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Clinical presentation and management of penetrating chest trauma

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Abstract

Thoracic injuries account for 20-25% of deaths due to trauma and contribute to 25-50% of the remaining deaths. Approximately 16,000 deaths per year in the United States alone are attributable to chest trauma. The present study was done in Dhaka Medical College Hospital from January 2004 to September 2005. This is one of the specialized Institutes of this country dealing with chest injury. In this series, 50 cases of penetrating chest injury were studied and 12 (Twelve) of them had also associated with blunt chest injury. The highest incidence occurred between the ages of 31 and 50 yrs. Male was predominantly affected by penetrating chest injury i.e. 84%. Homicidal injury was common in rural areas but accidental injury was common in urban area. Injuries by sharp weapon caused all of the homicidal injuries. In 28 cases (56%) showed penetrating chest injury with severe respiratory distress and rest 10 (20%) cases showed penetrating chest injury with hemorrhage from external wounds. Here, 70% cases are managed conservatively with or without I.C Tube drainage. Mean duration of Hospital stay for patient treated conservatively with or without 1C tube thoracostomy was 8 days but in patient with major surgery it was 15.5 days. Range of Hospital stay for conservatively treated patient was (3--8 days) and for patient with major surgery it was (10—16 days). Referred to other centers had due to extra--pulmonary Involvement, after initial resuscitation & I.C. tube thoracostomy. Mortality:- 2% for penetrating chest injury.

Keywords: Blunt Trauma; Compression; Penetrating trauma; Missile

1. Introduction

Injury can be defined as damage to the body caused by acute exposure to energy. Trauma is the medical term used to denote injury and usually refers to life threatening or serious injuries that require specialized surgical care if the patient is to survive without disability. Thoracic injuries account for 20-25% of deaths due to trauma and contribute to 25-50% of the remaining deaths. Approximately 16,000 deaths per year in the United States alone are attributable to chest trauma [1]. Thoracic trauma accounts directly for or is a contributing factor in 50% of deaths due to trauma [2]. Early deaths are commonly due to

- Airway obstruction,
- Flail chest,
- Open pneumothorax,
- Massive hemothorax,
- Tension pneumothorax, and vi. Cardiac tamponade. Later deaths are due to respiratory failure, sepsis and unrecognized injuries.

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References to thoracic wounds are found in the oldest medical writings. The Smith papyrus (300 B.C.) contains notations about chest injuries treated by the Egyptian physician Imhotep [3] which underscores the fact that many thoracic injuries can be treated with relatively simple techniques.

In the fourth century B.C. Hippocrates, aware that rib fractures can be associated with hemoptysis prescribed rest and bloodletting for patients with broken ribs [4]. The Greeks and Romans considered penetrating injuries of the chest almost uniformly fatal. Aristotle, writing in the third century B.C. felt that "The heart alone of all the viscera cannot withstand injury" [5]. Galen, in the second century A.D. wrote of packing open chest wounds suffered by gladiators in ancient Rome [6]. In 16th century, Ambrose Pare described subcutaneous emphysema associated with chest wall injury and advocated debriding segments of broken ribs. In the 17th century, Riolanus successfully treated cardiac injuries in animals [7] and Scultetus described as a complication of penetrating thoracic injury [8].

2. Material and methods

2.1. Study Model

Study of consecutive 50 cases of penetrating injuries of the Chest in the casualty block of Dhaka Medical College Hospital.

2.2. Criteria for Selection of Patients

All the patients in this series were studied carefully and minutely following fixed protocol. Age, sex, habitat, mode of injury, methods of injury, clinical presentation, chest pathology and management were noted. All the routine investigation, concerning, Chest injury (X-Ray chest both views, blood grouping and cross matching, haematocrit, Hb%, TC, DC, ESR, blood urea, serum creatinine) were done in all cases. X-Ray neck, abdomen, skull, and Limb, contrast X-ray of Stomach and Duodenum, gastrograftin swallow X-ray of oesophagus, wound swab for c/s, c/s of pus, blood gases (PO₂, PCO₂, PH), serum electrolytes (Na⁺, K⁺, CL⁻, HCO₃⁻), esophagoscopy and diagnostic aspiration were done in selective cases. Individual patient was managed in its own merit either conservatively with intercostal tube (1C) thoracostomy or major surgery. All collected data were compiled and studied thoroughly. All the data will be analyzed and a conclusion is likely to be drawn as regards to management protocol of Chest trauma.

