

Blunt chest trauma, not to be underestimated

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Abstract:

Objectives: To understand the pattern, presentation, management strategies and outcome associated with blunt chest trauma patients.

Study design: Retrospective analytical

Patients & methods: The study was conducted at cardiothoracic surgery department of Liaquat national hospital, Karachi and Surgical unit 5 Dow University of health sciences - Civil hospital Karachi from the period of April 2009 to March 2014. A total of 290 patients were identified and analyzed, who were admitted with history of Blunt Chest trauma.

Results: The most common age group involved was between the ages of 20-50 years with male: female ratio of 7:1. Road traffic accident was the most common mode of injury and motor bike was the most commonly involved vehicle. Multiple rib fracture with haemothorax and or pneumothorax was the most common presentation. 39% of all patients were victim of multiple trauma (thoracic plus extra thoracic), where limb, abdominal and head & neck were the most common associated injuries. Out of 290 patients, 56 (19%) patients were managed conservatively while 223 (77%) patients required intercostal tube thoracostomy and supportive therapy while only 11 (4%) patient required thoracotomy after intercostals tube thoracostomy. During this period 11 patients (4%) required thoracotomy, 2 in emergency, 5 urgent while 4 were elective and eight patients required Laparotomy. Ventilatory support (12%) was required only in multiple trauma patients, patients with flail chest and post thoracotomy patients. The overall mortality was 11 (4%), mostly in multiple trauma patients, only one patient with isolated chest injury did not survive due to extensive pneumonia/ARDS following thoracotomy for empyema.

Conclusion: The vast majority of blunt chest trauma patients (>90%) require either no invasive therapy or at most a tube thoracostomy with excellent outcome and prognosis. A high index of suspicion and close follow up is vital to avoid preventable morbidity and mortality especially in multiple trauma patients.

Keywords: Chest Trauma, Haemothorax, Pneumothorax, Intercostal tube thoracostomy, Thoracotomy, Road traffic accident

Introduction:

Trauma is the leading cause of hospitalization, disability and death worldwide¹. Out of all, chest trauma is directly responsible for 25% of all trauma related deaths and is a major contributor in another 25%². Blunt and penetrating chest trauma combined ranks third behind head and extremity trauma in major accidents in USA³ and approximately 80% of blunt chest trauma is due

to road traffic accidents only⁴. USA chest trauma frequency estimate, show that thoracic trauma occurs in 12 persons per million populations per day and approximately 33% of these patients require hospitalization⁵. In a 5 year Canadian study of patients admitted to an urban trauma unit, the incidence of thoracic trauma was 46% with mortality of 15.7 %⁶.

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Low and middle income countries account for almost 90% of global mortality due to road traffic injuries (RTI) and south Asian countries in particular account for approximately a third of all global mortality due to RTI⁵⁻⁶. Karachi is the largest city of Pakistan and houses the 20th largest metropolitan population of the world with estimated population exceeding 17 million and estimated total road length exceeding thousand kilometers and due to lack of civil sense and almost non existing traffic laws, the risk of RTI is immense.

The spectrum of chest injuries is very wide from a simple rib fracture to life threatening cardiac and major vascular injuries. There has been significant reduction in the mortality of chest trauma patients, who reach the hospital in time due to better awareness of wide spectrum of injuries and their association with potential complications and availability of appropriate monitoring, diagnostic and treatment facilities. Having said that, still an alarming number of patients succumb to death before arriving to any hospital due to lack of civic sense, ambulances with trained paramedical staff and well equipped health facilities.

The objective of our study is not only to understand the pattern, presentation, management strategies and outcome associated with blunt chest trauma patients but to appreciate enormosity of this problem and to highlight potentially preventable circumstances leading to road traffic accidents in our society as well.

Patients & methods:

This retrospective study was conducted at cardiothoracic surgery department of Liaquat national hospital, Karachi and Surgical unit 5 Dow University of health sciences - Civil hospital Karachi from the period of April 2009 to March 2014.

A total of 290 Blunt Chest trauma patients were identified and analyzed through medical records. Exclusion criteria includes age under 12 years, patients with penetrating chest injuries isolated or combined with blunt trauma, those

patients who were discharged from accident and emergency department with minimal chest injuries or those who left against medical advice and patients referred from other hospitals with intercostals thoracostomy in situ.

