Thoracotomy and decortication in empyema: Clinical spectrum and outcome

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ABSTRACT

INTRODUCTION: Pus in pleural cavity is empyema thoracis which may be loculated or free flowing. More than half of cases result from extension of parenchymal infection to pleura. When pus is organized or associated with fibrothorax decortication is required which can be achieved either by thoracoscopic or thoracotomy and decortication to ensure lung expansion and control of pleural sepsis. The objective of this study is to find out the clinical profile of patients with empyema and outcome of thoracotomy and decortication.

METHODS: Medical records of forty-seven patients who underwent thoracotomy and decortication in Cardiothoracic and vascular surgery unit of NAMS, Kathmandu, Nepal from April 2011 to May 2013 were studied. Analysis of data regarding age, sex, signs/symptoms and their duration until definitive surgery, comorbid conditions, etiology of empyema, imaging study findings, cultures of pleural fluids, procedures performed before definitive surgery, postoperative stay in the hospital, morbidity and mortality was done.

RESULTS: Most of the patients were of young age group and male were predominant (81.5%). The commonest cause of empyema was pneumonia (74.46%). Tubercular empyema was uncommon. Interestingly two cases of empyema were found with underlying mesothelioma and another two due to ruptured hydatid cyst. Failure of tube drain due to multiloculated empyema and thickened visceral pleura were indications of surgery in 89.5%. Pleural fluid culture was positive only in 12.76%. Chest tube was removed on 6th post-operative day. Average post-operative hospital stay was 8 days.

CONCLUSION: Results of thoracotomy and decortication in chronic empyema is encouraging enough to opt for decortication in cases where medical and more conservative surgical techniques fail.

KEY WORDS: empyema, thoracotomy, decortication,

INTRODUCTION

An empyema thoracis is a collection of pus in pleural space which may be free-flowing or loculated. An initial sterile exudation (simple parapneumonic effusion) in some cases may progress to complicated parapneumonic effusion & eventually empyema. More than half of cases result from direct extension of a parenchymal infection to pleural spaces, post-surgical infection and penetrating or blunt trauma each account about 20 %. Sometimes bacteria from abdominal infection, such as a subdiaphragmatic abscess, cross the diaphragm and enter the pleural space. Rarely empyema results following thoracocentesis or pleural biopsy.

The common presenting symptoms of empyema are usually non-specific- dyspnea, fever, cough or chest pain. However, some patients with empyema present with only constitutional complaints, such as weight loss, fatigue, and malaise. Evidence of fluid in the pleural space is the principal radiographic finding; most empyema patients also have a recognizable parenchymal infiltrate.
Different surgical treatment modalities are used to manage chronic empyema- open thoracotomy or video-assisted thoracoscopy and decortication when medical and conservative surgical techniques (eg. tube thoracostomy) have not resulted in clearance of pleural sepsis and lung fails to expand. In the present time video-assisted thoracoscopic surgery (VATS) is considered as an effective procedure in the early stages of empyema thoracis. From the mid-1990s thorascoscopic evacuation of empyema sac has gained popularity and success rate of 68% to 93% have been reported. However, in the late stages of empyema is usually induced. Decor

Due to late presentation of patient usually in organized stage VATS may not be feasible. Hence thoracotomy and decortications might be the only surgical modality left. Decortication is a surgical procedure that removes a restrictive layer of fibrous tissue overlying the lung, chest wall, and diaphragm along with its encysted effusion or empyema sac. The aims of decortication are to remove this layer and allow the lung to re-expand and control pleural sepsis. When the peel is removed, compliance of the chest wall and lungs returns and patient symptoms improve rapidly. Tuberculous empyema is usually first treated with antitubercular drugs and decortication is only undertaken after long-term drug therapy fails if required.

Delorme, the great pioneer of chest surgery, was probably the first to perform a true decortication, in 1895 and after the First World War, the value of decortication for pyogenic diseases became firmly established. Decortication of the lung for clotted hemothorax was reported first by Burford in 1943.

There are no absolute contraindications other than physiological fitness of the patient. Presence of pleural space infection and large airway stenosis may make decortications futile. Other relative contraindications include coagulopathy, severe chest wall infection and terminal disease. Good-quality data is lacking to decide the optimum timing of surgery but it has been shown that early decortications yielded good functional outcomes. If pleural infection is controlled, decortication is not required for thickened pleura only because this type of thickening usually resolves spontaneously over several months.

Decortication in general has an excellent outcome in young people. The morbidity and mortality after a decortication is dependent on the patient age, underlying comorbidities, complications from the surgery and post-operative chest physiotherapy. Postoperative complications include bleeding and air leaks, formation of bronchopleural fistula, damage to phrenic nerve or diaphragm, hemothorax and reemergence of pus, peel and entrapment.

