

Penetrating thoracic injuries treatment options in the Authority of Al Thawra Hospital-Taiz, Yemen, during war 2015–2016

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Abstract— Aim: To describe the review of treatment options for Penetrating thoracic injuries (PTIs) cases during war admitted to the Emergency Surgical center in Authority of Al Thawra Hospital-Taiz. **Materials and Methods:** The records were reviewed of 187 patients (pts) seen at general surgery unite in our Hospital during the wartime period over a one year. **Result:** The study includes 187 pts. with PTIs, 170 (90.9%) were male and 17 (9.1%) were female, Male to female ratio was 11:1. The Study show that PTIs are common in second to sixth decade of age 156(83.4%) pts. in the age group 18-60 years of age, the mean of age was 37 year. the Gunshot wounds are the most prominent mode of injury 131 pts. (70.1%), 52 (27.8%) pts. were from blast injury, and 4 (2.1%) had stab injuries. isolated PTIs were in 140 pts (74.9%), which are combined with injuries of abdominal happened in 47 patients (25.1%). In the 131 gunshot wound patients, 23 (17.6%) had thoracotomy, whereas only 5 (11%) of the 52 blast-wound patients had thoracotomy exploration. Most of the patients 158 (84.5%) were treated by tube thoracostomy. (15%) had exploration with thoracotomy and exploration. only One (0.5%) patient need conservative treatment (observation). **Conclusion:** In this study we emphasize that chest tube thoracostomy should remain by far the most common method of treating penetrating injury to the thorax, with only 15% of patients requiring thoracotomy. Most of the cases of seemingly serious PTIs was adequately and successfully being managed by general surgeons.

Index Terms— Penetrating thoracic injuries, tube thoracostomy, thoracotomy, besieged Taiz city.

1 INTRODUCTION

TRAUMA is perhaps the oldest of humankind's afflictions, and the history of trauma is as old as medicine itself. One of the earliest writings on thoracic injury was found in the Edwin Smith Surgical Papyrus, written in 3000 BC, which describes cases of penetrating thoracic trauma.[1] Thoracic injuries account for 20%-25% of deaths due to trauma.[2] Thoracic injury during warfare is associated with a high incidence of morbidity and mortality. In World War I, chest injuries were 6% of all combat wounds, with a mortality of 24– 27%.[3] During the Second World War, the overall mortality from thoracic trauma had reduced to 9–11%. In Vietnam, thoracic injury mortality fell further to 2.9%.[4]

While penetrating injuries to the thorax can be highly lethal, for patients who reach the hospital alive, mortality in recent military and civilian series has ranged from 8.4 to 18.0 %.[5][6] Overall, injuries to the thorax account for 37 % of deaths associated with penetrating trauma.[4]

Broadly speaking thoracic injuries can be categorized as blunt and penetrating.[7] I was inspired to write about penetrating thoracic injuries (PTIs) by the events that took place in Taiz city, which are ravaged by war and dispute, at 2015-2016 and still continues the siege of city so far. I limited my topic to PTIs, because this is such an interesting part of the body. Many vital organs reside in the thoracic

cavity and no gunshot wound to the chest is alike.[8] explosive weapons are designed to increase the number and energy of casing fragments leading to multiple penetrating wounds. which it imposes a great challenge on the general surgeon to recognize and treat those patients. [9]

With a rise in political tension all over and increasing inter racial violence; it is imperative that the surgeon should be apprised of war injuries.[10] Chest injury is potentially the most dangerous of all and its management should be a matter of the most extreme urgency. The particular danger of the chest injury is that it threatens the vital transport of oxygen to the tissue by two ways: By hypovolemia from severe bleeding and by trauma to the lung itself. [10] Pre hospital deaths due to chest injuries are mostly due to great vessel injuries, cardiac injuries and tension pneumothorax.[11] The diagnosis of chest injury was made by clinical history, physical examination and abnormal chest radiographs at the accident and emergency department. Chest injuries were considered as only penetrating affecting the chest wall and the contents of the thorax e.g. pleura, lungs, lower respiratory tract, esophagus, heart and great vessels.

All the study patients were managed according to advanced trauma life support [ATLS] and under supervision International Committee of the Red Cross

(ICRC) and Medecins Sans Frontieres (MSF) organization, which supported hospitalized emergency cases. The associated injuries were managed appropriately according to type of injury.

