IMPLICATIONS OF EMERGENCY THORACOTOMY IN THORACIC TRAUMA

SEBASTIAN SUCIU[1], LORANT KISS[2], CONSTANTIN ROŞCA[3], ROLAND KISS[4]

[1,2,4] "Lucian Blaga" University of Sibiu, [3] Sibiu County Clinical Emergency Hospital

Keywords: *thoracic trauma, thoracotomy, emergency*

Abstract: *The retrospective study is based on the experience accumulated in the period 1978-2015 on a group of 7000 thoracic traumas (TT) treated. The study is based on the evaluation of the medical documentation, the communicated and published statistics regarding the thoracic traumatic pathology. In the study we analyzed the results obtained by the immediate emergency thoracotomy in the post-traumatic thoracic pathology, summing up a number of 7000 thoracic traumas treated between 1978-2015 in two hospitals with an emergency profile.*

INTRODUCTION

It is difficult to estimate the general incidence of thoracotomies practiced in immediate emergency as statistics are not homogenous.(1,2)

The therapeutic behaviour in penetrating thoracic wound in relatively well established, compared with the indication of emergency thoracotomies in blunt thoracic trauma (TT).(3,4)

Traumatic injury is the leading cause of death in all age and the incidence of blunt or penetrating thoracic trauma is estimated to be present in about 25-50% of these cases.(5)

An increasing number of patients with a major thoracic trauma are arriving at the hospital because of the increasing incidence of trauma and also because of the efficiency of the prehospital emergency medical services.(6)

Nearly 85% of patients with TT can be managed with conservative method of therapy, respiratory non-invasive and invasive mechanical support, thoracic drain, therapy of shock and about 10-15% will require thoracotomy.(7)

AIM

The study aims at evaluating the indication of thoracotomy for the pleural-pulmonary lesions regarding 7000 cases observed.

MATERIALS AND METHODS

The study includes the emergency indication and the vital indication of thoracotomy in closed and open trauma. The study aims at framing the indication of early and late thoracotomy with the incidence of postoperative morbidity and mortality in relation to the time of thoracotomy.

Of the total number of 7,000 TT, 2000 (28.8%) were as a result of severe polytrauma, 1675 (23.9%) TT were associated with severe abdominal trauma (AT), 2130 (30.2%) with brain or bone skeletal injury, and 295 of the total number of thoracic traumas were isolated TT, 5760 (82%) in TT were closed, 1240 (18%) were chest thoracic lesions.

Emergency thoracotomies were performed in 402 (5.74%) of the TT, 319 (79.5%) of the thoracotomies aiming at resuscitation at the time of hospitalization.

In the first hour interval up to 72 hours until admission, 83 (20.6%) of thoracotomies were performed

For a better analysis in the present study, 83 emergency thoracotomies were included, except for the resuscitation ones (319), being evaluated the types of TT the therapeutic procedures and the results obtained.

In the presented study, each patient was included in the Hanover polytrauma score, each patient being in one of the four grades of the trauma score.

In the presence of penetrating wounds from the anterior mediastinum accompanied by collapse due to hemopericardium, subxiphoid pericardial puncture was practiced using Breaux and Moreno's method and in the presence of cardiac tamponade with the Becks triad, patients were thoracotomized by left thoracotomy immediately after the diagnosis set up in the emergency room. Central thoracic wounds accompanied by hemorrhagic shock have benefited from emergency thoracotomy. The lateral thoracic wounds initially benefited from pleurotomy.

The primary indication for emergency thoracotomy was the refractory shock by TT under the conditions of excluding the extrathoracic etiology of the shock and the externalization on the thoracic drainage of a quantity of blood between 1500-2500 ml in the first three hours, pericardial tamponade, massive air leakage on pleurotomy.

The second indication for thoracotomy was the accumulation of a hemopneumothorax within 24-48 hours after TT.

Criteria underlying the indication of emergency thoracotomy in the Emergency Room are: blood pressure less than 90 mmHg; central vascular injury; massive loss or persistence of blood in pleurotomy; cardiac wound; tamponade; hemopneumothorax.

RESULTS

The incidence of emergency thoracotomy was 5.74% (402 cases) compared to the total group of 7000 TT, of which 82% (5760) were closed TT and 18% (1240) open TT with thoracic penetrating wounds.

