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Management of Penetrating Chest Injury in a Tertiary Hospital in Northeast India

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Abstract: *Trauma is the leading cause of morbidity and mortality. Penetrating chest trauma is generally less common but more deadly than blunt chest trauma.Penetrating chest injury is frequently acutely life threatening. So, appropriate and timely diagnosis of chest injury is important to reduce the mortality and morbidity.This is an observational cross-section study in tertiary hospital located in the northeasternmost corner of India. All patients with penetrating chest injury with or without other associated injuries like head, abdominal or bony injuries were included in this study.27 patients were analysed for age, sex, mechanism of injury, management and complications.Majority of them were firearm injuries (48.14%) and all were due to metallic spherical shot resulting from unintentional firing during hunting except in one case which was due to high velocity bullet from a handgun. Seven patients (25.92%) had stab injuries and out of which 5 patients had cardiac injuries. One patient (3.70%) was due to bull gore. Three patients had splinter injuries resulting from bomb blast. Three patients (11.11%) was due to impalement resulting from road traffic accident (RTA). In this study Firearm(48%) and stab injuries(26%) were found to be the main cause of penetrating chest trauma and usually involves young males. Tube thoracostomy is a simple and most important procedure in the initial management in penetrating chest trauma as most of the patients presented with hemothorax or haemopneumothorax.*

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I. Introduction

Trauma is the leading cause of morbidity and mortality, especially during the first four decades of life.[1] Thoracic injuries account for 20-25% of deaths due to trauma[2]. Penetrating chest trauma is generally less common but more deadly than blunt chest trauma. Though road traffic accidents are the commonest cause of chest injuries, with increasing use of firearms the incidence of penetrating chest injuries are increasing among civilians.[3] Chest trauma may include injury to chest wall, lung and pleura, tracheobronchial system, esophagus, diaphragm, great vessels, thoracic duct and heart. These organs are potentially susceptible to penetrating chest injury and each should be considered in the evaluation of a patient with penetrating chest injury. Many of these injuries can be acutely life threatening, so prompt diagnosis and timely intervention of penetrating chest injury is of great importance to decrease the morbidity and mortality. This is an observational study of the mechanism of injuries, management and outcome in the CTVS unit of RIMS, Imphal.

II. Material And Methods

This is an observational study to examine the various nature of penetrating chest injury and its management and outcome in RIMS Hospital, which is a tertiary Hospital located in the northeasternmost corner of India.

Study Design: Cross sectional study

Study Location: This was a tertiary care teaching hospital based study done in Department of Cardiothoracic and Vascular Surgery, Regional Institute of Medical Sciences, Imphal, Manipur.

Study Duration: January 2015 to December 2018.

Sample size: 27 patients.

Inclusion criteria:

1. Either sex
2. Penetrating chest injury with or without other associated injuries like head, abdominal or bone

Exclusion criteria:

1. Patients who expired before reaching the hospital were excluded from the study.

Procedure methodology:

All patients presented with penetrating chest injury from January 2015 to December 2018 at RIMS, Imphal were included in this study. All patients with penetrating chest injury with or without other associated injuries like head, abdominal or bony injuries were included in this study. Patients who expired before reaching the hospital

were excluded from the study. The patients were analysed for age, sex, mechanism of injury, management and complications. All the patients were managed initially at the RIMS Emergency Department as per ATLS protocol. CT scan was the primary imaging technique used for assessing the degree of chest injury in haemodynamically stable patients. All the patients had either haemothorax or haemopneumothorax. Initially tube thoracostomy was done in all the patients in the Emergency room except in 1 patient who had minimal haemothorax.

Statistical analysis:
Descriptive statistics like frequency, mean, percentage were used.

III.Results

There were 27 patients with penetrating chest injuries and all were male between age group of 6 to 42 years with a mean age of 23 years (Table I). Mechanism of injury is shown in Table II. Majority of them were firearm injuries (48.14%) and all were due to metallic spherical shot resulting from unintentional firing during hunting except in one case which was due to high velocity bullet from a handgun. Seven patients (25.92%) had stab injuries and out of which 5 patients had cardiac injuries. One patient (3.70%) was due to bull gore. Three patients had splinter injuries resulting from bomb blast. Three patients (11.11%) was due to impalement resulting from road traffic accident (RTA). All the patients presented with either haemothorax or haemopneuthorax. Four patients with stab injury had haemopericardium. Two patients presented with sucking chest wound. Eight patients had other associated injuries (Table III). All the patients underwent emergency tube thoracostomy except in one patient who had minimal haemothorax. Two patients were managed with initial tube thoracostomy alone, 23 patients had underwent thoracotomy including three patients with cardiac injury and the fourth cardiac injury patient underwent sternotomy. One patient was managed conservatively (Table IV). Sixteen patients had lung parenchymal injury and the bleeding and air leak was controlled. Type of injuries encountered is shown in Table V. Two out of three patients with cardiac injury underwent anterolateral thoracotomy and the right ventricular injury was repaired, and pericardial window was made in all the three patients. The patient who underwent sternotomy had bleeding from severed right internal mammary artery which was controlled and ligated, with large mediastinal haematoma and pericardial injury. Pericardial bleeding was controlled and pericardial window was made.
In all the patients postoperative period was uneventful. The length of hospital stay varies from 6 to 13 days with a mean duration of 8 days.

