

A 3- Year Review of Patients with Chronic Empyema Treated Surgically at Tikur Anbessa Specialized Referral Hospital, Addis Ababa, Ethiopia

A. Tizazu, B. Nega.

Addis Ababa University College of Health Sciences, School of Medicine, Department of Surgery, Cardiothoracic unit, Addis Ababa, Ethiopia.

Correspondence to : Berhanu N. Alemu, E-mail: b_nega@yahoo.com

Background: *Empyema thoracis is one of the main causes of morbidity and mortality in developing countries. This study was aimed at determining the causes, clinical presentation, outcomes of surgical intervention and variables associated with adverse outcomes in patients with chronic empyema treated surgically.*

Methods: *This was a cross sectional hospital based longitudinal case series analysis done at Tikur Anbessa Specialized referral hospital, Addis Ababa, Ethiopia. All patients admitted and operated for chronic Empyema over a period of three year. (April 01, 2011 - March 30, 2014) were studied.*

Results: *A total of 62 patients were operated for empyema thoracis. The Male to female ratio was 5.9:1 and mean age at presentation was 29.96+/-10.6 years. Patients presented after an average of 8.02 +/- 4.37 months from the onset of symptoms (range from 1-16 months). Shortness of breath 43(69.4%), cough 43(69.4%), chest pain 47(75.8%), fever 30(48.4%), weight loss 21(33.9%) poor appetite 9(14.5%) and haemoptysis 1(1.6%) were the leading causes of symptoms on admission. Thirty seven (59.7%) patients were previously treated for tuberculosis, 11 (17.7%) had pneumonia and 53(85.5%) of them gave history of trauma. The right {32(51.6%)} and left pleural space, {29(46.8%)} were affected with similar incidence. Only one patient was admitted with bilateral empyema. In the majority of patients, 46(74.2%), open thoracotomy with abscess drainage and decortications were done. In addition to this, either lobectomy or pneumonectomy was done for 4 (6.5%) and 7 (11.3%) patients respectively. Three patients were treated by rib resection and open drainage. The average post-operative hospital stay was 12 days (range 3 - 63days). Major complications encounter were lung laceration 15(24.2%), BPF 8(12.9), recurrent empyema 10(16.1%), and persistent air space 14(22.6%). Two (3.2%) patients died in their hospital stay. During follow up visits, 52(83.9%) patients had shown significant subjective improvement of symptoms.*

Conclusion: *In general, our experience on the outcome of open thoracotomy and decortication done for chronic empyema was excellent with low mortality and very good Functional results as majority of patients either returned to normal activities or showed significant improvement of symptoms.*

Key words: Chronic Empyema, Decortication, Bronchopleural fistula

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Introduction

Chronic pleural empyema is usually seen as the last phase of the inflammatory process occurring in parapneumonic effusion. According to Light et al¹ 1980 and Ahmet and Harrison² 1963, purulent fluid accumulates in the pleural space, and fibrin is deposited on both pleural surfaces, forming a thick peel that restricts the underlying lung. A study done on effect of decortications by Nieminen³ indicated that restriction of the lung and impairment of chest wall elasticity due to the thickened pleural layer cause thoracic asymmetry in the late phase of empyema. Hence, decortication aims to increase the lung volume by freeing the trapped lung with surgical removal of the thickened pleura. There are several reports in the literature⁵⁻⁷ about the benefits of lung decortication; focussing mostly on the improvement of lung volume, lung perfusion and diffusion capacities.

There are various surgical techniques used to treat chronic empyema. As technology and medical science develops, in the last decades the video-assisted thoracic surgery (VATS)⁸⁻⁹ has been demonstrated as an effective procedure in selected patients, allowing an optimal debridement of early organized pleural effusions. In the late phase of the pleural infectious process, when a thick pleural peel encases the lung, a pulmonary decortication is required and open approach is often needed¹⁰⁻¹¹.

