

ORIGINAL RESEARCH PAPER

Open thoracotomy and decortication for chronic empyema thoracis: our experience

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ABSTRACT

Introduction: Decortication for chronic empyema thoracis can be performed either by open thoracotomy or by minimally invasive procedure i.e. Video Assisted Thoracoscopic Surgery (VATS). As we don't have facility for VATS, we are treating all chronic empyema thoracis by thoracotomy. The objective of this study is to review all cases of empyema thoracic treated by open thoracotomy and decortication and analyze outcome of treatment. **Materials and method:** Records of the entire patient treated by open thoracotomy and decortication for chronic empyema thoracis over a period of three years from 2015 to 2017 were reviewed retrospectively and analyzed. **Results:** In total, 39 patients had undergone open thoracotomy and decortications for chronic empyema thoracic during this period. 37 of them had excellent recovery and return to normal activities within 4 weeks time. 2 patients had prolonged air leak and recovery period was prolonged for them. **Conclusion:** Chronic empyema thoracic can be treated by open thoracotomy and decortications with low mortality and morbidity.

Keywords: Pleural empyema; chronic pyothorax; posterolateral thoracotomy; pleurectomy.

INTRODUCTION

Empyema thoracis is defined as collection of pus in pleural cavity. According to natural history, the American Thoracic society divided empyema into three phases, (i) exudative or acute phase (ii) fibrinopurulent or transitional phase (iii) organising or chronic phase. In its chronic stage, fibroblasts grow into exudate from both visceral and parietal pleura to form an inelastic pleural peel which entraps the lung to render it virtually functionless.¹ X-ray of Chest and

Computed Tomography scan of thorax are useful tools in diagnosis of empyema.² Various surgical procedures practised to treat this condition include serial thoracentesis, chest tube drainage, intrapleural fibrinolytic therapy and decortication.³ Despite availability of various treatment options, mortality associated with empyema thoracis ranges from 1% to 19%.⁴

Decortication results in the most successful outcome for treatment of chronic empyema thoracis.² The conventional approach for surgical decortication is open thoracotomy.⁵ Decortication is also performed by minimally invasive technique called Video Assisted Thoracoscopic Surgery (VATS). Our institution does not have facility for VATS and we are performing all decortications by open thoracotomy approach only.

This paper has aimed to analyze the experience on decortications via open thoracotomy approach in chronic empyema thoracis and also to know about clinical details of the patients, per-operative findings, post operative course of the patients and outcome of the treatment.

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MATERIALS AND METHODS

Study population: All chronic empyema thoracis patients treated by open thoracotomy and decortication in Cardiothoracic surgery Unit.

Place of study: Assam Medical College & Hospital, Dibrugarh.

Type of study: Descriptive, retrospective and observational study

Study duration: Three years from January 2015 to December 2017

Inclusion criteria: (a) Age above 12 years (b) Failed treatment with antibiotic therapy, pleural aspiration and tube thoracostomy drainage, (c) All patients who fulfilled one or more of the following criteria for diagnosis of empyema i) Drainage of pus on aspiration ii) presence of bacteria in gram stain or culture of aspirate. iii) Biochemical parameters of aspirate indicating empyema (pH <7.2, Lactate Dehydrogenase >1,000 IU/L, glucose level <40 mg/dl). (d) All patients who were symptomatic for more than six weeks before surgery. (d) All patients who had preoperative chest x-ray and computed tomography (CT) scan of thorax performed to confirm the presence of a thickened visceral pleura or a shrunken hemithorax or multiloculated empyema. (e) All patients in whom intrabronchial obstructive pathology was ruled out by bronchoscopy.

Exclusion criteria: Patients with destroyed lung, malignancy, diagnosed bronchopleural fistulas or previous thoracic surgery

Ethical clearance: Ethical clearance obtained from the Institutional Ethics Committee of Assam Medical College & Hospital.

Records of all patients were reviewed to gather information regarding gender, age, symptoms and its duration, signs, side of the hemi thorax involved, aetiology, haemoglobin, leukocyte count, type of pleural aspirate, results of smear examination of the pleural fluid, culture of pleural fluid, biochemical parameters of the pleural fluid, medical and surgical treatment offered before decortication, co-morbidities, duration of operation, length of post operative thoracostomy tube drainage, length of hospital stay, post operative course in hospital, morbidity, mortality, and patients status at follow up in the outpatient clinic. Follow up records were reviewed to know any residual signs and symptoms of empyema, about time required to return to normal physical activities after surgery and findings of check chest X-Rays.

