Recent updates in surgical management of traumatic haemothorax

Thesis
Submitted in partial fulfillment of M.Sc. degree in General Surgery

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CAIRO UNIVERSITY
FACULTY OF MEDICINE
2012
When you care enough to send the very best...

Discover what's possible.
Acknowledgments

First and foremost, I feel always indebted to Allah, the most kind and the most merciful.

I wish to express my deep thanks and sincere gratitude to Prof. Dr. Ashraf Helal, Professor of Cardiothoracic surgery, Faculty of Medicine, Cairo University for his continuous support, guidance, valuable remarks and kind advice.

My deepest thanks and gratefulness to Prof. Dr. Hesham El-Sharkawy, Professor of General & Vascular surgery, Faculty of Medicine, Cairo University, for his generous help and continuous encouragement. He provided me with valuable comments, knowledge and experience necessary for achieving this work.

I am also profoundly grateful to Dr. Alaa El-Deen Farouk, Lecturer of Cardio-Thoracic Surgery, Faculty of Medicine, Cairo University for his continuous close supervision, support, constant help and his stimulating remarks throughout this study. I owe his a lot for all the time he spent in revising every detail in this work.

I consider myself very lucky to have my wife and family. I would like to express my deepest gratitude for what they did and are still doing.

Special gratitude is directed towards my colleagues, and friends for their help and support offered to me during my whole residency and my whole life so that I was able to proceed in all the projects in my life.

Khaled Rasheed
بسم الله الرحمن الرحيم

"نَرْفَعُ دَرَجَاتٍ مَّنَ نَّشَاءُ وَفَوْقَ كُلِّ ذِي عَلْمٍ عَلِيمٍ"

صدق الله العظيم
سورة يوسف
الأية (76)
Abstract

Traumatic Haemothorax is a surgical emergency after blunt and penetrating chest injury. 36 Patients were enrolled to the study. The major cause for penetrating trauma was stabs and for blunt trauma was motor car accident. 31 patients were managed with chest tubes and 5 Patients had emergency thoracotomy. The study showed that about 13.8% of all Patients with traumatic haemothorax will need thoracotomy.

Key Words:

Traumatic Haemothorax - penetrating trauma – Blunt trauma – Emergency thoracotomy
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Abbreviations & Acronyms:

ICT : Intercostal chest tube

CXR : Chest x-ray

PA chest x-ray : Postero-anterior chest x-ray

FFH: Fall From Height

MCA: Motor Car Accidents

FAST : Focused Abdominal Sonography for Trauma

CT scan : Computed Tomography

VATS : Video Assisted Thoracoscopic Surgery

ER : Emergency room

TTE : Transthoracic Echo

TEE : Transesophageal Echo

F : French

EDT : Emergency Department Thoracotomy

IU : International unit

Tlc : Total leukocytic count

LOS : Length of hospital stay
Introduction

Hemothorax refers to a collection of blood within the pleural cavity. Although some authors state that a hematocrit value of at least 50% is necessary to define a hemothorax (compared to a bloody pleural effusion), most do not agree on any specific distinction. Although the most common etiology of hemothorax is blunt or penetrating trauma, it can also result from a number of nontraumatic causes or can occur spontaneously.120

Its cause is usually traumatic, from a blunt or penetrating injury to the thorax, resulting in a rupture of the serous membrane either lining the thorax or covering the lungs. This rupture allows blood to spill into the pleural space, equalizing the pressures between it and the lungs. Blood loss can be massive in people with these conditions, as each side of the thorax can hold 30-40% of a person's blood volume. Even minor injury to the chest wall can lead to significant haemothorax.85

The penetrating injuries are usually due to missile or stab wound injuries. In civilian life, the majority of injuries are due to stab wounds whereas in the military most of the injuries are due to missile wounds.66

Hemothorax is classified according to the amount of blood present: minimal, moderate, or massive. In a chest injury, a rib may lacerate lung tissue or an artery, causing blood to collect in the pleural space. Shock in a trauma victim is often related to a large hemothorax. Hemothorax may also be associated with a collapsed lung and may be pneumothorax.22

If left untreated the condition can progress to a point where the blood accumulation begins to put pressure on the mediastinum and the
trachea, effectively limiting the amount that the heart's ventricles are able to fill. The condition can cause the trachea to deviate, or move toward the unaffected side.\(^8^5\)

Most small to moderate haemothoraces are not detectable by physical examination and will be identified only on Chest X-ray, FAST or CT scan. However, larger and more clinically significant haemothoraces may be identified clinically. If a large haemothorax is detected clinically it should be treated promptly.

Chest examination may indicate the presence of significant thoracic trauma with external bruising or lacerations, or palpable crepitus indicating the presence of rib fractures. There may be evidence of a penetrating injury over the affected hemithorax.

The classic signs of a haemothorax are decreased chest expansion, dullness to percussion and reduced breath sounds in the affected hemithorax. There is no mediastinal or tracheal deviation unless there is a massive haemothorax.

