

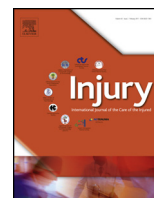


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## Challenges in war-related thoracic injury faced by French military surgeons in Afghanistan (2009–2013)

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### ARTICLE INFO

#### Keywords:

Thoracic injury  
Trauma  
Database  
General surgery

### ABSTRACT

**Background:** This study reports the challenges faced by French military surgeons in the management of thoracic injury during the latest Afghanistan war.

**Methods:** From January 2009 to April 2013, all of the civilian, French and Coalition casualties admitted to French NATO Combat Support Hospital situated on Kabul were prospectively recorded in the French Military Health Service Registry (OPEX<sup>®</sup>). Only penetrating and blunt thoracic trauma patients were retrospectively included.

**Results:** Eighty-nine casualties were included who were mainly civilian (61%) and men (94%) with a mean age of 27.9 years old. Surgeons dealt with polytraumas (78%), severe injuries (mean Injury Severity Score = 39.2) and penetrating wounds (96%) due to explosion in 37%, gunshot in 53% and stabbing in 9%. Most of casualties were first observed or drained (n = 56). In this non-operative group more than 40% of casualties needed further actions. In the operative group, Damage Control Thoracotomy (n = 22) was performed to stop ongoing bleeding and air leakage and Emergency Department Thoracotomy (n = 11) for agonal patient. Casualties suffered from hemothorax (60%), pneumothorax (39%), diaphragmatic (37%), lung (35%), heart or great vessels (20%) injuries. The main actions were diaphragmatic sutures (n = 25), lung resections (wedge n = 6, lobectomy n = 4) and haemostasis (intercostal artery ligation n = 3, heart injury repairs n = 5, great vessels injury repairs n = 5). Overall mortality was 11%. The rate of subsequent surgery was 34%.

**Conclusions:** The analysis of the OPEX<sup>®</sup> registry reflects the thoracic surgical challenges of general (visceral) surgeons serving in combat environment during the latest Afghanistan War.

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### Introduction

During Operations Iraqi and Enduring Freedom, thoracic injury occurred in 10% of casualties and the related mortality was around 10% [1,2]. Truncal hemorrhage was reported to be the main cause of preventable death in 47–67% of cases [3,4]. The analysis of the US database, the *Joint Trauma Theater Registry*, allows evaluation of

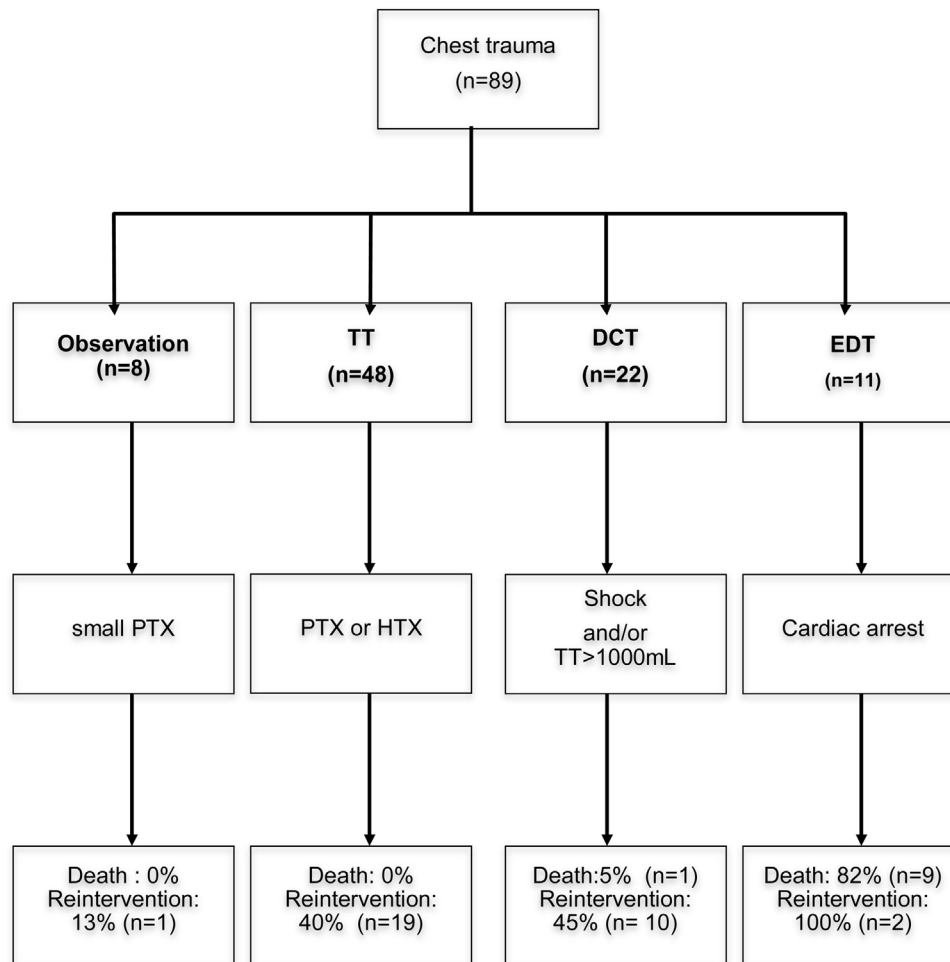
combat casualty care. The French Military Health Service has its own database since 2009: the OPEX<sup>®</sup> Registry.