Up to date, unlike many other countries in the world, in besieged Taiz city, since start of war 2015, Limited facilities, and, health worker flight (no thoracic surgeons). So alternative providers have stepped in to fill widening service gaps as the conflict has unfolded. this drew my attention, how to deal with the penetrating thoracic injuries.

Aim of the work

The aim of this study is to describe the review incidence and treatment options for Penetrating thoracic injuries cases during war admitted to the Emergency Surgical Department in Authority of Al Thawra Hospital-Taiz.

2 PATIENT AND METHODS

Study design

The study retrospectively reviewed the records of patients presenting to the hospital with penetrating thoracic injuries during war (September 2015 - August 2016).

Study Location

The study was carried out at Surgical wards and surgical ICU of Authority of AL Thawra Hospital-Taiz, which is a referral, consultancy and teaching hospital for Taiz University College of Health Sciences and other paramedics and it is located in Taiz city in the south part of Yemen. It has a bed capacity of 664.

The study population

All patients admitted to the surgical ward and surgical ICU for the penetrating thoracic injuries during study period.

Inclusion Criteria

- All age groups , both sexes with PTIs.
- Patients who admitted with PTIs and associated abdominal injury (thoracoabdominal penetrated injuries) were included in the study.
- All soldiers, and local civilians were included.

Exclusion Criteria

- Blunt chest injuries.
- Combination both blunt and PTIs.
- Files patients, which are not meet complete information during study period.

The selected patients were subjected to the following:

- Chest X-ray was the initial radiographic diagnostic tool for all cases. a computerized thorax tomography was performed for some complicated cases.
- Chest tube thoracostomy was the initial treatment modality in cases of advanced pneumothorax or hemothorax. the conservative treatment modalities were a worrying option to avoid follow up with lack of resident doctors in the wards which crowded with traumatic patients.
- Immediate thoracotomy was performed if the chest was full of blood, if more than 1500 cm3 of blood had drained with insertion of a chest tube, if drainage exceeded 200 cm3/h for 3 h, or if there

was a major air leak.

Data collection and analysis

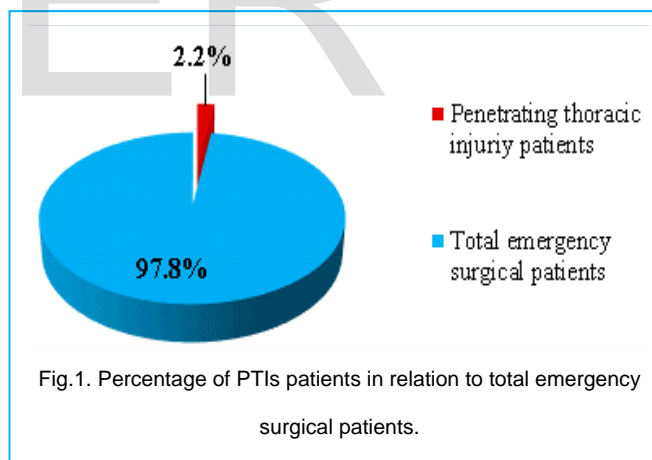
Records of patients were retrieved from the hospital records. The files of patients with PTIs were consecutively selected and reviewed. Which are meet complete information by support and under guide ICRC and MSF organizations respectively, during that period. Data were analyzed using Excel and SPSS 24.0 with the help of a statistician.

3 RESULTS

A total of surgical cases arrived to surgical emergency center over one year during war were 8172 cases. there were 187 (2.2%) patients with penetrating thoracic injuries (Graph 1), Of these 170 (90.9%) were male and 17 (9.1%) were female, (Table 1). The male to female ratio were (11:1, with a mean age of 37.0 years.

TABLE 1
SEX DISTRIBUTION OF PATIENTS WITH PTIS.
(n=187)

Sex	patients with penetrating thoracic injury	
	No.	%
Male	170	90.9
Female	17	9.1
Total	187	100.0



The peak frequency of patients with penetrating thoracic injury was 83.4 % in the age group 18- 60 years of age (n=156), males represented 76.4% in the age group 18 - 60 years, also females were more in the age group 18- 60 years (6.9%). (Fig. 2).

Observing the types of the trauma, isolated penetrating thoracic injury was found in 140 patients (74.9%),128 patients (68.4%) male and 12 patient's female. The associated abdominal injury was found in 47 patients (25.1%), 42patient (22.5%) male and 5 patients (2.7%) female. (Fig. 3).

