PENETRATING CHEST TRAUMA AND EARLY THORACOTOMY

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ABSTRACT

Penetrating chest injuries continues to be associated with high morbidity, reflecting the importance of intra thoracic viscera which are at risk following penetrating chest trauma. Management ranges from careful monitoring, tube thoracostomy, to early thoracotomy. The indications of early thoracotomy alone were analyzed in a prospective study of 120 patients admitted to the cardiothoracic surgery department at Lady Reading Hospital, Peshawar over a period of one year. Conservative management was adopted in 10 patients (8.33%). Thoracostomy tube was placed in 110 patients (91.66%), 10 patients (9%) underwent early thoracotomy, 3 for massive hemothorax and lung laceration, 2 for evacuation of clotted hemothorax, 2 for removal of foreign body (bullet) in the lung parenchyma, and one each for empyema, chylothorax and diaphragmatic laceration, with an overall mortality of 2.5% (3 patients out of 110). We conclude that early thoracotomy has a definite role both in emergency situations and for various complications resulting from penetrating chest trauma.

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INTRODUCTION

Trauma deaths result from chest injuries in 25% of cases[1]. Penetrating chest injury occurs when there is communication between intra thoracic viscera and the environment[1]. After initial clinical evaluation, the insertion of tube thoracostomy, monitoring of blood loss and evaluation of chest roentgenograms, one should be able to select 10-15% of patients who require urgent thoracotomy[2,3,4]. The main indications for emergency thoracotomy are life threatening conditions which must be diagnosed or excluded. These include massive hemothorax, cardiac tamponade and tracheobronchial injuries[5]. Emergency thoracotomy in massive hemothorax is considered in patients have initial output in excess of 1500 mls after chest intubations, or more than 200 mls per hour for three consecutive hours accompanied with hemodynamic compromise[6,7].

The relatively high salvage rate is in penetrating chest trauma patients who present with signs of life, supports the continued use of emergency thoracotomy[8]. Moreover, the key to improved outcome lies in rapid transportation to adequate emergency care by the quickest available measures[9].

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There is a group of patients however, who will need early surgical intervention either for missed injuries or complications, include clotted hemothorax, chylothorax, and empyema[10,11]

METHODS

A prospective study was carried out between May 1996 and April 1997 at Cardiothoracic Surgery Department, Lady Reading Hospital, Peshawar. Data of patients were analyzed with regard to the side of the chest affected, type of chest injury and the different lines of management, whether conservative or surgical. Thoracotomy, was indicated in 10 cases. Three patients were diagnosed as massive hemothorax and underwent early thoracotomy. Lung laceration and bleeding were controlled by over sewing the lacerations. Two cases were diagnosed as clotted hemothorax and confirmed by CT scan. Evacuation of clotted hemothorax and decortication was done. Two symptomatic patients underwent thoracotomy for removal of foreign body (bullet) in the lung parenchyma. Diaphragmatic injury was suspected in those, who had penetrating chest trauma in the proximity to the diaphragm. Proximity to the diaphragm was assessed when the penetrating injury was located at the level of fourth intercostal space anteriorly and sixth rib posterolaterally. One case underwent thoracotomy for diaphragmatic injury, one for chylothorax and one for empyema drainage and decortication.

RESULTS

This study included 120 patients. There were 95 (79%) males and 25 (20.82%) females with male to female ratio of 3.8:1. Out of 120 penetrating chest injuries, there were 105 patients with missile injury, 14 stab wounds while 1 patient required admission for steel bar injury (Table-1).

TABLE 1

I	Mechanism	No. /Percentage
A	Firearm injuries	105 (87.5%)
B	Stab Wound	14 (11.66%)
C	Steel Bar	1 (0.83%)

Right to left side of chest injury ratio was 76:44 while there were 3 trans-mediastinal and 2 bilateral chest injuries (Table-2).