The Forward Surgical Teams (FSTs) had to stop the bleeding process and prevent further contamination spread in order to keep the Wounded In Action alive, stable and fit for a quick evacuation. French military surgeons are neither specialized cardiothoracic surgeons nor trauma surgeons but general (visceral) surgeons who are given thorough specific training, which includes cardiothoracic and vascular parts, in order to be up to skill with Damage Control Surgery in combat environment.

The objective was to answer to the following question: does the French general surgeon concept supported by focused thoracic trauma care training provide the expected level of expertise in war-related thoracic injuries? The actual surgical practices for thoracic injuries during the latest Afghanistan War is reported here in order

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**Fig. 1.** Management of casualties.

PTX: pneumothorax; HTX: hemothorax; TT: Tube Thoracostomy; DCT: Damage Control Thoracotomy; EDT: Emergency Department Thoracotomy.

to highlight the challenges faced by military surgeons and to study the results of this training.

## Material and methods

The French Society of Thoracic and CardioVascular Surgery's Institutional Review Board approved this protocol (n° 2015-2-24-8-48-37-deHe).

### Patients

During the French leadership, all the French, coalition, and local civilian casualties admitted in the OR of the international Role-3 NATO Combat Support Hospital situated on Kabul International Airport (CSH KAIA) were prospectively recorded in the OPEX<sup>®</sup> Registry. Both penetrating and blunt thoracic trauma patients were retrospectively included in this study. Killed In Action were not included. Patients with superficial damage, non-penetrating shrapnel wounds, and road traffic accident injuries were excluded.

### Technical facilities

A Role-3 NATO CSH could be compared to a level 1 US trauma center with a full range of specialists and equipment available 24 h a day (general surgeons, emergency physicians, intensivists, nurses). Additionally, prompt availability of care in varying

specialties such as neurosurgery or Head and Neck surgery was present. The capacities of CSH KAIA were as follows: 3 ORs, 1 multi-slice CT, a lab, a 7-bed ICU, a 6-bed Emergency Department and 2 shock rooms, and a 30-bed surgical ward. Surgeons used mobile ultrasound SonoSite 180<sup>®</sup> (Sonosite Inc., Botjell, WA, USA) and x-ray Mobilett XP<sup>®</sup> (Siemens AG, Germany) in shock room.

### Management

*Non operative management* concerns hemodynamically stable casualties, just observed or drained for thoracic injuries, who did not undergo thoracotomy. Observation was chosen only for wounded with small pneumothorax (<2 cm), without hemothorax. All the others were drained (Fig. 1).

*Damage control thoracotomy* corresponds to surgical exploration performed immediately in the following circumstances:

- Penetrating thoracic injury with large hemothorax on X-ray and/or ultrasound examinations.
- Evacuation of more than 1000 mL of blood immediately after tube thoracostomy.
- Repeated blood transfusions required to maintain hemodynamic stability, in respect to the shock room rule of initial assessment (SBP < 65 mmHg after 10 min of intensive resuscitation and active bleeding process or SBP < 90 mmHg after 20 min of intensive resuscitation) (Fig. 2)

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