



Surgical and nonsurgical outcomes for treating a cohort of empyema thoracis patients: A monocentric retrospective cohort study



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ARTICLE INFO

Keywords:

Empyema thoracis
Decortication
Tube thoracostomy
Surgery
VATS

ABSTRACT

Background: There are several studies reporting high success rates for surgical and nonsurgical treatments of empyema separately. The aim of current retrospective cohort study is to find the best treatment in low socio-economic areas.

Material and methods: A total of 149 patients were treated in the referring hospital from January 2002 to December 2008. The current retrospective cohort study was carried out by nonsurgical (medically & thoracentesis & chest tube drainage with or without fibrinolytic agents) and surgical (VATS & open thoracotomy decortication methods) procedures in single center performed in thoracic and respiratory medicine wards. The independent *t*-test on demographic data was the statistical test tool.

Results: The complete cure and mortality rates for 130 patients were 27% (35 out of 130 patients) and 0.3% (1 out of 130 patients), respectively. Thirteen out of 149 patients that were estimated to be at stage II underwent VATS decortication. The results showed zero success rates for this procedure which was then converted to open thoracotomy decortication. And, 113 patients who underwent thoracotomy decortication had a cure rate of 96.4% (109 patients) and mortality rate of 1.8% (2 patients). Four (3.5%) patients needed thoracoplasty, 2 died and 2 (1.8%) needed open window thoracostomy resulted in empyema necessitans that remained uncured. Total hospitalization lengths for the patients treated by tube thoracostomy and thoracotomy decortication were (15.4 ± 2.1) and (6.2 ± 1.8) days (*P* < 0.001), respectively. The success rates between surgical and nonsurgical treatments were 98.2% and 27.1%. And, the difference between them was significant (*P* < 0.001).

Conclusion: Because of the advanced stages of empyema in our patients, thoracotomy decortication procedure is often the first rank choice with success rates higher than nonsurgical techniques. However, nowadays, the success rates of nonsurgical and VATS management of empyema thoracis are mostly reported in the literature.

1. Introduction

The sterile pleural space infected by various bacteria can produce empyema thoracis [1]. These infections are para-pneumonic effusion, secondary to trauma, complications of postoperative thoracic surgery, and extension of neighboring infections [1]. On the occasions that the empyema is not well-treated or is complicated, significant levels of mortality and morbidity are the results [2]. A range of therapeutic options are available for treatment such as percutaneous aspiration, chest tube drainage, and video-assisted thoracoscopic surgery (VATS) and open thoracotomy decortication procedures.

Some studies showed high success rates for treating empyema by VATS decortication and nonsurgical management of empyema (i.e. tube

thoracostomy & antibiotics with or without instillation of fibrinolytic agents) [3].

At the multiloculation and early stages of fibrinopurulent states when the peel was not formed yet, VATS decortication would be the common procedure [3,4]. Also, some surgeons reported favorable results for VATS decortication at stage III of empyema that the results were the same for open thoracotomy decortication. But, the ability of VATS to adequately decorticate the lung at stage III remained controversy. Moreover, in situations of delayed referral, empyema patients treated by VATS decortication were mostly converted to be treated by open thoracotomy decortication [5]. On the other hand, the most successful therapy for advanced stages of empyema is thoracotomy decortication when thick peel is formed [6,7].

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<http://dx.doi.org/10.1016/j.amsu.2017.10.002>

Received 31 August 2017; Received in revised form 6 October 2017; Accepted 6 October 2017

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Although, all of the existing studies were based on single treatment procedure without any comparisons (i.e., surgical or nonsurgical) and hence, their results could not be reliable for choosing the best one. There are several cohort studies carried out on empyema [8–17] from which only two of them were retrospective [14,17] and they were analyzing the risk of aortic aneurysm [14] as well as the characteristics of medically and surgically treated patients in terms of chest pain, IV antibiotics, chest tube, and intrapleural fibrinolytics [17]. A retrospective cohort study is used for comparing medical treated groups for whom the information for the outcomes are recorded in a long period of time to be analyzed later in the near future [18]. However, this type of study may suffer from treatment selection or information biases. The research questions are “what are the outcomes of surgical and nonsurgical treatment of empyema?”, and “what is the best management procedure for empyema patients in low socioeconomic areas?”. The purpose of the current study is to perform a retrospective cohort analysis of the experiences obtained from treating the empyema thoracis in the low socioeconomic area to assess the cure and success rates by excluding and including mortality rate, respectively. Both surgical (VATS, thoracotomy decortication) and nonsurgical (tube thoracostomy and antibiotics, with or without fibrinolytic agents) procedure were performed which were serially conducted on the referral cohort during a period of time.

2. Material and methods

The current retrospective cohort study was carried out on serially admitted hospitalized patients with empyema thoracis in a single center (Imam Reza Referral Hospital, Tabriz University of Medical Sciences, Northwest of Iran) from January 2002 to December 2008 and the research was registered at the publicly available database (i.e., ResearchRegistry.com) with the No. 2939. The study was approved by the Medical Ethics Committee of the University. Also, this study was complied with the STROCCS guideline for strengthening the reporting of cohort studies in surgery [18].