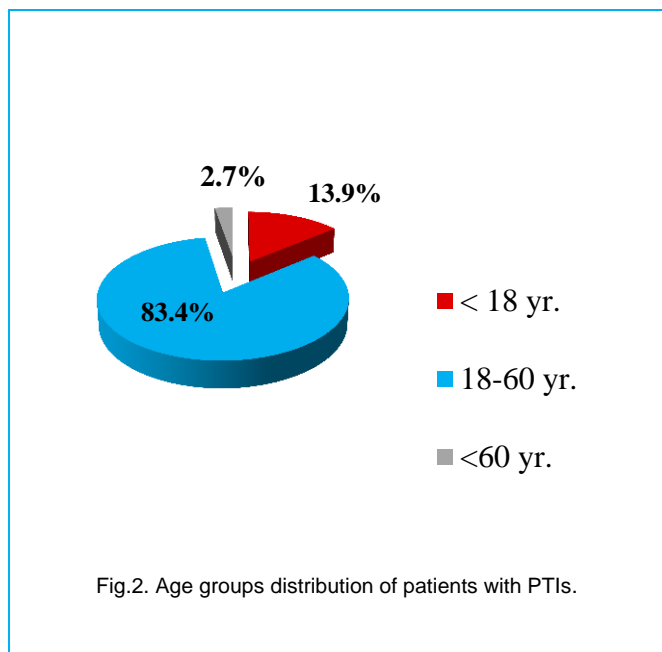


Fig.2. Age groups distribution of patients with PTIs.

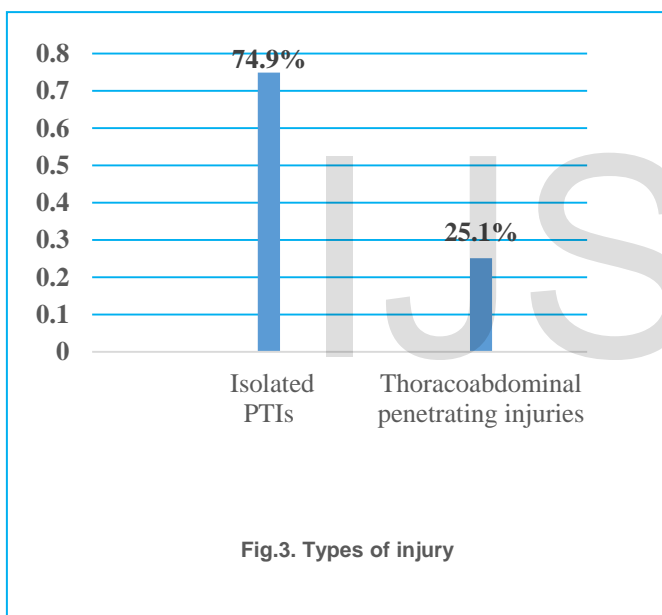


Fig.3. Types of injury

Observing the cause of the injury, the Gunshot wounds in 131(70.1%) patients, 121(64.7%) male and 10 (5.3%) female. Blast (Explosive) injury in 52 (27.8%) patients, 48 (25.6%) male and 4 (2.1%) female. Stab wounds in 4 (2.1%) patients, 1 (0.5%) male and 3 (1.6%) female. (Table 2).

The outcome for the great majority of patients with PTIs 158 patients (84.5%) were treated by tube thoracostomy, 41 (21.9%) of them need laparotomies with chest tube. In over 117 (62.6%) require either no invasive therapy or, at most, a tube thoracostomy to effect resolution of their injuries. Some patient need wound debridement and washout with chest tube.

Overall, 85% of patients were treated without thoracotomy. Only 28 patients (15%) in the study had exploration with thoracotomy, 5 (2.7%) patients of them were laparotomy with thoracotomy. One (0.5%) patient need conservative treatment (observation). (Table 3).

There is statistically significant relationship between the

treatment options and type of injury (isolated versus associated abdominal injury). Especially there are relation between chest tube insertion and thoracotomy related to type of injury.

Also There is statistically significant relationship between mode of injuries with option of treatment. Especially there are relation between chest tube insertion and thoracotomy related to mode of injuries.

In comparison mode of injuries with option of treatment were, In the 131 gunshot wound patients, 23 (17.6%) had thoracotomy, whereas only 5 (11%) of the 52 blast-wound patients had thoracotomy exploration.

