with high energy polytrauma with multiple associated injuries. Three of the patients were victims of traffic accidents while the fourth suffered a fall from around 30ft. Two of the patients underwent thoracotomy

for flail chest with gross hemothorax, one laparotomy for splenic injury and the fourth suffered brain injury with intracranial hemorrhage.

DISCUSSION

In our study the gender distribution was highly skewed with males forming the majority of the victims (45/64). This is in agreement with most studies done on the epidemiology of blunt chest trauma.¹ The average age in our series was 38.6 years for males and 32.5 years for females.

In adults the most frequent mode of injury in our study was traffic accident which was also reported previously by multiple studies.^{12,13,14} The close association between lower rib fractures and liver/splenic injuries is also borne out by earlier studies.^{15,16,17} In our series, we did not observe any major vascular injury. Flail chest is a serious problem in blunt chest trauma practice because of the risk of respiratory insufficiency and operative fixation has been advocated by some, but in our series none of the patients with flail chest underwent fixation of rib fractures. In flail chest mortality rates between 11 and 40% have been reported^{18,19,20}, we witnessed the death of two out of eight (25%) patients with flail chest.

Over recent years, the need for surgery in BCT has decreased²¹, and Richardson suggested that as low as 5% of patients with BCT have a thoracotomy indicated.²² In our series only four patients required a thoracotomy (6.25%). Previous studies have reported a laparotomy rate between 11 and 31 percent^{23,24,25} which in our series was 6.25% (4/64) possibly because of high threshold for laparotomy and use of preoperative CECT Abdomen in selecting patients.

The in-hospital mortality rates for isolated chest injuries were reported to range from 4 to 8%, and increased to 13–15% when another organ system was involved and to 30–35% when more than one organ system was involved.²⁶ Our series reported a mortality of 6.25% (4/64 patients). In accordance with previous studies, we found that the mortality in BCT was significantly related to associated injuries.²⁷ Presence of multiple rib fractures, age more than 60 years, and Injury Severity Score of >16 have been associated with increased mortality. Identification of these risk factors is important in order to prevent the complications including death.

CONCLUSION

Blunt chest injury is a common source of morbidity and mortality in victims of trauma. Both intrathoracic and extrathoracic injuries can result in life threatening complications which need to be anticipated, identified and adequately managed to reduce the rates of poor outcome. A tailored and integrated conservative management in most patients and timely surgical intervention in selected patients is of paramount importance in reducing the rates of undesirable outcome. Adequate fluid resuscitation, ventilatory support, O₂ inhalation, pulmonary physical therapy and efficient analgesia can lead to quick recovery and reduced rates of surgical intervention. At higher risk for complications are elderly patients, patients with multiple

rib fractures, associated injuries and co-morbid conditions which must be appropriately managed.

REFERENCES

- Rivara FP, Grossman DC, Cummings P. Injury prevention. *N Engl J Med*. 1997;337:543–548.
- Johansson C, Mellström D, Rosengren K, et al. Prevalence of vertebral fractures in 85-year-olds. Radiographic examination of 462 subjects. *Acta Orthop Scand*. 1993;64:25–27.
- Price C, Makintubee S, Herndon W, et al. Epidemiology of traumatic spinal cord injury and acute hospitalization and rehabilitation charges for spinal cord injuries in Oklahoma, 1988–1990. *Am J Epidemiol*. 1994;139:37–47.
- Clark GC, Schecter WP, Trunkey DD. Variables affecting outcome in blunt chest trauma: flail chest vs. pulmonary contusion. *J Trauma* 1988;28:298–304
- Shorr RM, Crittenden M, Indeck M, et al. Blunt thoracic trauma. Analysis of 515 patients. *Ann Surg* 1987;206:200–5.
- Bergeron E, Lavoie A, Clas D, et al. Elderly trauma patients with rib fractures are at greater risk of death and pneumonia. *J Trauma* 2003;54:478–85.
- Ziegler DW, Agarwal NN. The morbidity and mortality of rib fractures. *J Trauma* 1994;37:975–9.
- Kerr-Valentic MA, Arthur M, Mullins RJ, et al. Rib fracture pain and disability: Can we do better? *J Trauma* 2003;54:1058–63.
- Bulger EM, Arneson MA, Mock CN, Jurkovich GJ. Rib fractures in the elderly. *J Trauma* 2000;48:1040–6.
- Jones KM, Reed RL, Luchette FA. The ribs or not the ribs: which influences mortality? *Am J Surg* 2011;202:598–604.
- Besson A, Saegesser F (1982) Chest trauma and associated injuries. Wolfe Medical Publications, Lausanne
- Ziegler DW, Agarwal NM. The morbidity and mortality of rib fractures. *J Trauma* 1994;37:975–9.
- Liman ST, Kuzucu A, Tastede AL, et al. Chest injury due to blunt trauma. *Eur J Cardiothorac Surg* 2003;24:374–8.
- Flagel BT, Luchette FA, Reed RL, et al. Half-a-dozen ribs: the break-point for mortality. *Surgery* 2005;138:723–5.
- Sirmali M, Turut H, Topcu S, et al. A comprehensive analysis of traumatic rib fractures: morbidity, mortality and management. *Eur J Cardiothorac Surg* 2003;24:133–8.
- AL-Hassani A, Ablulrahman H, Afifi I, et al. Rib fracture patterns predict thoracic chest wall and abdominal solid organ injury. *Am Surg* 2010;76:888–91.
- Bergeron E, Lavoie A, Clas D, et al. Elderly trauma patients with rib fractures are at greater risk of death and pneumonia. *J Trauma* 2003;54:478–85.
- Clark GC, Schecter WP, Trunkey DD. Variables affecting outcome in blunt chest trauma: flail chest vs. pulmonary contusion. *J Trauma* 1988;28:298–304.
- Freedland M, Wilson RF, Bender JS, Levison MA. The management of flail chest injury: factors affecting outcome. *J Trauma* 1990;30:1460–1468
- Thomas AN, Blaisdell FW, Lewis Jr FR, Schlobohm RM. Operative stabilization for flail chest after blunt trauma. *J Thorac Cardiovasc Surg* 1978;75:793–801.
- Galan G, Penalver JC, Paris F, Caffarena Jr JM, Blasco E, Borro JM, Garcia-Zarza A, Padilla J, Pastor J, Tarrazona V. Blunt chest injuries in 1696 patients. *Eur J Cardiothorac Surg* 1992;6:284–287.
- Richardson JD. Indications for thoracotomy in thoracic trauma. *Curr Surg* 1985;42:361–364.
- Ziegler DW, Agarwal NN. The morbidity and mortality of rib fractures. *J Trauma* 1994;37:975–9.
- Peterson RJ, Tepas JJ III, Edwards FH, et al. Pediatric and adult thoracic trauma: Age-related impact on presentation and outcome. *Ann Thorac Surg* 1994;58:14–8.
- Wilson JM, Thomas AN, Goodman PC, Lewis FR. Severe chest trauma. Morbidity implication. *Arch Surg* 1978;1113:846–9.
- Mayberry JC, Trunkey DD. The fractured rib in chest wall trauma. *Chest Surg Clin North Am* 1997;7:239–261.
- Jones KM, Reed RL, Luchette FA. The ribs or not the ribs: which influences mortality? *Am J Surg* 2011;202:598–604.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 23-01-2019; **Accepted:** 21-04-2019; **Published:** 13-05-2019