Thoracotomy was performed through posterolateral incision. Purulent materials and debris were completely evacuated. Though complete excision of visceral pleura was attempted in all patients, isolated area of visceral pleura fused inseparably to underlying lung was left behind to avoid

injury to the lung. Parietal pleura was removed partially only. Diaphragm was separated from the lung in all patients. At the end of the procedure, thoracotomy was closed with an apical and a basal thoracostomy tubes in presence of air leak from lung and with only one basal thoracostomy tube in absence of air leak. During post operative period, appropriate antibiotics and adequate analgesia was administered in all patients. Vigorous respiratory physiotherapy was encouraged in each patient. Thoracostomy tubes were removed after cessation of air leak and reduction of drainage to less than 50 ml during the preceding 24 hours. Patients were followed up in the outpatient clinic after discharge.

RESULT

In this study, total 40 patients underwent open thoracotomy and decortication for chronic empyema thoracis. However, malignant mesothelioma was confirmed in one patient after surgery and was excluded. Of the remaining 39 patients 31(79.49%) were male and 8(20.51%) were female. Their age ranges from 13 to 70 years (average age being 34.67 years).

Their common presenting symptoms were cough in 31(79.49%), fever in 27(69.23%), chest pain in 27(69.23%), and dyspnea in 21(53.85%) patients. They were symptomatic for more than six weeks, average duration being 56.69 days (range 45 days to 95 days). Clinical signs of chronic empyema i.e. contraction of hemithorax and narrowed intercostals spaces, were present in all patients. Empyema was on right side in 22(56.41%) and left side in 17 (43.59%) patients.

The etiology of chronic empyema was pneumonia in 29(74.36%), trauma in 8(20.51%), ruptured hydatid cyst in 1(2.56%) and osteomyelitis of rib in 1(2.56%) patients. Out of 39 patients with pneumonia, 7(17.95%) were undergoing treatment for tuberculosis.

The average haemoglobin of these patients was 10.2 gms/dl. 22(56.4%) patients had leukocytosis which becomes normal after decortication.

Frank pus was aspirated in 10(25.64%) patients and Gram stain was positive in 9(23.08%) patients. Bacterial culture of pleural fluid was positive in 13(33.33%) patients.

Lactate dehydrogenase was elevated and was more than 1000 IU/L in all of them.

All patients received antibiotics before decortication. Diagnostic tapping was done in all, thoracostomy tube drainage was performed in 33(84.62%) and rib resection and open drainage was performed in 3(7.69%) patients.

Co-morbidities noted were diabetes mellitus in three (7.69%), chronic airways obstructive disease in two (5.13%) and hypertension in 5(12.82) patients.

Chest X ray and Computed Tomography (CT) scan of thorax

demonstrated presence of narrowed intercostal spaces, thickened pleura, and contraction of affected hemithorax (**Figure 1**, **Figure 2** and **Figure 3**). Multiloculated collection was detected in 10(25.64%) patients.

Per-operative findings noted were narrowed intercostal space, thickened visceral and parietal pleura, shifting of mediastinum to the affected side and elevation of diaphragm in all patients. Empyema cavity contained pus 10(25.64%) patients and organized debris in rest. Multiloculation was detected in 10(25.64%) patients. Underlying lung was trapped, collapsed and consolidated in all patients. Pleural calcification was noted in 15 (38.46%) patients.

During thoracotomy resection of one rib in 5 and two ribs in 6 patients were required to overcome severe ribs crowding. Single basal thoracostomy tube was placed in 8(20.51%) and both apical and basal thoracostomy tubes were placed in remaining 31(79.49%) patients.