TABLE 2
DISTRIBUTION OF THE PATIENTS ACCORDING THE SEX AND MECHANISM OF INJURY.

(n=187)		
Mechanism of injury	Total	
	N	%
Gunshot wounds	131	70.1
Blast wounds	52	27.8
Stab wounds	4	2.1
Total	187	100.0

TABLE 3
MANAGEMENT OF THE PATIENTS.

(n=187)		
Treatment	Total	
	N	%
Conservative (observation)	1	0.5
Tube thoracostomy	117	62.6
Thoracotomy	23	12.3
Tube thoracostomy + Laparotomy	41	21.9
Thoracotomy + Laparotomy	5	2.7
Total	187	100.0

4 DISCUSSION

The thoracic injuries concerned 9.7% of emergency surgeries in French registry in Afghanistan war (2009–2013), like in other NATO nations reports: 12% in the Afghanistan war (US), 8% and 12% in the Gulf war (US and UK) [12], [6] The true incidence of pulmonary injuries is unknown and difficult to estimate from the literature. [13]

This study revealed that penetrating thoracic injury was a frequent trauma about 2.2% among emergency patients admitted to the surgical departments in one referral hospital (Authority of AL Thawra Hospital- Taiz) during war over one year. this incidence is low comparing by other studies probably explained by Lack of a proper

transport system that could bring the patients to the hospital quickly was a big health problem. So chest injuries due to great vessel injuries, cardiac injuries and tension pneumothorax, are mostly die before reaching the hospital.

Our study showed that penetrating thoracic injury is common in second to sixth decade of age (83.4 %). This is in agreement to other studies. [14] mean age was 37 years. This is in agreement to other studies. [11] there were 26(13.9%) patients below 18 years and only 5(2.7%) patient above the age of 60 years. but there is difference in extended age (till sixth decade of age) probably explained by stop salaries at that time most people joined to new military recruitment in order to get the military salary. And also the conflict was religious.

Males 170 (90.9%) were more frequently affected than females 17 (9.1%) by a huge margin of 11:1 due to their greater exposure to outdoor activities and propensity to violence. The male preponderance of 11:1 is higher than the 5.5:1 ratio reported in a prospective analysis of 168 patients in Nigeria. [11] a higher incidence of 14.9:1 was found in a Pakistani study with 191 cases. [2]

Blast contributed to 56.8% of the injuries, which fits with the increased use of Improvised Explosive Devices (IEDs) in wars (Afghanistan and Iraq). [4] Secondary blast fragments were the main mechanism of wounding for thoracic injury from the First and Second World Wars [15]; this had not changed in the Korean War where such fragments caused 87% of the thoracic wounds. [4] In this study Explosive (blast) injury was in 52 (27.8%) patients.

In this study the most common mode of the injuries were the Gunshot wounds in 131 (70.1%) patients this is higher than (56%) to study by Henri de Lesquena in the French registry- 2016 in Afghanistan war. [14] the high incidence of gunshot wounds in this study can be explained by the fact that most people in our country own guns and use them at verity of occasions. also may be due to frequent sniper deployment during street war and availability of weapons in the society. penetrating injuries result from stab wounds were 4 (2.1%) patients, 75% of them were female.

Studies have shown that most chest injuries can be treated by relatively simple nonsurgical methods, such as tube thoracostomy, appropriate analgesics management, oxygen inhalation therapy, and good pulmonary toilet. [16]

In our study, 158 patients (84.5%) were treated by tube thoracostomy (This is in agreement to other studies [7] but is lower to other studies [17], [12]), 41 (21.9%) of them need laparotomies with chest tube. Overall, 85% of patients were treated without thoracotomy. Only 28 patients (15%) in the study had exploration with thoracotomy (This is in agreement to other studies) [7], [18], 5 (2.7%) patients of them were Concurrent thoracotomy and laparotomy.

5 CONCLUSION

The chest tube thoracostomy should remain by far the most common method of treating penetrating injury to the thorax, with only 15% of patients requiring thoracotomy.

Most of the cases of seemingly serious PTIs was adequately and successfully being managed by general surgeons, but should be supported by focused thoracic

trauma care training.

ACKNOWLEDGMENT

The authors would like to thank the Emergency surgical center members for participating in collection of data.

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