All these clinical signs may be subtle or absent in the supine trauma patient in the emergency department, and most haemothoraces will only be diagnosed after imaging studies.\(^2^5\)

Complications include shock due to massive bleeding from cut blood vessels and organs before surgery, lung abscess (empyema), or fibrous clot within the pleural cavity (fibrothorax).\(^2^2\)

Management of hemothorax either includes chest tube placement to remove the source of bleeding and to drain the blood already in the thoracic cavity or by thoracotomy. Blood in the cavity can be removed
by inserting a drain (chest tube) in a procedure called a tube thoracostomy. Patients should recover swiftly after this. However, if the cause is rupture of the aorta in high energy trauma, the intervention by a thoracic surgeon is mandatory.\textsuperscript{28}

Chest tube placement is the first step in the management of traumatic haemothorax. The majority of haemothoraces have already stopped bleeding and simple drainage is all that is required. All chest tubes placed for trauma should be of sufficient calibre to drain haemothoraces without clotting. Hence the smallest acceptable size for an adult patient is 32F, and preferably 36F tubes should be placed.

Chest drains for simple haemothorax can be placed posteriorly. However if there is concomitant pneumothorax, or patients have multiple rib fractures with positive pressure ventilation, drains should be placed anteriorly to avoid tension pneumothorax for an obstructed chest tube.\textsuperscript{25}

Inadequately drained posttraumatic hemothorax with tube thoracostomy can lead to the complications of fibrothorax/entrapped lung or empyema. Conventionally, these conditions are managed surgically with open thoracotomy. Video-assisted thoracoscopic surgery (VATS) has emerged as an alternative surgical technique in the evaluation and treatment of posttraumatic pleural complications.\textsuperscript{97}

Thoracotomy is required in less than 10\% of thoracic trauma patients. Most haemothoraces stem from injury to lung parenchyma or venous injury and will stop bleeding without intervention. Penetrating trauma is more likely to be associated with arterial haemorrhage requiring surgery.
The indications for thoracotomy are usually quoted as the immediate drainage of 1000-1500mls of blood from a hemithorax. However the initial volume of blood drained is not as important as the amount of on-going bleeding. If the patient remains haemodynamically stable they may be admitted and observed. The colour of the blood is also important - dark, venous blood being more likely to cease spontaneously than bright red arterial blood. Patients admitted for observation who have continuing drainage with no signs of reduction in chest tube output over 4-5 hours should also undergo thoracotomy. The threshold for this is usually stated at around 200-250mls of blood per hour.25

In injuries of the heart, great arteries, veins and lymphatics the indication for immediate surgery includes cardiac tamponade, radiographic confirmation of a great vessel injury. Long term indications for surgery include the late recognition of a great vessel injury (e.g., development of traumatic pseudo aneurysm).70,89
Aim Of The Work

We intend to clarify the role of surgery in treatment of patients afflicted by traumatic haemothorax and what is the percentage of patients who will need thoracotomy inevitably for complete management.
Historical Background

Hemorrhage from or within the chest has been detailed in numerous medical writings dating back to ancient times. Although lesser forms of trauma were commonly treated in the ancient physician’s daily practice, major injuries, especially those to the chest, were difficult to treat and often lethal. 87

By the 18th century, treatment for hemothorax was advocated; however, surgeons disagreed as to its form. A number of surgeons, including John Hunter in 1794, advocated the creation of an intercostal incision and drainage of the hemothorax. Those of the opposing view recommended closure of chest wounds without drainage. Although Hunter’s method was effective in evacuating the hemothorax, the morbidity associated with the creation of an iatrogenic pneumothorax as a result of the procedure was significant. The risks associated with wound closure or conservative management included the possibility that empyema with sepsis would develop or that persistent trapped lung with permanent reduction of pulmonary function would result. 87

Observing the advantages and dangers of both forms of therapy, Guthrie, in the early 1800s, proposed early evacuation of blood through an existing chest wound. He asserted that if bleeding from the chest persisted, the wound should be closed in the hope that existing intrathoracic pressure would halt the bleeding. If the desired effect was accomplished, he advised that the wound be reopened several days later for the evacuation of retained clotted blood or serous fluid. 87
By the 1870s, early hemothorax evacuation by trocar and cannula or by intercostal incision was considered standard practice. Not long after this, underwater seal drainage was described by a number of different physicians. This basic technique has remained the most common form of treatment for hemothorax and other pleural fluid collections to this day.87

Dogmas on the best possible treatment modalities of chest wounds and their sequelae such as empyema thoracis have changed several times during the wars. Where hemothorax is concerned, the pre–World War I policy of “noli me tangere” changed first. Evacuation of intrapleural blood/air became unquestionable. Tapping was the procedure advised. Air replacement based on civilian experience with poor expansion tuberculous lungs was considered necessary. The European schools favored tapping and drainage during World War II. “As experience increased in the management of penetrating chest trauma, the number of thoracotomies progressively decreased”.121

In the US Army, the proportion of major surgeries for control of bleeding and to evacuate hemothorax increased in the late phase of World War II. This trend intensified on the United Nations' side of the Korean War, mainly due to the advent of more sophisticated anesthesia. It is interesting to see how dogmas influence and interfere with reality. As soon as early decortication became the preferred option, the decreased number of drainages led to the increasing number of candidates for operative evacuation. This vicious circle seemed to support the philosophy of discouraging drainage. In the Vietnam War, surgical aggression receded, and drainage regained its role in primary treatment. In the 1990s, antibiotics, computed tomography, and chest
ultrasonography supported the conservative primary approach, without unnecessary delay of intervention. At the same time, cases requiring thoracotomy and major lung/tracheobronchial surgery with or without interventions on the central cardiovascular system are treated with maximal aggressivity.\textsuperscript{121}