Surgical Factors in Chest Trauma Causing Post-Traumatic Thoracic Empyema

Qais M. Ali
MBChB, FICMS

Abstract:

Objective: The aim of this study is to determine the most important surgical factors in chest trauma causing post-traumatic thoracic empyema and hence the most important measures to prevent its occurrence.

Methods: Fifty four patients of post-traumatic thoracic empyema were analyzed. These patients were treated in the period of 1994-2006. The analysis included studying the series of available chest X rays of these patients from time of trauma to the occurrence of thoracic empyema, trying to discover the most important factors causing the empyema, and thus the most important preventive measures.

Results: Thoracostomy tubes were inserted initially for all of these patients for the treatment of traumatic haemo-pneumotnorax. In 18 patients (33%) the tube was left in place for more than 10 days due to continued air leak with or without collapse of the involved lung. In 36 patients (67%) the tube was removed but the patients got empyema later. Study of the series of available chest X rays of these patients showed that in 14 patients (26%) there was an incomplete evacuation of the haemothorax. In 10 other patients (19%) there was re-accumulation of blood in the pleural cavity after removal of the Thoracostomy tube. In 7 other patients (13%) there was an incomplete expansion of the injured lung. In the remaining 5 patients (9%), no definite cause of the empyema could be identified.

Conclusion: Incomplete evacuation of haemothorax, re-accumulation of blood after removal of thoracostomy tubes, incomplete expansion of the injured lungs, persistent air leak and delayed removal of thoracostomy tubes were the main Surgical causes of post-traumatic thoracic empyema. Delayed or improper management of these conditions usually end in thoracic empyema.

Key wards: Chest trauma, Thoracic & Pleural Empyema

Introduction:

With the development of thoracic surgery and traumatology, mortality and morbidity in chest trauma has decreased significantly[1].

Chest trauma is still one of the most important causes of thoracic empyema[2]which is a serious complication causing significant mortality and morbidity.

Most cases of post-traumatic thoracic empyema can be prevented by prompt and early treatment of conditions which can end in empyema. Improper or delayed management of these conditions usually leads to this complication[3].

Patients & methods:

Fifty four patients with established post-traumatic thoracic empyema have been included in this study. These patients were treated in the period (1994-2006).

Penetrating injuries were in 50 patients (93%), which included 47 patients (87%) due to bullets or shells and 3 patients (6%) due to stab wounds.

In 4 patients (7%) the trauma was of the blunt type due to car accidents (table 1).

The male to female ratio was 26:1 with an age range of 17-46 years.

The study depended on the findings identified on the series of the available chest X rays taken from the onset of the injury to the time of occurrence of the thoracic empyema.

Twenty six patients (48%) had fibro-purulent empyema, while the other 28 patients (52%) developed organized constrictive empyema (table 2).

Results:

Thoracostomy tube was inserted initially for all of these patients for the treatment of traumatic haemo-pneumotnorax.

In 18 patients (33%), the tube was not removed due to continued air leak with or without collapse of the involved lung.

In 36 patients (67%), the tube was removed and then reinserted again. Seventeen patients (31%) were discharged home but were re-admitted again.

The series of chest X rays showed that there was incomplete evacuation of haemothorax in 14 patients (26%).

In 10 patients (19%), there was re-accumulation of haemothorax after removal of the thoracostomy tube.

In 7 patients (13%), there was incomplete expansion of the injured lung with persistence of a space between the chest wall and the lung border.

In 5 patients (9%), no definite cause could be identified (table 3).

Table (1): Types of Trauma

Types		No.	%
Blunt injuries		**4**	**7**
Penetrating injuries	**Stab injuries**	**3**	**6**
	Bullets and shells	**47**	**87**
Total		**54**	**100**

Table (2): Stages of Empyema

Stages	No.	%
Fibro-purulent	26	48
Organized constrictive	28	52
Total	54	100

Table (3): Causes of empyema

Causes	No.	%
Delayed thoracostomy tube removal due to continuous air leak	18	33
Incomplete evacuation of the blood	14	26
Re-accumulation of the blood	10	19
Incomplete expansion of the injured lung	7	13
No cause identified	5	9
Total	54	100

Discussion:

Infection of the pleural space ending in thoracic empyema is common after chest trauma. The source of infection is more likely from inoculation of the pleural space by the injury itself or by the thoracostomy tube [4].

Almost all cases of serious chest traumas are associated with significant haemo-pneumotnorax which is usually treated by a thoracostomy tube connected to an under water seal drainage system [5] This usually ends in cure of most of the patients within few days, but keeping them for long periods is usually complicated by empyema thoracis [6] A patient with organized constrictive empyema requiring decortications implies that an error in management or a complication had occurred during the treatment[3].

Air leak from the under water seal system is usual. In most cases it is due to parenchymal lung injury which usually settles within few days. Continuous low grade suction on the drainage system may help.

If such a leak continues for more than 7-10 days it is unlikely that it will ever stop. Most probably it is due to injuries in the major part of the bronchial tree or to laceration of the lung or a lobe of the lung. Unless it is stopped surgically by thoracostomy or thoracoscopy, the patients usually develop thoracic empyema.

Persistent brncho-pleural fistula is a strong indication for a video assisted thoracoscopy [7]

Keeping the thoracostomy tube in these patients for more than 10 days usually adds nothing but a more chance for empyema [8]. The risk of empyema thoracis is increased significantly in patients with prolonged placement of the thoracostomy tube [9].

Collapse of the lung should be promptly managed. Physiotherapy is very important to achieve full lung expansion. Low grade suction is also helpful. Every effort should be made to clear the bronchial tree from foreign bodies and thick secretions.

Bronchoscopy is some times needed to achieve that goal. Fibrinous adhesions encaging the lung should be removed. Intra-pleural fibrinolysis might succeed to remove these adhesions [10] but if it fails, early thoracoscopy is needed [11].

Early premature removal of the thoracostomy tube may leave some blood within the pleural cavity. This will end in a fibrothorax or a pyothorax.

Delayed or improper insertion of the thoracostomy tube may lead to retained clotted haemothorax. If the pleural space is not cleared from the blood through the thoracostomy tube, early drainage with video assisted thoracoscopy is recommended [12]. Retained haemothorax is one of the strong indications of video assisted thoracoscopy in cases of chest trauma [13,14]. Video assisted thoracoscopy is a safe and effective procedure and is believed to be the first initial operative approach in

these cases [15] but if it is not available, minimal access thoracostomy is indicated.

All of the above factors should be treated especially in elderly patients where intensive pulmonary care is needed to remove the thoracostomy tubes early and to prevent the development of empyema thoraces [9].

Once thoracic empyema develops, the patient should be referred to a specialized thoracic unit. Early referral of these patients can prevent the development of advanced organized empyema and thus increase the chance for cure [16].

Many cases of thoracic empyema can be prevented by proper management of thoracic trauma.

Early proper placement of thoracostomy tubes is needed to achieve full evacuation of haemothorax.

Thoracostomy tubes should not be removed before complete drainage of blood from the pleural cavity, but should not be kept for more than 7-10 days whatever the reason was.

Continuous air leak, failure of expansion of the injure lung, and retained haemothorax should be treated promptly to remove the thoracostomy tubes as early as possible.

Follow up of the patients by chest X rays after removal of the thoracostomy tubes is necessary to treat re-accumulation of blood within the pleural cavity before developing empyema thoracis.

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Specialist thoracic surgeon, Al- Yarmouk teaching hospital, Lecturer of thoracic and vascular surgery, Al- Mustansirya university medical college.