We aimed to review the medical records of patient who underwent thoracotomy and decortications for empyema thoracis over a 26-month period at Cardiothoracic and Vascular unit of the National Academy of Medical Science, Kathmandu to find out the clinical profile of patients with empyema and outcome of thoracotomy and decortication.

METHODS

This is a descriptive, retrospective and observational study. Medical records of patients who underwent thoracotomy and decortication for empyema thoracis in the Cardiothoracic and Vascular surgery (CTVS) Unit between April 2011 and May 2013 were reviewed. The information obtained from the records included sex, age, signs/symptoms and their duration until definitive surgery, comorbid conditions, etiology of empyema, imaging study findings, cultures of pleural fluids, procedures performed before definitive surgery, postoperative days in the hospital, morbidity, mortality and follow-up.

Diagnosis of empyema was confirmed by one of the following criteria:

- drainage of grossly purulent pleural fluid,
- pleural fluid culture or Gram stain positive for bacteria
- biochemical parameters of empyema (pH < 7.2, lactate dehydrogenase level > 1,000 IU/L, glucose level < 40 mg/dl.).

CT chest was done to describe the location of fluid and anatomy of pleural space.
The surgical approach was posterolateral thoracotomy through the bed of 5th or 6th rib using double lumen endotracheal tube. After entering the pleural cavity, all purulent materials were evacuated and overlying cortical peel was removed from costal, diaphragmatic and visceral surfaces. Two drainage tubes were placed and wound closed after securing hemostasis. Previously kept chest tube for drainage was removed, debridement of the tract done and sutured. Patients were extubated in the operating room and sent to the CTVS intensive care unit for postoperative management. Patients were managed in the intensive care unit till they require oxygen or vasopressors support. Active chest physiotherapy was encouraged along with incentive spirometry from second postoperative day.

All patients routinely received antibiotics covering both aerobes and anaerobes. Chest tubes were removed when there was no air leakage and drainage was less than 50 to 100 ml per day. Patients with tuberculosis continued their anti-tubercular drugs. Reports of pus culture and histopathological diagnosis of surgical specimen were recorded. Follow up with chest X-ray was arranged in OPD at 2 and 6 weeks after discharge.

RESULTS

Forty-seven patients diagnosed with empyema were treated by thoracotomy and decortication in 26 months period. Forty patients (85.10%) were male and seven (14.89%) were female. The average age of the patients was 30 years (range 4 to 66 years). The cause of empyema was pneumonia in 35 (74.46%), tuberculosis in three (6.38%), pyopneumothorax in two (4.25%) and one case of trauma and bronchiectasis each. Two patients (4.25%) were found to have ruptured hydatid cyst in the pleural cavity. Histopathological examination of surgical specimen revealed mesothelioma in 2 patients (4.25%), and adenocarcinoma in one (2.12%). Multiloculated empyema was documented in forty patients (85.10%). Four patients (8.51%) were referred from Patan Hospital and two (4.25%) from Kanti Children Hospital. Two patients had diabetes mellitus (4.25%), one patient was hypertensive and the other one had bronchiectasis. The most common indication for surgery (89.95%) were multi-loculated empyema and thickened visceral pleura with failure of tube drain followed by bronchopleural fistula (10.86%) not better even after 2 weeks.

<table>
<thead>
<tr>
<th>Table 1: Causes of Empyema</th>
<th>No of patients in %</th>
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<tbody>
<tr>
<td>Causes</td>
<td></td>
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<tr>
<td>Post-pneumonic</td>
<td>74.46</td>
</tr>
<tr>
<td>Post tubercular</td>
<td>6.38</td>
</tr>
<tr>
<td>Malignancy</td>
<td>6.38</td>
</tr>
<tr>
<td>Pyopneumothorax</td>
<td>4.25</td>
</tr>
<tr>
<td>Ruptured hydatid cyst</td>
<td>4.25</td>
</tr>
<tr>
<td>Bronchiectasis</td>
<td>2.12</td>
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<tr>
<td>Post- traumatic</td>
<td>2.12</td>
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Analysis of presenting symptoms revealed that fever was present (>38.2°C) in 42 (91.3%) patients, chest pain in 43 (93.47%), dyspnea in 34 (73.91%) and hemothysis in 9 (19.56%). All patients were treated with antibiotics for a variable period before being admitted to our unit. The commonest antibiotic was ceftriaxone (54%) followed by piperacillin-tazobactam (26%) and all patients got metronidazole. Three patients (6.38%) were on ATT for more than 8 weeks.