Empyema thoracic is one of the main causes of morbidity and mortality in developing countries.⁴ Many epidemiological studies have also shown the increase in the prevalence of empyema and its importance of immediate diagnosis and treatment.¹²⁻¹⁶ In our context, although the role of surgery in solving chronic empyema is well demonstrated, the causes and its outcome of treatment and the causes are not well studied. Besides, most patients seek medical help in its late stage. This happens because of the delay in recognizing the infected pleural fluid and the initiation of appropriate measures to drain the pleural space. This study was there for done with main objective of assessing the outcome of surgically managed patients with chronic empyema done at Tikur Anbessa Specialized Hospital during three years period.

Patients and Methods

The study was done in the surgical department of Addis Ababa University, Ethiopia, at Tikur Anbessa Specialized Teaching Hospital. The study design is a Cross sectional hospital based longitudinal case series analysis. Source and study population for the study was all patients with empyema of the lung, seen at Tikur Anbessa Specialized Hospital during the study period. The hospital records of sixty two patients who underwent surgery for chronic empyema between April 2011 and March 2014 were reviewed retrospectively and all patients who fulfil the inclusion criteria in the study period were included in the study. Data was collected by the principal investigator and data extraction sheet was used using a pre tested questionnaire. Data was collected from the routine patient chart recording system. Based on the pre-test result the data extraction sheet was revised and edited. Data completeness and its clarity were ascertained by the investigator before data entered for analysis. Then, data entered and cleaned using SPSS version 20.0 statistical software and presented in descriptive and tabular forms. Errors related to inconsistency of data was checked and corrected during data cleaning. Different variables are cross tabulated and compared for significant differences and statistical analysis made using chi-square test and t-test. For ethical purpose, Maximum caution was taken to maintain the anonymity of the study participant. No personal identifier such as name was used in the report or data collection of this study.

Results

The total number of adult patients admitted for surgical management of empyema during the study period was sixty two, of which 53 (85.5%) was males and 9 (14.5%) females. (F: M → 1:5.9). Their mean (SD) age was 29.9 +/-10.6 years (range from 18-60 years). The most frequent age group affected was the 18-28 years age group accounting for 35 (56.5%) followed by 40-50 years in 16 (25.8%). Admission for Empyema treatment was found uncommon in those patients beyond 50 years [2(3.2%)]. Both people from urban as well as rural area were affected with similar incidence (48.4% Vs 51.6%). Right, 32(51.6%) and left side, 29(46.8%), of the chest were affected with similar incidence. Only one patient was admitted with bilateral empyema. Forty six (74.1%) patients had never smoked and 3(4.8%) were ex-smokers. Only 23(37%) patients admitted to drink alcohol regularly. The mean (SD) duration of symptoms on arrival to the OPD was 8.02 +/- 4.37 months (range from 1-16 months).The major presenting symptoms recorded were shortness of breath 43(69.4%), cough 43 (69.4%), chest pain 47 (75.8%) , fever 30(48.4%), weight loss 21(33.9%), poor appetite 9(14.5%) and haemoptysis 1(1.6%). Thirty seven (59.7%) of patients were previously treated for tuberculosis. Among them 23 (37.1%) had completed their treatment while 14(22.6%) were still on treatment while they were admitted for surgery. Twelve (19.4%) patients had reported previous history of chest trauma. In 53(85.5%) of them, trauma has happened 4-7months before, while in the rest 7(11.3%) and 2(3.2%) it occurred < 3 and >7 months respectively. In 49(79%) of patients, the cause of trauma was not properly documented. Previous history of pneumonia was reported in 11 (17.7%) of patients.

Empyema was considered the most likely diagnosis by the admitting doctor in all patients, besides the definitive diagnosis (which depends upon the demonstration of purulent fluid in the pleural space) was similarly made in all patients during surgery. Diagnosis was primarily made in all patients using chest X-ray finding. However in 29 (46.7%) of patients an additional investigation of CT-Scan or Ultrasound examination of the chest was made. In all patients neither a preoperative nor a properly documented post operative microbiological studies were done to identify the responsible pathogen. All patients took either single or a combination of antibiotics prior to admission. However, the choice of antibiotic before surgery or during the subsequent postoperative period did not follow the culture and sensitivity result.