Three stages of post infectious pneumonia and empyema which were used as clinical parameters for therapy of empyema included the followings [19,20]:

Stage I- Dry or exudative stage that lasts for one to five days (treated nonsurgically), *Stage II*- Fibrinopurulent state that occurs within the first three weeks of infection (treated surgically: VATS or open thoracotomy decortication), *Stage III*- This is also known as organizing stage that can happen after three weeks when a thick pleural peel develops (treated by open thoracotomy decortication). Any failed treatment of stage I or VATS surgery was treated by open thoracotomy decortication.

The treatment options included surgical and nonsurgical procedures. The former treatments were VATS decortication, and mini-thoracotomy or standard thoracotomy decortication whereas, the latter ones were combinations of antibiotics, thoracentesis, instillation of fibrinolytic therapy with drainage, and toilet of pleural cavity [5].

Nonsurgical management of patients was performed in the Respiratory Medicine Ward and surgical treatment of patients was carried out in the Thoracic Ward of Academic referral Hospital affiliated with Tabriz University of Medical Sciences. All patients were followed up six to twelve months in the subspecialist clinic of the hospital.

The inclusion criteria were based on European Association Cardio-Thoracic Surgeon (EACTS) guideline which suggested choices for diagnosis and treatment of any stages of empyema thoracis [5]. All patients with chest symptoms, pleuritic chest pain, dyspnea, bacterial pleural effusion, and septic conditions with empyema were included. Patients who underwent VATS decortication and were converted to open thoracotomy during or after operation were also included. Additionally, the patients whom their nonsurgical treatments were failed were included.

And, the exclusion criteria were as follows:

- Patients with empyema necessitans (2 patients).
- Patients were clinically unstable and hence, were not suitable for general anesthesia (1 patient)
- Patients with cardiopulmonary compromises and empyema (1 patient).

The first two patients involved in advance stages of empyema (such those of Hippocrates's patients) did not satisfy the abovementioned criteria, and regarding the other two patients, they did not have stable conditions and hence, they refused to be treated.

153 patients at the acute and chronic stages of empyema thoracis with following characteristics were first included; (i) post pneumonic infections (142 patients), (ii) trauma sequels (8 patients), and (iii) extension of suppuration process from neck, mediastinum and abdomen (3 patients).

The cohort groups included 130 and 113 patients which were treated nonsurgically and surgically, respectively. The management on nonsurgical group was carried out medically with or without thoracentesis or instillation of any types of fibrinolytic agents. And the treatment on surgical group was performed using open thoracotomy decortication which had three subgroups including 13 patients treated by VATS procedure, 94 uncured patients of nonsurgical management group, and 6 patients treated by open thoracotomy decortication. All the patients especially the surgical treated patients were preoperatively managed by chest physiotherapy, flexible bronchoscopy, and antibiotics.

The surgical group of patients was under general anesthesia and treated via standard posterolateral thoracotomy. During decortication, lung tearing parenchyma was sutured by nylon or PDS (3-0) sutures. VATS procedure was done at the estimated stage (II) using three or four 5 mm to 10 mm ports and thoracoscopic dissector or scissor made by Storz and Olympus instrument. Five experienced thoracic surgeons holding academic degrees carried out the open thoracotomy decortication procedure while VATS decortication procedure was carried out by three thoracic surgeons. Full expansion of lung after decortication was measured for recording as a successful treatment. Then, the septic and malnutritional patients were transferred to Intensive Care Unit (ICU) for two to five days. They were then managed in the thoracic ward while they had received antibiotics. The outcomes of two procedures were obtained by resolution and progression of empyema, recurrences, mortality, failure or converted procedures to open thoracotomy decortication, success and cure rates. Outcome measures were involved by primary and secondary endpoints. Primary endpoint was successful treatment of two procedures at the first management of empyema. Secondary endpoint was observed after failure or unsuccessful treatment.

The data were collected from the hospital medical records of the patients and analyzed in terms of incidence, symptoms and signs, methods of therapy, and outcomes. The data were presented as standard deviation (SD) and N (%). Variables were analyzed with the independent samples T-test for continuous variables and Chi-square or Fisher exact test for quantitative variables. P-values less than 0.05 were considered statistically significant. The statistical package for social science (SPSS 16) was used for analyses.

3. Results

In this retrospective cohort study, the patients were admitted one by one in the abovementioned period of time to the referral hospital. 149 patients with empyema thoracis were treated at the referral center while 88 (59%) were male (mean age 42.11 ± 10.25 years) and 61 (41%) were female (mean age 39.59 ± 9.24 years). Out of 149, 130 patients (70 males and 60 females) with a mean age of 43.12 ± 6.2 years were treated nonsurgically. The cure rate was 27% (35 patients including 20 males and 15 females) and one died due to sepsis. The remaining 94 patients were left uncured and included for thoracotomy

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