All patients had chest tube inserted for variable period (range 2-4 weeks). Pleural fluid was routinely cultured but bacterial growth was found in 6 patients (12.76%) only. Streptococcus pneumonia was isolated in two patients (4.25%) whereas Klebsiella pneumonia, Pseudomonas aeruginosa, Staphylococcus aureus and S. epidermidis one each.

The first chest tube was removed on third post-operative day (range 1 to 3 days) and the second on sixth post-operative day (range 4 to 29 days). Forty patients (85.10%) did not have complications. Four patients (8.51%) required post-operative negative suction for fluid drainage and two patients (4.25%) had air-leak from the tube for more than two weeks requiring the tube drainage for 4 weeks but required no other intervention. One patient with diabetes developed acute renal failure post-operatively and required hemodialysis for 3 months before his renal function recovered completely. Repeat thoracotomy and decortications required in one young girl because of persistent drainage of fluid in excess of 300 ml and lung not expanding completely even after 2 weeks. Left pneumonectomy was done in a patient with bronchiectasis who had distorted and fibrotic lung which failed to inflate with intraoperative positive pressure ventilation. Wound was infected in 4 (8.51%) patients requiring secondary suture. Ten patients (21.27%) required ionotropic support (dopamine) up to 48 hours. The average postoperative stay was 8 days (range 6 to 36 days).

### Table 2: Post-operative complications

<table>
<thead>
<tr>
<th>Complications</th>
<th>No of cases in percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wound infection</td>
<td>8.51</td>
</tr>
<tr>
<td>Air leak</td>
<td>4.25</td>
</tr>
<tr>
<td>Acute renal failure</td>
<td>2.12</td>
</tr>
<tr>
<td>Persistent drainage</td>
<td>2.12</td>
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</table>

All patients achieved full expansion of lung radiologically and could return to normal activities.

### DISCUSSION

An empyema represents the end stage of a complicated parapneumonic effusion. Though parapneumonic effusion occurs in 20-40% of patients hospitalized with bacterial pneumonia, only a small percentage (10 to 15%) have complicated effusions, and empyema develops in only 5 to 10%.12 Decortication by thoracoscopy or thoracotomy is necessary in patients with established empyema for the removal of all fibrous tissue from the visceral pleura and parietal pleura to ensure lung expansion and clearing pus and debris from the pleural space.13 Video-assisted thoracoscopic surgery (VATS) has been treatment of choice for empyema especially in fibrinoproliferative stage. The duration of chest tube drainage and hospitalization are shorter, less painful and better cosmetic results have been reported with VATS.14,15 Most of the patients presenting late in organized stage where VATS becomes difficult. In patients who are too debilitated to undergo surgery, open drainage is an option.14 Use of fibrinolytic agents is controversial and clearly depends on the stage of the parapneumonic effusions. In the early fibrinolytic stage, fibrinolitics may shorten the clinical course. In established empyemas, the Multicenter Intrapleural Streptokinase trial showed that streptokinase was of no benefit in decreasing the rate of mortality, length of hospital stay and need for surgery.17

The commonest cause of empyema in this study was post-pneumonia (74.6%) but post-tubercular was lower (6.38%) which is comparable with other studies.10,13 Though tuberculous pleuritis is common, it is rarely complicated by fibrothorax. The other reason could be due to recommendation of surgical intervention only after at least 2 months of antitubercular drugs.3,5,4 There are a few case reports of malignant mesothelioma complicated by empyema- one of them was associated with tubercular pleuritis.18,19 The cause of empyema in two of our patients with mesothelioma and one with adenocarcinoma could be due to thoracocentesis. Out of two cases of ruptured hydatid cyst one had solitary cyst localized in right chest wall but the other patient had cysts in right lung, liver and right ovary. Following cystectomy and clearing pleural space the latter was referred to general surgery after 8 post-operative days. Review of literatures revealed that lungs are the second most commonly involved organs (20-30%), the first being liver (60%). Cysts can involve chest wall or...
lungs were found in only 13% cases. Pre and post operative spirometry would have been better parameters for outcome of procedures rather than radiology and clinical parameters.

Nonfatal postoperative complications were comparable with other studies. 2,5

There are a few limitations of the study. The number of cases was relatively small. Being a retrospective study it was not possible to find the mean duration of disease before definitive treatment. Biochemical parameters of pleural fluid such as pH, glucose and LDH were found in only 13% cases. Pre and post operative spirometry would have been better parameters for outcome of procedures rather than radiology and clinical parameters.

CONCLUSION

The commonest cause of chronic empyema was pneumonia. Thoracotomy and decortication yielded very good result with only minor complications. The results of this study were encouraging enough to opt for decortication in cases where medical and more conservative surgical techniques fail.

REFERENCES