Institutional review - Pulmonary

Non-surgical treatment for post pneumonectomy empyema

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Abstract

We describe an alternative treatment for postpneumonectomy empyema in patients for which Claggett procedure is inappropriate. During the years 1990–2002 eight patients with postpneumonectomy empyema were treated by continuous soft tube thoracostomy, intrapleural fibrinolysis and antibiotics. The medical records of these patients were reviewed retrospectively. The procedure was well tolerated by all patients and there were no significant complications during the treatment period. One patient died 9 months postpneumonectomy due to metastatic disease. The remaining patients have successfully completed the treatment with no recurrence of empyema. Continuous soft tube drainage with intrapleural fibrinolysis and antibiotics is a safe treatment for postpneumonectomy empyema in patients who are not appropriate candidates for operative management.

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1. Introduction

Empyema is one of the more serious complications following pneumonectomy with a reported incidence of 2–13\% [1,2]. Bronchopleural fistula (BPF) is identified in over 40\% of patients [3]. The traditional management of postpneumonectomy empyema (PPE) includes closed tube drainage followed by open thoracostomy [4,5]. Closure of the bronchial stump and obliteration of the residual space are usually performed later and require complicated surgical procedures. This kind of treatment is not suitable for all patients. In this paper we report our experience with conservative, non-operative treatment of PPE in a subgroup of patients, who, for various reasons could not undergo a modified Claggett procedure.

2. Materials and methods

The medical records of eight patients with early PPE who were treated non-operatively were reviewed retrospectively. Upon admission a 28F Foley catheter was placed in the 6–8th intercostal space in the posterior axillary line under local anesthesia. Once in the pleural space the balloon was inflated with 5 ml of contrast material and the drain was attached to a standard urine collection bag. Patients with BPF were connected to an unsealed bag through a Heimlich valve. A chest X-ray was obtained at the end of the procedure. The following day the patient received intrapleural Streptokinase; 1.5 million I/U in 150 ml normal saline on the first day and 250,000 I/U during the next 3–5 days after which the Foley catheter was clamped for 4 h. Patients with bronchopleural fistula underwent this procedure in a lateral decubitus position (empyema side down) or in a sitting position. Upon completion of the fibrinolytic treatment, for the next 7 days, intrapleural irrigation was performed using a 150 ml solution of povidone iodine in normal saline at a concentration of 1:100, three times twice a day. Following each irrigation session an antibiotic solution (Vancomycin 1 g or Amikacin 0.5 g in 150 ml NS guided by culture and Gram stain) was instilled and the catheter was clamped for 1 h. Wide spectrum intravenous antibiotic was administered upon admission after blood and pleural fluid were sampled. Treatment was modified according to the microbiology results. Treatment protocol was repeated in cases of recurrent infection. All patients were followed clinically and radiographically on an outpatient basis (Fig. 1). The tube was replaced monthly and then removed only when complete or near complete
pleural space obliteration was observed by chest X-ray and fluid was sterile.

3. Results

All patients were males with an average age of 69 years (range 45–82). Five patients had right and three had left pneumonectomy. Six patients had lung cancer, one patient had severe hemoptysis due to massive unilateral bronchiectasis, and one patient had multiple gunshot wounds and shrapnel. Four cancer patients were stage II and two patients were stage IIIB (post-induction chemotherapy). Patients presented to the emergency room with fever, dyspnea and general deterioration 14–21 days following pneumonectomy. Diagnosis was confirmed by chest radiograph, computed tomography (CT) scan of the chest and needle aspiration of fluid from the post pneumonectomy space. Three patients had bronchopleural fistula diagnosed clinically at presentation and confirmed by the CT scan and bronchoscopy. Intercostal tube drainage took an average time of 20 ± 10 min including a post procedure chest film. No significant mediastinal shift was noted on the chest X-ray and there was no case of respiratory demise following the drainage procedure.

Pleural cultures were positive in all eight patients. Table 1 depicts the results of microbiology studies. Three patients had methicillin resistant Staphylococcus aureus (MRSA), two had mixed infection with gram positive and gram negative aerobic and anaerobic bacteria, one had beta hemolytic Streptococcus group A and two had Pseudomonas infection. Four patients had positive blood cultures upon admission. One patient with mixed infection had a multi-resistant Acinetobacter. Approximately 1 week following drainage, intra pleural fibrinolysis and combined intravenous and intrapleural antibiotic treatment, pleural fluid was sterile in six patients. There was neither fever nor significant dyspnea at the end of the first week and all patients were discharged from the hospital by the end of the second week (range 7–14 days). During the following weeks all patients had intermittent contamination of the pleural fluid usually asymptomatic. There were four admissions due to clinically significant infection. Treatment included replacement of the catheter and combined treatment protocol as described in Table 2. The catheter was not removed before complete obliteration of the pleural space (Fig. 2). The average length of drainage was 11 months (range 3–16 month). Patients with bronchopleural fistula required slightly longer drainage period. One patient with bronchopleural fistula died due to brain metastasis before drain removal.