2.3. Data sheet for cases with penetrating chest trauma

- Particulars of the patients.
- Presenting complaints with duration.
- History of present illness.
- Physical examination.
- Investigation.
- Treatment.
- Follow up.

2.4. Ethical consideration

We have taken the university's institutional review board (IRB) approval before conducting the study. Written consents from participants have been taken before enrollment. The participants were informed about the merits and demerits of the study's participation and had the right to withdraw the consent at any time.

3. Results

The present study was done in Dhaka Medical College Hospital from January 2004 to September 2005. This is one of the specialized Institutes of this country dealing with chest injury. In this series, 50 cases of penetrating chest injury were studied and 12 (Twelve) of them had also associated with blunt chest injury. The series has similarities in patients profile; symptomatology and treatment used but also has dissimilarities with cause, weapon used and nature of injury with the western records.

Table 1 Socio-demographic characteristics of chest injury patients (n=50)

Age in year	No. of Cases	Percentage
0 – 20 years	1	2%
21 – 30 years	9	18%
31 - 40 years	16	32%
41 – 50 years	16	32%
51 – 70 years	8	16%
Sex		
Male	42	84%
Female	8	16%
Habitat		
Rural	27	54%
Urban	23	46%
Injury		
Accidental	29	58%
Homicidal	21	42%
Homicidal injury weapon (n=21)		
Sharp weapon like Knife, Tata, Ballam, Kunch, Ramdao, Krich.	19	90.47%
Fire arms like Short gun pillet-1, Bullet-l, Splint of bomb- 1, sharpnel-l	2	9.52%
Causes of accidental Injury (n=29)		
Fall from being over sharp object	4	13.79%
Road traffic accident	23	79.31%
Industrial accident (Fall on revolving sharp object)	2	6.89%

The age of the patient ranged from 7 to 70 yrs. The highest incidence occurred between the ages of 31 and 50 yrs. Male was predominantly affected by penetrating chest injury i.e. 84% and Female constituted only 16%. In these series rural dwellers 54 % dominated over the urban dwellers 46%. Of the entire patient in this series accidental injury 29 cases (58%) were dominating over the homicidal injury 21 cases 42%. Homicidal injury was common in rural areas but accidental injury was common in urban area. Injuries by sharp weapon caused all of the homicidal injuries. Most of the weapons were locally made and traditional. Some of the weapons particularly Fire arms were foreign made and some were local made. Some of the cases the injuries were caused by splint of locally made bomb.

In all cases first-aid was given and ensured properly, In 12 (24%) cases sucking chest wound from penetrating injury needed immediate sterile gauze covering following by suture of the wound and I.C. tube drainage. In 28 cases (56%) showed penetrating chest injury with severe respiratory distress and rest 10 (20%) cases showed penetrating chest injury with hemorrhage from external wounds. Immediate resuscitative measures were started in them. Following initial evaluation and resuscitation the injured patients were continually monitored. In a stable patient complete history, physical examination and investigations were done to understand chest pathology resulting from Injury and to make complete diagnosis. On the basis of Diagnosis, decision was made about the type of specific treatment, whether conservative or major surgical Procedure should be adopted.

Table 2 Case details on Admission (n=50)

Condition	Number of Patient	Percentage
Sucking of the wound	12	24%
Penetrating chest injury with severe respiratory distress	28	56%
Penetrating injury with haemorrhage from external wounds,	10	20%
Type of Complaints		
Chest pain	50	100%
Difficulty in Respiration	46	92%
Cough	14	28%
Swelling over the chest	12	24%
Abdominal pain	9	18%
Haemoptysis	2	4%
Findings		
Restriction of chest wall movement Right-24, Left-24 Bilateral-2	50	100%
Position of Trachea shifted to opposite side	5	10%
Tenderness over Rib with crepitation	2	4%
Subcutaneous crepitation	14	28%
Percussion Note: Hyperresonant - 12, Hyperresonant above & dullness bellow - 28, Dullness - 10	50	100%
Decreased or absent breath sound - Rt.-24, Lt.- 24, Bilateral-2	50	100%
Abdominal rigidity & tenderness	5	10%
Hypotension with or without shock	2	4%
Type of Investigation		
Initial & follow-up chest X-Ray A/P or Lateral or both & Hb% and Haematocrit, Complete Blood count (CBC)	50	100
X/Ray of other site (where Limb, Skull, Neck, Abdomen).	22	44
Bl. grouping & cross matching	50	100
Aspiration of Pleural content & microscopic Examination and culture and sensitivity	2	100
Wound swab for culture and sensitivity	6	12
Ba-meal X-Ray of stomach and duodenum	1	2
Oesophagoscopy	1	2
Bl. urea S. Creatinine	36	72
Blood gas analysis (PO ₂ , PCO ₂ , P ^H), Serum electrolyte (Na ⁺ , K ⁺ , CL ⁻ , HCO ₃ ⁻)	14	28
Findings		
Subcutaneous emphysema	14	28%
Pneumothorax	16	32%
Rib fracture	12	24%
Haemothorax	3	6%