During surgery, Empyema fluid was described as malodorous in 34 (51.6%) of patients. In all patients, both Pleural fluid as well as the pleural surface was described as 'thick'. In the majority of patients, 46(74.2%), open thoracotomy with abscess drainage and decortications were done. In addition to this, either lobectomy or pneumonectomy was done for 4 (6.5%) and 7 (11.3%) patients respectively. No patient was treated by either diagnostic aspiration and antibiotics or intercostal tube drainage alone. The majority of them, 59(95.2%), had initially treatment with intercostals tube drainage which fails to completely resolve the abscess demanding further intervention. Three patients were treated by rib resection and open drainage. The overall mean total hospital stay was 23 days (range 7-70 days). The average post operative hospital stay was 12 days (range 3 - 63days). Thirty six (58.1%) of patients has developed one or more complications during or later in subsequent days (Table 2) . Person Chi-square test was done to identify any character which will show statistical significance association with post operative complication $P < 0.05$) and found out that all characters had no significant association with it (Table 1).

Table 1. Analysis of demographics and clinical presentations and its relation to adverse outcome

Feature	Adverse Outcome			P-Value
	Yes	No	Total	
Demography				
Age (years)	—	—	29.9 +/-10.6	0.377
Sex -Male	33	20	53 (85.5)	0.104
- Female	3	6	9 (14.5)	
Duration Of illness (Month)	—	—	8.02 +/- 4.37	0.484
Total Hospital Stay(days)	—	—	23.9+/- 12.1	0.241
Post-operative stay(days)	—	—	11.8 +/- 9.7	0.401
Clinical Presentation				
Shortness of breath	25	18	43 (69.4)	0.986
Hemoptysis	0	1	1 (1.6)	0.236
Productive cough	16	8	24 (38.7)	0.275
Dry Cough	12	11	23 (37.1)	0.470
Chest Pain	27	20	47 (75.8)	0.861
Fever	21	9	30 (48.4)	0.065
Weight Loss	15	6	21 (33.9)	0.127
History of Tuberculosis	21	16	37 (59.7)	0.104
History of pneumonia	9	2	11 (17.7)	0.078
Trauma History	6	6	12(19.4)	0.528
Affected side of the chest				
Left	19	13	32(51.6)	0.656
Right	16	13	29(46.8)	
Bilateral	1	0	1 (1.6)	

Data are frequencies; Values in parenthesis are percentages, ‡ $P < 0.05$

Table 2. Descriptive statistics on the type and frequency of adverse outcome encountered following surgery

Adverse Outcome	Frequency	Percent
Bleeding	6	9.7
Lung Laceration	15	24.2
Lobectomy	4	6.3
Pneumonectomy	7	11.1
Diaphragm Injury	3	4.8
Phrenic nerve injury	1	1.6
BPF	8	12.9
Pneumonia	2	3.2
Wound infection	4	6.3
Recurrent Empyema	10	16.1
Persistent air space	14	22.6
Death	2	3.2

P.S. Patient could develop more than one complication which was also counted

The major complications encountered during surgery were, bleeding {6(9.7%)}, lung laceration {15(24.2%)}, Diaphragm injury {3(4.8%)}, phrenic nerve injury {1(1.6%)}, thoracic duct injury {1(1.6%)}. Other post-operative complications seen were BPF {8(12.9%)}, pneumonia {2(3.2%)}, wound infection {4(6.3%)}, recurrent empyema {10(16.1%)}, and persistent air space {14(22.6%)}.

Due to intra-operative complications encountered, the intended procedure of decortication was changed to either lobectomy or pneumonectomy in 4(6.3%) and 7 (11.1%) of patients respectively. Two (3.2%) patients died during their hospital stay. Age of patients who died was 46 and 54 years. They have died after 37 and 26 days of stay following surgery. Decortication with abscess drainage was done for both patients. For the 54 year old patient, additional lower lobectomy was done because of a mass was identified in the lower lobe. The possible causes of death for both patients were persistent BPF with respiratory insufficiency and sepsis. Later, biopsy taken from the lower lobe mass has identified bronchogenic carcinoma. During the subsequent months of follow up, 52(83.9%) patients had shown significant subjective improvement of symptoms, while the rest 10 (16.1%) complain of either no improvement or worsening of symptoms.