Average time required for decortications was 122 min (range from 70 to 210 min). 37 (94.87%) patients were discharged without any complications. The average days required for removal of their apical thoracostomy tube was 3 days (range from 2 to 9 days) and same for basal drainage was 6 days (4 to 16 days). Average hospital stay for these patients was 11 days. Chest x-ray done before discharge of these patients showed a well-expanded lung and a partially obliterated costophrenic sulcus (**Figure 4**). They were symptom free and returned to regular activities within



Figure 2 CT Scan of Thorax of Chronic Empyema Thoracis



Figure 3 CT Scan of Thorax of Chronic Empyema Thoracis

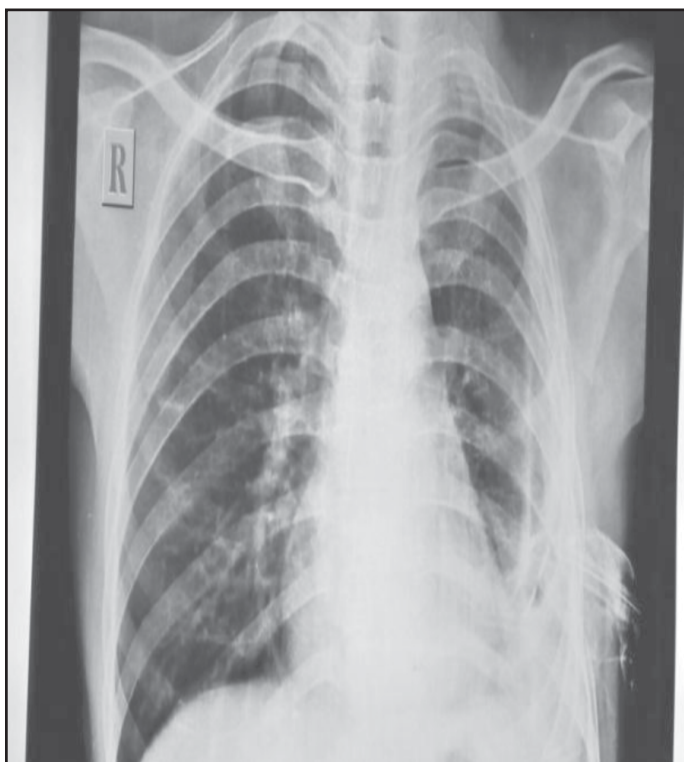


Figure 1 PA View of Chest of Chronic Empyema Thoracis

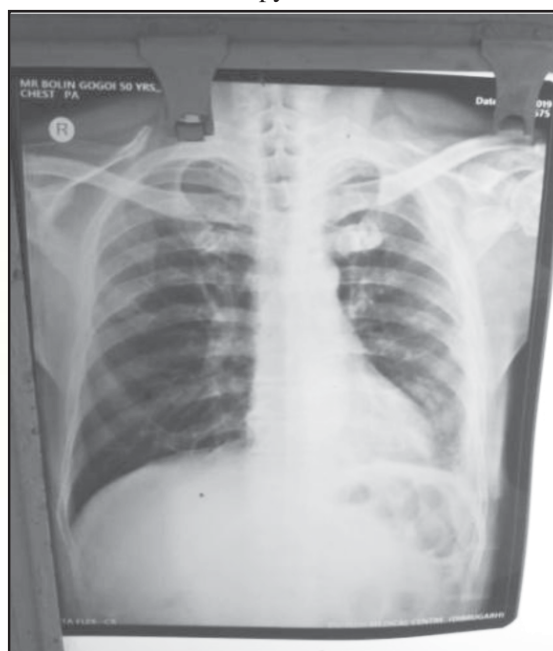


Figure 4 Chest X-ray Before Discharge.

4 weeks after decortication. Followed up chest X-ray did not reveal any residual collection or recurrence.

Only Two (5.13%) patients receiving anti-tubercular chemotherapy had prolonged air leak and drainage. However these complications resolved well with adequate treatment. The average days required for removal of their apical and basal tubes were delayed and their average hospital stay was 26 days. On average they required 9 weeks to return to normal physical activities. There was no mortality in this study.

The follow-up period for patients ranged from 3 to 12 months. No patient had recurrence of empyema during follow up period.

DISCUSSION

Chronic phase of empyema thoracis begins after 7 to 10 days of onset of disease and is completed by 4 to 6 six weeks.⁶ All patients included in this series were symptomatic for more than six weeks. Most practitioners prefer to perform decortication for this stage through open thoracotomy approach.⁷

The surgical procedure of decortication consists of removal of fibrous pleura along with pus and debris from empyema cavity. This results in elimination of pleural sepsis and allows re-expansion of underlying collapsed lung.

