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Developing risk factors for post traumatic empyema in patients with chest trauma

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ABSTRACT

Objective: To establish the risk factors associated to development of empyema posttraumatic in patients with chest trauma managed with closed thoracostomy.
Methods: It was a descriptive and observational study of patients with chest trauma who were admitted between January 2013 and May 2014. The variables were evaluated and the results according to management with closed thoracostomy in patients with thoracic trauma was determined. Univariate analysis was performed and measures of central tendency were calculated.
Results: In total 240 patients were analyzed. Among them, 10.4% (25) developed posttraumatic empyema. In patients who developed empyema, the mean age was 34.2 years, and the mean injury severity score was 20.6. It was identified as a risk factor closed chest trauma in 68% (17) and 84% coagulated hemothorax trauma. Empyema management thoracoscopy was in 100% of cases.
Conclusions: The posttraumatic empyema is a complication that occurs in patients with thoracic trauma. One of the most important risk factors is coagulated hemothorax which could be identified and treated in time to avoid comorbidities during hospital stay.

1. Introduction

Trauma is a disease of global importance, which generates about 5 million deaths per year, of which 1.2 million are from traffic accidents[1,2]. According to the study of the World Health Organization on global burden of disease published in 2010[3,4], the trauma remains a public health problem and generates a significant burden on health systems in Latin American countries.

Trauma is an epidemic that is increasing. It causes more than 5 million deaths per year. Its incidence is 15% of the health problems in the world and OMS predicts that by 2020 this figure will reach 20%. Among the types of trauma, chest trauma is one of the most common disorders that comes to the emergency. Posttraumatic empyema is rare in patients with chest trauma that occurs around 1% to 4.2% of cases and increases in patients who are performed closed thoracostomy[5,6].

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It is important to identify the potential risk factors associated with the development of posttraumatic empyema in patients managed with closed thoracostomy. The present study aimed to establish preventive measures to reduce significantly the incidence[7,8].

2. Materials and methods

2.1. Design

Prospective observational cohort study was carried out in the patients with thoracic trauma admitted to the Emergency Department of the Neiva University Hospital from January 2013 to May 2014 and underwent closed thoracostomy as a therapeutic measure. The Neiva University Hospital, which is a university hospital located in Southern Colombia, is reference center for trauma and services in the Department of Huila and their areas of influence including Caquetá, Putumayo, North of Cauca and Southern Tolima, and has 390 beds of which 21 are for the ICU. Adult trauma patients admitted to the hospital are

approximately 4000 patients per year.

2.2. Inclusion and exclusion standard

In the study, patients older than 18 years with thoracic trauma admitted to the institution and underwent operation with closed thoracostomy and who has been documented posttraumatic empyema subsequently as a complication were included. The trauma patients were excluded who were with thoracic trauma under 18, with a history of debilitating heart disease, immunosuppressed transplant and had required urgent thoracostomy.

The diagnosis of empyema was based on the following standard: 1. Purulent liquid extracted from the pleural cavity or drain it by probe thoracostomy; 2. Gram-positive culture for bacterial growth of the extracted fluid from the pleural cavity; 3. Patient outcome of an imaging study (ultrasound or CT of the chest) compatible with empyema; 4. Characteristics of exudate in the extracted fluid from the pleural cavity (pH <7.10, LDH>1000 IU/L-glucose<40 mg/dL).

2.3. Data collection and statistical analysis

The method used for data collection was direct observational non-participatory. Documentary review of medical records recording data to a form with epidemiological, clinical data such as age, sex, type of trauma, diagnosis, abbreviated injury scale, injury severity score (ISS), pneumothorax, hemothorax were performed. Chest tube, location, amount, procedure, surgery, time with tube, empyema, culture, microorganism, antibiotic treatment, thoracocentesis, decortication, day hospitalization were carried out. The results obtained in the study were stored and analyzed in a statistical software version 2.15.2 R online. Measures of central tendency and dispersion for continuous variables were calculated. Student *t*-test was used to compare continuous variables, and for categorical variables the Pearson *Chi*-Square, statistical significance was defined as a $P \leq 0.05$.

3. Results

In total 240 patients were analyzed with chest trauma who were admitted between January 2013 and May 2010. About 10.4% (25) had empyema as a complication after trauma. The mean age was 34.2. The mean ISS was 20.6. Las clinical and demographic characteristics of the population are described in Table 1.