Haemo-pneumothorax	15	30%
Empyema	01	02%
Diaphragmatic Hernia	1	02%
Severe Bleeding from Intercostal Vessel	03	06%
Laceration of Lung	01	02%

Table 3 Management & outcome of Chest injury patients (n=50)

Type of management	Maximum Hospital stay	Minimum Hospital stay	Mean duration of Hospital stay
Conservatively treated patient	8 days	3 days	6 days
Patient sustained major surgery	16 days	10 days	12 days
Management	Number of cases	Percentage	
Only Intercostal tube drainage	29	58%	
Laparotomy with or without intercostal tube drainage	09	18%	
Simple observation with wound Management	06	12%	
Referred to other specialized center	06	12%	
Complications			
Pyrexia	22	44%	
Wound Infection	6	12%	
Blockage of I.C. Tube	3	6%	
Empyema following I.C. Tube thoracostomy	1	2%	
Pneumonia	2	4%	
Extra-pulmonary involvement caused by trauma			
Fracture with Nerves & vessel injury.	1	2%	
Spinal Injury Producing Paraplegia	1	2%	
Multiple fracture at different site of the body	1	2%	
For require thoracotomy	3	6%	
Cause of mortality			
Multiple penetrating injury of chest with profuse haemorrhage with irreversible shock.	1	2%	

Here, 70% cases are managed conservatively with or without I.C Tube drainage. Mean duration of Hospital stay for patient treated conservatively with or without 1C tube thoracostomy was 8 days but in patient with major surgery it was 15.5 days. Range of Hospital stay for conservatively treated patient was (3--8 days) and for patient with major surgery it was (10—16 days). Referred to other centers due to extra--pulmonary Involvement, after initial resuscitation & I.C. tube thoracostomy. Mortality:-2% for penetrating chest injury.

4. Discussion

The management and presentation of chest injury cases have undergone marked changes in the last seventy years. Military experience, techniques of surgery, better understanding of chest pathology and patho-physiology of trauma, modern scientific instruments, greatly improved the overall trauma management. But still chest injury constitutes 25% of all trauma death [1,9]. Recent study with incident of chest trauma is not available in our country at the moment.

The treatment of penetrating Injuries of the chest has changed dramatically over the last 20 years, from an aggressive surgical approach to a more conservative policy using intercostal tube drainage [10,11].

Finally, trauma management should begin with prevention, education, improvement of law and order, awareness of causes and complications by news media nationally. Again a significant number of those sustaining penetrating chest injuries with multiple traumas at other site of the body, before getting definitive care had proceeded toward grave situations. The causes of this was delay in transport of the patient into the definitive care center like DMCH, So, major advances in the rapid transportation of the injured by the trained personnel in well-equipped ambulance and helicopter (in some limes) could save the lives of many of the victims of major trauma. Another important cause of increasing morbidity was improper first aid care provided by the peripheral hospital. Sometimes Intercostal tube thoracostomy could save many of the patient's lives. This procedure is very simple. The doctors and paramedics working in district and peripheral hospital should be properly trained for managing, the chest trauma. So, that morbidity and mortality could be decreased.

5. Conclusion and Recommendations

Management of penetrating chest injury is still localized in few specialized Hospital like DMCH, NIDCH, NICVD, These facilities should be extended to other Medical College Hospitals of Bangladesh.

- Doctors & paramedics working in district and rural Hospital should be properly trained in primary management of chest trauma.
 - Mass awareness and training for proper & safe transportation of the injured patient to the hospital.
 - Above all the law and order situation has got a tremendous role to minimize prevalence of all traumas including chest trauma.
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Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest.

Statement of ethical approval

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