Empyema thoracis patients usually present with symptoms of fever, chest pain, dyspnea, and cough with or without evidence of systemic toxicity.⁸ The commonest etiology of empyema is pneumonia which may be caused by bacterial, tubercular, viral and mycotic infection.⁶ In a review of empyema that involved 14 studies and total of 1383 patients, 70% of patients were found to have pleural infection secondary to pneumonia.⁹ Other causes enumerated for empyema are trauma, lung abscess, as a complication of thoracic surgery, extension of subphrenic abscess, as a complication of pneumothorax, foreign bodies in the bronchial tree, spontaneous rupture of esophagus and generalized sepsis.⁶ Pneumonia was the predominant etiology in our series, of which 7 were due to tuberculosis. Another cause of empyema in our study was due to extension of infection from osteomyelitis of rib. Sometime undiagnosed malignancy is also be detected after decortications.¹⁰ In our study a malignant mesothelioma was diagnosed after decortication and was excluded from the study.

Analysis of biochemical parameters of pleural fluid is required for confirmation of empyema.¹¹ In this study Frank pus was aspirated in 10(25.64%), gram's stain was positive in 9(23.77%) and bacterial culture was positive only in 13(33.33%) patients. Pre-operative use of antibiotics may be a cause of failure to culture organisms from the empyema fluid and detect microorganism in Gram stains.^{2,12}

Lactic dehydrogenase was elevated in all patients. A study has established that the level of lactic dehydrogenases increases with increase of the duration of empyema.¹³

Chest x-ray and CT scan of thorax performed before decortications give valuable information regarding underlying pathology. These radiological investigations help in detection of loculations, thickened pleura, size of the empyema, evidence of constriction of the thoracic cage underlying lung disease like abscess and tumour². We routinely performed bronchoscopy in all patients. This helps to rule out presence of any endobronchial lesion which may prevent re-expansion of lung after decortication.¹⁴

In a chronic empyema thoracis, affected hemithorax is contracted, intercostal spaces are narrowed, mediastinum is shifted to the affected side, and diaphragm is elevated.¹⁵ These findings were noted in all our patients on clinical examination, in radiological evaluation and during decortication. In 11(28.21%) patients, we had to resect one or more ribs during surgery because of presence of severe crowding of ribs.

During decortication, attempts were made to excise complete layer of visceral pleura while parietal pleura were only partially excised. Parietal pleurectomy increases operative time and blood loss during surgery and hence many authors discourage it.¹⁶

Post-operative recovery of 37 (94.87%) patients was uneventful. Average time required for decortications (122 min), average duration of thoracostomy tube drainage (3 days for apical thoracostomy tube and 6 days for basal thoracostomy tube, average duration of hospital stays (11 days), average weeks required to return to normal physical activities (4 weeks) and morbidity for them were almost similar to decortication performed by other authors.^{5,14} Normalization of white blood cell count was observed in all patients after decortications. They became symptoms free after surgery and their follow up chest X-ray demonstrated well expanded lung. There was no recurrence of empyema. The reported success rate of decortication is 87%–100% and mortality rate ranges from 0% to 9%.^{12,17,18} Success rate of our series was 94.87% and mortality rate of our series was 0%.

Cause of this satisfactory outcome may be attributed to proper radiological evaluation before surgery, exclusion of patients with previous thoracic surgery, destroyed lung, or bronchopleural fistula, and regular post-operative vigorous respiratory physiotherapy. Moreover, we did not combine decortication with any pulmonary resection in this study. Similar result was also reported in another prospective study.¹⁴

Video-assisted thoracoscopic surgery (VATS) has been found to be a valuable tool for thoracic surgeons and it has been proposed for treatment of chronic empyema thoracis.¹⁹

However one study found that empyema of more than 3 weeks duration with enhanced thickened pleura and evidence of restriction on CT scan of thorax is inaccessible to VATS approach.²⁰

Another study demonstrated that the probability conversion of VATS to open thoracotomy increased manifold if it was performed between after 30 days of onset of symptoms.²¹ All patients included in our study were symptomatic for more than six weeks, all had pleural thickening and narrowed intercostals space. Even if VATS was available, probability of conversion to open thoracotomy was high in these patients.

CONCLUSION

The commonest cause of chronic empyema thoracis is pneumonia. Decortication is the treatment of choice in chronic stage. Mortality and morbidity associated with the procedure is low and can be recommended for chronic phase of the disease.

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