After initial assessment, resuscitative and supportive measures were initiated according to extent and mechanism of injuries and status of patient. Chest X-ray was done straightaway in all stable patients while in unstable patients with respiratory distress, tube thoracostomy was done if indicated purely on clinical grounds according to the standard of Advanced Trauma Life Support guidelines before acquiring CXR. Once stable and depending upon nature and extent of injuries and CXR finding, further investigations like C T Scan chest, ultrasound chest/abdomen and Echo was done along with appropriate investigations of associated injuries. Sucking chest wound if any was sealed immediately and soft tissue lacerations were dressed initially and subjected to proper debridement as appropriate. Patients with open wounds and tube thoracostomy were given IV antibiotics. After initial management and investigations, patients were transferred to theatre /ICU or wards accordingly.

Results:

The most common age group involved was between the ages of 20-50 years with over 50% were in their second and third decades of life. Out of 290 patients, 249(86%) were male while 41(14%) were female with male: female ratio of 7:1. Road traffic accident was the most common mode of injury and motor bikes were the most commonly involved vehicle (Table 1).

Isolated chest injuries were more common than multiple trauma (thoracic and extra thoracic) (59% vs 39%), while multiple rib fracture with haemothorax / pneumothorax or both was the most common presentation (Table 2). In multiple trauma patients (39%), limb, abdominal and head & neck injuries were the most common associated injuries. Out of 290 patients, 56 (19%) patients were managed conservatively while 223 (77%) patients required intercostal tube tho-

racostomy and supportive therapy while only 11(4%) patient required thoracotomy after intercostals tube thoracostomy (Table 3).

There were 11 thoracotomies (4%) during this period, two in emergency due to drainage of >1500mls of blood on placement of tube thoracostomy, five patient required urgent thoracotomy due to continuous blood drainage of >150 mls for 4 consecutive hours along with sign & symptoms of hemodynamic instability. On surgery common source of bleeding was lung parenchymal laceration, bleeding from intercostals vessels and internal mammary artery laceration.

Table 1: Mode of blunt chest trauma

Mode	% of Patients
Road Traffic Injuries	78%
Motor Cycle	48%
Pedestrian	22%
Passenger	30%
Direct Blow to Chest	22%

Table 2: Pattern of chest injuries

Pattern	% of Patients
Rib fracture	76%
Pneumothorax	39%
Haemothorax	12%
Haemo + Pneumothorax	08%
Pulmonary contusion	43%
Diaphragmatic rupture	04%
Flail chest	08%
Tension Pneumothorax	02%
Sternal fracture	04%
Major airway	01%
Heart and major vascular	01%
Subcutaneous Emphysema	07%
Thoracic spine fracture	03%
Multiple trauma	39%

Table 3: Management options

Options	No. of Patients (%)
Conservative	56 (19%)
Tube Thoracostomy	223 (77%)
Thoracotomy	11 (4%)
Emergency	2
Urgent	5
Elective	4
Laparotomy	8 (3 %)

Four patients required elective thoracotomy and decortication due to development of empyema post thoracostomy. There were eight laparotomies, carried out for spleen, bowel/mesentery and liver lacerations and three patients had diaphragmatic rupture repaired as well through laparotomy.

Ventilatory support (12%) was required only in multiple trauma patients, patients with flail chest and post thoracotomy patients. The overall mortality was 11(4%), mostly in multiple trauma patients, only one patient with isolated chest injury did not survive due to extensive pneumonia/ARDS following thoracotomy for empyema.

Discussion:

Chest trauma remains a major public health issue both in the developed and developing countries alike. It is responsible directly for one quarter of all traumatic deaths and major contributor in another 25 %⁷. According to initial three years results of Pakistan's first road traffic injury (RTI) surveillance project, a total of 99,272 victims have been enlisted in Karachi, giving an annual incidence of RTI of 184.3 per 100000 populations. The total number of deaths due to RTI during this time period was 3097, giving a mortality of 5.7% per 100000 populations and injury fatality ratio of 32:1⁸.