Discussion

It is generally accepted that pleural empyema should be treated early to avoid complications, extensive operations and lengthy hospital stays⁶. Unfortunately, there are some patients for whom early treatment is not possible and in whom chronic empyema will develop, mainly due to delayed diagnosis or delayed referral. At this stage, the standard treatment is open thoracotomy and decortication. Historically, other surgical procedures have been practiced, including open window thoracostomy, rib resection, thoracoplasty, Claggett's procedure and percutaneous drainage guided by ultrasound or CT.^{6, 7} With the increasing popularity of minimally invasive techniques, videothoracoscopy has been proposed for the treatment of chronic empyemas.^{2, 4, 7}

The local experience in the management of chronic empyema is not well studied. It is for these reasons that we decided to analyze our experience with open thoracotomy and decortication in the management of chronic empyema. The study is a retrospective audit of the diagnosis and treatment of chronic empyema in a sample collected over a period of three years in a central referral hospital of Ethiopia (Tikur Anbessa specialized referral hospital). The average duration of symptoms before arriving to our hospital was 8 months which reflects the significant delay in referring and in making the diagnosis by other health institutions. This is not surprising, as the patients usually present very late and the diagnostic armaments used for diagnosis of empyema are not readily available in most part of the country. Moreover, the presenting features, rather than suggesting respiratory disease, are often

nonspecific, so that other diagnoses like Tuberculosis pleurisy are frequently entertained. Our findings emphasize the need for an early X-ray examination in patients with a vague history of malaise, fever, weight loss, etc., particularly after a respiratory infection and chest trauma with unresolved haemothorax. Further delay in diagnosis and treatment could also occur in hospital because of delay in diagnosis and long waiting list for admission and intervention.

Unlike most of the studies done in western countries like A.D. Ferguson⁹ who found a mean age of patients with 54.8 years, our patients are relatively younger with the mean age of 29.9 years. This can be explained by a good proportion of our patients have developed following either tuberculosis or trauma, while those with past history of pneumonia are only 11 (17.7%).

Currently, in our hospital, diagnosis of empyema was primarily made in all patients using chest X-ray finding, although additional investigation like CT-scan and ultrasound is done in 29(46.7%) of patients. However proper microbiological studies were not properly done and antimicrobial drugs are given with empirical base. This could be one of the possible explanations for the higher incidence of complications like recurrent empyema, BPF and wound infections seen.

Almost all of the patients (95.2%) had initially been treated with intercostal tube drainage which fails to completely resolve the abscess demanding further intervention. This happens because imaging studies like CT scan and Ultrasound is not routinely done. However, different studies showed that CT scan is particularly helpful to demonstrate the chronicity of empyema by showing thick pleural cortex, locations, and size of the empyema and evidence of constriction of the thoracic cage. In addition to showing the characteristics of the empyema, chest CT allows the surgeon to locate and determine the best surgical approach, either limited or postero-lateral thoracotomy.

In the present work, it is important to note that chest intubation time averaged two weeks, and postoperative stay averaged twelve days. Fifty eight percent of patients have developed complications and there were two deaths. As compared to other similar study done by Ferguson⁴, the chest intubation time averaged four and five days, and postoperative stay averaged 10 days. Only three patients presented complications and there was no mortality. These results show longer duration of chest intubation, more postoperative days and more morbidity and mortality.

Conclusion

In conclusion, even though the study had several limitations like small number of cases reviewed, the type of study which is retrospective in nature where some of the variables could be missing, lack of comparative studies among different modality of treatment, general outcome of open thoracotomy and decortication was found to be an excellent surgical procedure with low mortality. Functional results were also good, as most patients returned to the normal activities that they performed before surgery and 83.9% of them showed significant improvement of their symptoms. Though the complications encountered during or after surgery are managed properly with little after effect, its incidence is relatively high which needs further investigation. Open thoracotomy and decortication will continue to be the standard treatment for chronic empyema, but it needs further prospective, randomized studies to compare with other modality of treatment like videothoracoscopy.

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