TABLE 2

Mechanism	Left Side	Right Side	Bilateral/ Transmediastinal
Firearm injuries	33	72	2 bilateral 3 transmediastinal
Stab Wound	10	4	
Steel Bar	1		
Total	44	76	5

There were 78 patients with hemothorax, 25 with hemopneumothorax, 5 lung contusions, 4 chest wall injuries, 5 pneumothorax and one chylothorax. (Table-3)

TABLE 3

Clinical Condition	No / Percentage
Hemothorax	78 (65%)
Pneumothorax	5 (4.16%)
Hemopneumothorax	25 (20.83%)
Lung contusion	5 (4.16%)
Chest Wall Injury	4 (3.3%)
Chylothorax	1 (0.83%)

110 patients were initially treated with tube thoracostomy. Three patients who continued to bleed after chest intubations and were hemodynamically unstable proceeded for emergency thoracotomy. Early thoracotomy was also performed in 7 patients who developed various complications or having missed injuries. (Table-3,4)

TABLE 4

DIFERRENT LINES OF MANAGEMENT

Group of Patients	N o
Expectant (conservative)	10
Tube thoracostomy	110
Thoracotomy	
a. Massive hemothorax	3
b. Clotted hemothorax	2
c. Recurrent hemoptysis (foreign body; bullet)	2
d. Empyema	1
e. Chylothorax	1
f. Ruptured diaphragm	1

DISCUSSION

Early deaths following penetrating chest trauma are the result of either hypovolemia, hypoxia or both. The first priority in the management of these patients is the establishment of stable circulation and adequate ventilation[12]. Patients showing signs of circulatory shock that is not due to cardiac tamponade require intravenous replacement with plasma substitutes until blood becomes available. Hypoxemia is treated in the acute situations by maintenance of clear secure air way, supplemental inspired oxygen and ensuring full expansion of both lungs by intercostal tube drainage of pneumothorax or hemothorax[13,14].

The lung is the most commonly injured organ in penetrating chest trauma[15]. The manifestations of lung injuries are pneumothorax, hemothorax, pulmonary contusion and pulmonary hematoma. Majority of patients with injured lung or intercostals vessels do not require thoracotomy. Tube thoracostomy and volume resuscitation allow most lung injuries to heal spontaneously[16]. In 110 patients who underwent tube thoracostomy, three (2.72%) patients required emergency thoracotomy for control of bleeding from lung parenchyma not responding to tube thoracostomy alone.

In our series, 5 patients developed pneumothorax and 25 developed hemopneumothorax. All these patients were treated with tube thoracostomy. Tube thoracostomy is not only an initial line of management for hemo or pneumothoraces but also provides an extremely versatile monitoring technique. It gives an excellent margin of safety[1,2].

Hemothorax is a major complication of penetrating chest injury. Up to one liter of blood may be concealed in the chest and be difficult to discern on a supine chest X-ray[17]. Tube thoracostomy was the initial treatment in 78 cases with hemothorax and in 25 patient with hemopneumothorax, while 3 patients who

continued to bleed excessively after tube thoracostomy were converted to emergency thoracotomy.

Clotted hemothorax results from delayed recognition and treatment of hemothorax; utilization of small size thoracostomy tube and repeated thoracocentesis. Retained hemothorax is a major risk factor for the development of empyema[10]. Clotted hemothoraces are best managed by early thoracotomy and evacuation. This was done in two of our cases, while two had recurrent symptoms due to foreign body (bullet) in the lung which required thoracostomy.

The incidence of post traumatic empyema ranges form 1 - 9%. Risk factors include penetrating trauma from gunshot wounds, clotted hemothorax, foreign body and bronchopleural fistula[13,18]. One of our patients was managed by early thoracotomy and decortication. Repair of diaphragmatic defect is accomplished by direct suture using a double layer of non absorbable suture[5].

We also had one case of missed diaphragmatic injury and one chylothorax not responding to conservative treatment. This was managed by early thoracotomy.

CONCLUSION

Penetrating thoracic trauma is a major cause of morbidity and mortality. Reduction in morbidity and mortality depends on avoidance of complications as well as early diagnosis of major injuries. Early thoracotomy is indicated for severely lacerated lung, clotted hemothorax, empyema, chylothorax and diaphragmatic injury.

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