A total of 1675 TT were associated with abdominal

[1]Corresponding author: Sebastian Suciu, B-Dul. Corneliu Coposu, Nr. 2-4, Sibiu, România, E-mail: sebadent2211@yahoo.com, Phone: +40749 415421
Article received on 05.07.2019 and accepted for publication on 28.08.2019
ACTA MEDICA TRANSILVANICA September;24(3):78-80

trauma, 2130 (30.2%) with skeletal injury and only 295 were isolated TT.

The frequency of closed or open TT by awarding the polytrauma score was 79%, respectively 21% with a high frequency of the thoracic trauma in ploytrauma.

Regarding the closed thoracic trauma the relative incidence of emergency thoracotomy was 3% and 7% in the penetrating wounds in the TT. We statistically analyzed 83 thoracotomies of primary emergency or preceded by pleurotomy. We excluded from our statistics 1265 cases of emergency pleurotomized patients because these patients could not be followed due to the association of dominant extrathoracic lesions, as a result of burns, polyfractures, severe brain injuries etc., which required immediate multidisciplinary assistance.

In 27 thoracotomies performed for closed TT, 25 (92%) were associated with extrathoracic lesions, with 15 abdominal lesions, 10 fractures.

In 32 of the cases with penetrating chest injuries, 7 abdominal wounds were encountered and 10 were associated with cardiac wounds and spine fractures.

Surgical indications

The operative indications varied with the type of trauma. In the group of 27 thoracotomies of closed TT, the indications of thoracotomy were the following: shock 48%, central vascular injury 48%, massive blood loss on pleurotomy 2%.

In the group of 56 thoracotomies of the penetrating wounds the indications were: large vascular lesions 45%, including 10 cardiac wounds; massive blood loss on pleurotomies 28%; shock state 15%; 2 cases (7%) other causes.

The major indication of thoracotomy in thoracic wounds has been systematized into 4 categories: shock through intrathoracic hemorrhage: persistent bleeding from the chest; tamponada; closed or open pneumothorax.

The most common indication for thoracotomy in penetrating wounds was hemopneumothorax, while in closed TT the indication for hemopneumothorax was less frequent.

In 55% of thoracotomies, anterolateral thoracotomy was chosen, in 39% posterolateral thoracotomy and in 6% sternotomy.

The injuries identified following the 83 emergency thoracotomies were: lung injuries 42%, 10% cardiovascular injuries; lung vessel injuries 8%, injuries of other structures 23% (internal mammary artery, intercostal artery, other mediastinal vessels).

In closed TT, in 48% of cases, there were found large vascular lesions, and in 31%, pulmonary lesions.

In the presence of shock through massive intrapleural hemorrhage, the structures responsible for the bleeding were: intrapulmonary bleeding 16 cases, bleeding from large vessels 16 cases, bleeding from the intercostal artery 1 case, cardiac wound 2 cases, injuries of the internal mammary artery with the retraction of the damaged artery - 2 cases.

In our experience, during the thoracotomy dictated by intrathoracic hemorrhage both after TT and after the initial pleurotomy, the causal organ was the lung in most cases.

All 10 patients with cardiac wounds were operated immediately, postoperative progression was without sepsis.

Survival of these cases shows that any cardiac wound of a patient alive has a real chance of being successfully operated, as in these cases, there are no injuries of the excitatory-conductive system of the heart.

The complete analysis of the lesions regarding the 83 emergency thoracotomies shows 3 major etiologies: lung, heart, thoracic vascular.

Surgical manoeuvres: pulmonary sutures, vascular sutures of the myocardial wall, pericardial suture with drainage, diaphragmatic suture, lobectomy, atypical pulmonary resections.

Most patients with open thoracic lesions had pulmonary, vascular or cardiac suture.

For the indication of the resections addressed to the pulmonary parenchyma, lobectomy was indicated in closed TT and atypical resections for wounds.

Frequency of thoracotomy: with the purpose of resuscitation 319 (79.3%), in primary emergency 83 (20.6%), in the first hour after admission 41%. Most of these interventions were imposed by open trauma.

Our study showed that the type of TT did not significantly influence the frequency of interventions during the first 24 hours.

After 24 hours, thoracotomy was indicated in 20% of cases for closed TT, being rarely indicated for the evolution of thoracic wounds.

In the vast majority of cases, emergency thoracotomy was imposed by hemorrhage, rarely of the antero-lateral mobile flail chest due to severe acute respiratory failure with obvious hypoxia (SaO2 <80%).