Table I:Age distribution

Age ranges (in years)	**No. of patients**	**(%)**
0 – 10	1	3.70
11 – 20	12	44.44
21 – 30	11	40.74
31 – 40	2	7.40
41 – 50	1	3.70
Total	**27**	

Table II: Mechanism of injury

Injury	No. of patients (n=27)	(%)
Stab injury	7	25.92
Bull gore	1	3.70
Firearm injury	13	48.14
Blast injury	3	11.11
RTA	3	11.11

Table III: Presentations

Mode of injury	**Presentation**	**No. of patients**
Stab injury (n=7)	Haemothorax	1
	Haemopneumothorax	1
	Haemothorax and Haemopercardium	4
Bull gore (n=1)	Haemopneumothorax with sucking chest wound	1
Firearm injury (n=13)	Haemothorax	6
	Haemopneumothorax	7
Blast injury (n=3)	Haemothorax	2
	Haemopneumothorax with sucking chest wound	1
RTA (n=3)	Haemothorax	3
Bull gore patient was associated with abdominal injury. *Two patients with firearm injury and all 3 patients with blast injury had associated abdominal injury.* *Two patients with RTA had associated long bone fractures.*		

Table IV: Treatment modality

Treatment Modality	No. of patients	(%)
Conservative	1	3.70
Initial tube thoracostomy	2	7.41
Thoracotomy	23	85.19
Sternotomy	1	3.70

Table v: Injuries found during thoracotomy and sternotomy

Injuries	No. of patients (n=24)	(%)
Chest wall injury only	1	4.17
Lung parenchymal injury	16	66.67
Diaphragmatic injury	3	12.5
Pericardial injury only	1	4.17
Pericardial injury with internal mammary artery injury	1	4.17
Right ventricular injury	2	8.33

IV. Discussion

Early recognition of trauma to the chest is a priority. Penetrating chest injury can be acutely life threatening in some of the cases, making early diagnosis crucial for better outcome. It is important to know the mechanism and site of injury as management may vary. Chest trauma was observed to be more frequent in males in various studies[4,5]. Similarly, all our were patients with penetrating chest injury were males. Penetrating chest trauma mostly occur in young people. Our youngest patient was 6 years old who had chest injury due to bomb blast. Mean age of the patients in this study was 23 years. However, it was 31 years in some series[6,7] and their patient population includes blunt chest trauma. Firearm injury including bomb blast account for 59.25% of penetrating chest injuries in our study making these the most common etiology of penetrating chest trauma followed by stab injury. This may be attributed to increasing use of firearms, especially during hunting in the thick forest, and law and order situation of the region.

It is not rare to miss a diaphragm injury since non-invasive diagnostic measures have little value to diagnose non-complicated diaphragmatic injury, while late diagnosis has significant morbidity and mortality. One third of thoracoabdominal wounds associated with diaphragmatic injuries[8,9]. This is especially true in case of gunshot or blast injury since it is difficult to predict the path of the projectile. We had 3 (12.5%) patients with diaphragmatic injury who had associated abdominal injury.

Penetrating cardiac injuries carries a high mortality risk. We had 4 (14.81%) cases of penetrating cardiac injuries in which two patients had right ventricular injury and the other two had only pericardial injury. Right ventricular injuries were repaired successfully, one by doing sternotomy and the other by left anterolateral thoracotomy without cardiopulmonary bypass. The victims are all young males and are caused by violence using sharp weapons which is in consistent with other series[10]. Nature of the injury, the chamber involved and the haemodynamic status upon arrival determines the mortality and morbidity rate in patients with penetrating cardiac injuries.

We do not have any mortality in this series, though our patient population is small.

V. Conclusion

Penetrating chest injury is frequently acutely life threatening. So, appropriate and timely diagnosis of chest injury is important to reduce the mortality and morbidity. Firearm and stab injuries remains the main cause of penetrating chest trauma and it usually involves young males. Tube thoracostomy is a simple and most important procedure in the initial management in penetrating chest trauma as most of the patients presented with haemothorax or haemopneumothorax.

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