The prevalence and pattern of blunt chest injuries in our study are more or less similar to various national and international studies⁹. In contrast to western studies, we found the male to female ratio of 7:1, though as per the 1998 census, there were 114 males for every 100 females in a typical urban population in the province of Sind as per Population Census Organization 2010¹⁰. This clearly portrays the picture of our society where male are more exposed due to our social, cultural and religious trends.

The predominant involvement of young males further amplifies the grave socio economic implication of this serious problem on our society. The most common age group involved was between the ages of 20-50 years with over 50%

were in their second and third decades of life in this study. This relatively young male predominance has been reported in various other studies as well¹¹.

We found relatively higher incidence of road traffic accidents as compared to that in the west and poor state of our roads, road side environment, condition of vehicles, low driving standards, unawareness and or violence of traffic laws, unsafe attitude of pedestrians and sharing of roads with animals etc. have all been known contributory factors.

Due to the wide spectrum of chest injuries from a simple rib fracture to life threatening cardiac and major vascular injuries, all patients does not need to be managed as in-patient. We included only in-patients in this study while those patients who were sent home after initial management and observation in the ER with advice to be followed up in thoracic outpatient clinic with repeat chest x-ray (CXR) as per thoracic society protocol, were not included. This protocol has been evaluated to be safe and cost effective¹². These patients were mostly young and healthy otherwise with simple rib fracture or soft tissue trauma.

A major cause of morbidity and mortality after blunt chest trauma remains undetected injuries. About 30% of the patients may have visceral injury without fractured ribs and with intact sternum, especially young patients and one should never be reassured after the first examination, as the complication may occur hours or days later¹³. Exadaktylos et al, reported over 50% of patients with normal initial chest X-ray showed multiple injuries on thoracic computed tomography TCT¹⁴ and should be included in the diagnostic workup of haemodynamically stable patient with blunt chest trauma¹⁵.

The presence of more than two rib fractures is a marker of severe trauma, so is the first and or second rib fracture. Poole reviewed all series of fractures of first and second rib and found 3% risk of aortic injury and a 4.5% risk of injury of brachiocephalic vessels¹⁶. In our study we did

not find any major vascular injury. Flail chest is a serious problem in blunt chest trauma patients with mortality between 11- 40% due to respiratory insufficiency. As primary operative fixation has not yet been widely accepted¹⁷, we perform surgical fixation only when thoracotomy is required for another indication and fixation by mechanical ventilation only in cases of respiratory insufficiency as per standard protocol.

Isolated chest injuries were more common than multiple traumas (59% vs 39%) while multiple rib fracture with haemothorax / pneumothorax or both was the most common presentation in our study. In multiple trauma patients (39%), limb, abdominal and head & neck injuries were the most common associated injuries.

The reported rate of thoracotomy after blunt chest trauma in world literature is between 4-10%¹⁸ and that was in according with our study, where only 11 (4%) patients required thoracotomy. The majority of patients (77%) were managed successfully with intercostals tube thoracostomy and supportive measures, while 19% patients did not require even tube thoracostomy. The value of prophylactic antibiotics in thoracic trauma patients, especially with thoracostomy has been established since long. Various Meta analyses have in fact proven significant reduction in the incidence of empyema in patients with prophylactic antibiotics¹⁹ and this protocol was strictly followed in our study as well.

Hospital mortality rate for isolated chest injuries were reported from 4-8% and increased to 13-15% when another organ system was involved and to 30-40% when more than one organ system was involved²⁰. In our study though most of the mortality was in multiple trauma patients but we did not find this direct correlation.

Conclusion:

The vast majority of blunt chest trauma patients >90% require either no invasive therapy or at most a tube thoracostomy with excellent outcome and prognosis. We must remember though that about 30% of the patients may have

visceral injury without fractured ribs and with intact sternum, especially young patients and one should never be reassured after the first examination, as the complication may occur hours or days later. A high index of suspicion and close follow up is vital to avoid preventable morbidity and mortality especially in multiple trauma patients.

Future:

Increasing role of Video Assisted Thoracoscopy (VAT) for the diagnosis and management of chest trauma patients and the development of Endovascular techniques for the repair of great vessel injuries.

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Conflict of interest:

None declare.

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