Of the 25 patients who developed posttraumatic empyema, 17 (68%) were closed trauma and 8 (32%) presented penetrating chest trauma, with indication of 76% thoracostomy tube handling hemothorax and 34% for handling pneumothorax. The data associated as risk factors for the development of posttraumatic empyema are described in Table 2. It was identified as a risk factor closed chest trauma in 68% (17) and 84% coagulated hemothorax trauma.

The average length of hospital stay in the ICU-A for the group of patients with chest trauma who developed posttraumatic empyema was (26.71±5.35) days. Empyema management thoracoscopy was in 100% of cases.

Table 1

Clinical and demographic characteristics of patients with thoracic trauma admitted to Neiva University Hospital.

Variable		*n* (%)
Gender	Male	193 (80.4%)
	Female	47 (19.6%)
Age (years)	Mean±SD	34.20±16.05
	Rank	(18-59)
Glasgow	Mean±SD	6.3±4.8
ISS	Mean±SD	20.60±11.10
Type of trauma	Closed	162 (67.5%)
	Penetrating	78 (32.5%)

Source: Database of patients at University Hospital in Neiva (HUN), *n*=240.

Table 2

Multivariate analysis for the development of posttraumatic empyema patients with thoracic trauma admitted to Neiva University Hospital.

Variables	B	Sig	OR	95% *CI*
Type of closed trauma	1.623	0.10	5.07	1.48-17.40
Presumptive antibiotic not used	1.514	0.016	4.54	1.33-15.55
Coagulated hemothorax	3.955	0.000	52.22	16.99-160.52

Source: Database of patients at University Hospital in Neiva.

4. Discussion

The trauma is still and will be a public health problem for the world population. According to international protocols in the management of trauma such as the advanced trauma life support, it is investing little or no research regarding promotion and prevention (just 4 cents for every dollar invested)[9-11]. Thoracic injuries are a major cause of morbidity and mortality, a fact demonstrated in multicenter studies internationally, and this is directly responsible for 15%-25% of deaths due to injuries in general[11,12]. With early diagnosis and appropriate therapeutic management in the Emergency Department, many of these deaths can be avoided.

In the present study, the largest numbers of patients were in the group of women aged between 31 and 40 years, which differs from that obtained by Professor Jimenez of Domingo Luciani Hospital in Caracas, Venezuela, where the trauma chest predominated in ages between 20 and 30 years[13]. In the study of Professor Bello in Chile, prevalence of thoracic trauma was also found lower than those found in the study in Cienfuegos. As for sex, all national studies and revised admissions agree dominance in men[14-16].

This study found that posttraumatic empyema is a complication that often occurs in patients with thoracic trauma. For the development of posttraumatic empyema,

the incidence was 10.4% and 1.4% literature describes, thus concluding that posttraumatic empyema can present as complication. In this study an association of coagulated hemothorax was found as a risk factor for the development of posttraumatic empyema, which is in accord with previous researches[17-19]. The presumptive use of prophylactic antibiotic chest trauma remains controversial, although in our study we found that the non-use of this is related as a risk factor for the development of posttraumatic empyema. However in this study there were not assessed antibiotics used and dosage. Most studies agree that *Staphylococcus aureus* is the main crop seed isolated, so it is very important that the use of antibiotics is directed against this organism.

Regarding the mechanism of trauma the relationship between blunt trauma and the development of empyema is due to the magnitude of the trauma, although it should be noted that the empyema that occurs in patients with penetrating chest trauma is due to different factors such as they are direct contamination of the pleural space among others[20,21].

We consider the limitations of the study are given because this is an observational study, whose sample compared with the various international series seems small, but significant for our Colombian population and the institution where we work every day.

In Colombia, the trauma and violence remains a public health problem, which is one of the diseases most commonly presents in our environment. Trauma-ray is a type of trauma which is served frequently in the Emergency Department of the Neiva University Hospital.

The posttraumatic empyema is a complication that occurs in patients with thoracic trauma. One of the most important risk factors is coagulated hemothorax which should be identified and treated in time to avoid comorbidities during hospital stay.

Conflict of interest statement

The authors declare that they have no conflict of interest.

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