4. Discussion

The second most frequent cause of empyema is postsurgical infection of the pleural space. Postoperative empyema accounts for approximately 20% of all cases of empyema [1]. The incidence of infected pleural space is 1–3% following lobectomy and 2–13% after pneumonectomy [2]. Although empyema may occur at any time after the operation, most empyemas develop early in the postoperative period [1,2]. The pleural space could be contaminated during the operation or by the development of bronchopleural fistula. Late postoperative empyema may be the result of blood-borne infection [1,3]. PPE is considered the most problematic among postoperative pleural infections and is associated with very high morbidity, and a mortality rate of 13–50% [3]. The majority of these patients are incapacitated and have recently experienced an

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Table 1

<table>
<thead>
<tr>
<th>Number of patients</th>
<th>Gram stain</th>
<th>Pleural cultures (admission)</th>
<th>Blood cultures (admission)</th>
<th>Pleural cultures (1st week)</th>
<th>Infection rebounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Gram positive cocci</td>
<td>MRSA</td>
<td></td>
<td>MRSA</td>
<td>Sterile</td>
</tr>
<tr>
<td>2</td>
<td>Mixed</td>
<td>Mixed</td>
<td></td>
<td>1-bacteroides</td>
<td>1 positive</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1-sterile</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gram negative rods</td>
<td>Pseudomonas</td>
<td></td>
<td>Sterile</td>
<td>Sterile</td>
</tr>
<tr>
<td>1</td>
<td>Gram positive cocci</td>
<td>Streptococcus group A</td>
<td></td>
<td>Streptococcus group A</td>
<td>Sterile</td>
</tr>
</tbody>
</table>

* MRSA, methicillin resistant Staphylococcus aureus.
extensive operative procedure. Bronchopleural fistula is discovered in approximately 40% of the patients and resolves spontaneously only in 20% [1]. Once the diagnosis of postoperative empyema is made, immediate tube thoracostomy drainage and institution of appropriate intravenous antibiotic therapy are the initial crucial steps of the treatment. When the patient is stabilized and an adequate drainage has been accomplished the course of the definitive treatment is usually determined. Traditionally, PPE patients are divided into groups by the association of bronchopleural fistula and by their overall medical condition. If no fistula is present an original or a modified Clagett’s procedure is considered an appropriate treatment option [1,6,7]. The failure rates are 25–80% [1,8]. Surgical closure of the bronchial fistula and obliteration of the residual space, using muscular and omental flaps, are usually suitable for stable patients with bronchopleural fistula [9,10]. Using these methods Pairolero and colleagues had a success rate of 84% and a mortality rate of 13%, but needed a mean of five (up to 19) operative interventions until definitive closure was achieved [5].

Not all patients, however, can withstand repeated surgical procedures. Moreover certain physical limitations such as state post omentectomy or severe chest wall injury render these procedures impractical.

Few reports describe non-operative tube drainage as a definitive treatment option. Kachel et al. and Kuoba and his colleagues reported a successful treatment of post pneumonectomy MRSA empyema using tube drainage and irrigation of the pleural space with Vancomycin [6,7]. In both cases early tube removal was possible and there were no recurrent infections. This modification of Claggett’s procedure is suitable for some patients but the reported failure rate is as high as 80% as described by Joseph et al. [1]. In our experience, early removal of the tube is associated with a high incidence of recurrent sepsis. As an alternative we have developed a novel treatment approach for this problematic complication. The fundamental components of this treatment protocol are:

1. Early drainage using a large soft tube (Foley 28F).
2. Intra-pleural fibrinolytic treatment to dissolve and debride infected loculations.
3. Combined intra-venous and intra pleural antibiotic treatment in order to accomplish at least temporary sterilization of the pleural space and initiate a normal healing process.
4. Careful follow-up on an outpatient basis with an adequate general, mental and nutritional support.

Patients treated by this protocol (Table 2) were able to recover quickly and proceed with their daily routine life within a few weeks. Both patients and their families accepted and tolerated the treatment fairly well. In most cases, after a few weeks and with appropriate training, a family member was able to properly perform the daily treatment including tube irrigation. At the end of treatment the tube was removed and patients had no permanent disability related to the empyema or to the treatment. As compared to traditional management this treatment protocol is simple and cost-saving. It’s main disadvantage is the extended period of tube drainage. This drawback is overcome partially by the construction of a simple, convenient and reliable pleural stoma (28F Foley catheter connected to a urine collection bag) which is not painful and has a very low incidence of tube dislocation or failure.

We have no doubt that the Clagget and Geraci procedure and it’s modifications are and will continue to be the management of choice for most patients with PPE. In this paper we describe an alternative treatment, both simple and effective, for postpneumonectomy empyema. This method is appropriate for a small but significant sub-group of patients who can not undergo a Clagget procedure.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Eight patients were treated by this protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (days) Streptokinase IU</td>
<td>Intra-pleural antibiotic</td>
</tr>
<tr>
<td>1</td>
<td>15,000,000</td>
</tr>
<tr>
<td>2</td>
<td>250,000</td>
</tr>
<tr>
<td>3</td>
<td>250,000</td>
</tr>
<tr>
<td>4</td>
<td>250,000</td>
</tr>
<tr>
<td>5</td>
<td>250,000</td>
</tr>
<tr>
<td>6</td>
<td>–</td>
</tr>
<tr>
<td>7</td>
<td>–</td>
</tr>
<tr>
<td>7–14</td>
<td>–</td>
</tr>
<tr>
<td>14–follow-up</td>
<td>–</td>
</tr>
</tbody>
</table>

Upon admission soft tube was inserted into the pleural space and was open for drainage until the next morning. Combined intra-venous and intra pleural antibiotics (vancomycin and amikacin guided by the Gram stain) were administrated during the first week. Streptokinase was used during the first 3–5 days. During the follow-up period irrigation were performed twice daily.

![Fig. 2. Chest X-ray showing complete obliteration of the postpneumonectomy space. Same patient as in Fig. 1.](https://academic.oup.com/icvts/article-abstract/2/4/616/707193)
References