Regarding our conduct for mobile flail chest, orotracheal intubation with mechanical ventilation was firstly preferred, as well as pleural drainage and fixing of the flap with COMAN blades.

After 24 hours, indication for thoracotomy was taken into consideration in post-traumatic atelectasis and some diaphragmatic ruptures not diagnosed upon admission and, in one case, for a deficient hemostasis on the retracted internal mammary artery.

Postoperative complications. In closed TT the complications were 3 times more frequent: pneumonia, respiratory failure, closed hematoma, pleural empyema, atelectasis, bronchial fistula.

Postoperative mortality.

Postoperative mortality after resuscitation thoracotomy from closed TT was 56% and 18% in case of penetrating wounds.

Regarding the postoperative evolution, posttorachotomy mortality in severe isolated TT was 16%, in the presence of polytrauma association it was 58%

Regarding the cardiac wounds operated, 2 patients died.

DISCUSSIONS

In the literature, the frequency of thoracotomy varies between 6%-64%, the average being between 10-15%.(8,9) In our casuistry the frequency of thoracotomy for thoracic wounds was higher. The incidence of emergency thoracotomies (33%) of thoracic wounds is comparable to the study published by Glinz.(10)

A recent study of 2608 patients with 1663 closed TTs and 945 thoracic penetrating wounds showed a 7.5% rate of thoracotomy for closed TTs and 27.5% for wounds (11) being close to our statistics in the indication of emergency thoracotomy .

The experience accumulated confirms the severe prognosis of TT associated with soft chest polytrauma and diffuse traumatic lung injuries. Regarding the severe ploytrauma patients, there is no time for complex investigations, thoracotomy indication being based on the clinical status of the patients, and the prognosis is influenced by the condition of the polytraumatized patient when brought to the emergency room.

Most authors recommend emergency pleurotomy, but if the drainage is> 1500ml or over 250ml per hour, thoracotomy is indicated in the next 3 hours.(12)

In our experience 32 (57%) of patients with penetrating wounds required hemostasis thoracotomy, 38% evolved with continuous bleeding on pleurotomy drainage and 20% were in shock.

Survival of closed TT was low compared to open TT. The difference in survival is explained by the association of extrathoracic lesions in closed TT, the first being massive bleeding from the abdomen. Massive air loss on pleural drainage suggests tracheobronchial injury or massive pulmonary dilaceration.

In our study, massive air fistula was recorded in 2.4% of cases.

Trauma therapeutic modalities from mild or severe lung injury depend on the degree of complexity of the lesions. The most important indication of thoracotomy was the vascular injury (48%) followed by massive hemothorax (4%), results close to those in the literature.(13,14)

Most polytrauma patients could not benefit from pre-operative investigations (319) because of their precarious general condition, which is explained by the association of major injuries in polytrauma.(15)

We considered it important to follow the quantity of blood, air eliminated after pleurotomy, allowing the treatment of abdominal lesions or of the flail chest, obtaining satisfactory results, performing thoracotomy under better safety conditions.

Patients with hemodynamic stability under conservative treatment benefit from surgery only if therapy is not adequately answered, an example for this attitude being drainage of a hemothorax with persistent bleeding or a pneumothorax with no tendency for pulmonary reexpression under aspiratory drainage.(16)

CONCLUSIONS

Our study confirms the presence of severe multiple injuries in the traumatized patients, lesions observed in the initial post-traumatic evolution.

To ensure a proper therapy in polytrauma, it is indicated that three conditions are met: consensual strategy, as a priority, coordination of emergency assistance, multidisciplinary completed team.

One of the circumstances for the indication of thoracotomy in hemothorax is the reduction of hospitalization, prevention/reduction of late complications and the complete pulmonary re-examination.

Intensive therapy, pleural drainage provides a suitable therapy in most TT.

The surgical procedures in the TT depend on the type and extent of the associated thoracic and general injuries as well as on the general condition of the traumatized patients.

In the selected cases, emergency thoracotomy is a life-saving procedure.

In polytrauma, acute comorbidities and associated lesions increase mortality and evolution of these patients.

Early mechanical ventilation in emergency and adequate hemodynamic stabilization are crucial for avoiding and preventing severe complications.

In the first 24 hours after the trauma, the most important causes of death are the bleeding of the central neurological lesions, and not the interval between the production of the trauma and the first emergency examination.

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