Empyema thoracis: a role for open thoracotomy and decortication


Abstract

Background—Thoracentesis and antibiotics remain the cornerstones of treatment for stage I empyema. The management of disease progression or late presentation is controversial. Open thoracotomy and decortication is perceived to be synonymous with protracted recovery and prolonged hospitalisation. Advocates of thoracoscopic adhesiolysis cite earlier chest drain removal and hospital discharge. This paper challenges traditional prejudice towards open surgery.

Methods—A five year audit of empyema cases referred to a regional cardiothoracic surgical unit analysing previous clinical course, surgical management, and outcome.

Results—Between February 1992 and February 1997, the number of referrals to this centre increased dramatically. Twenty two children were referred for surgery (15 boys, seven girls; age range, 0.5–16 years). Before referral, patients had been unwell for 6–50 days (median, 15), had been treated with several antibiotics, and had undergone chest ultrasound (15 patients), computed tomography (five patients), pleural aspiration attempts (13 patients), and intercostal drainage (seven patients). The organism responsible was identified in only two cases (Streptococcus pneumoniae). Three patients had intraparenchymal abscess formation. Eighteen patients underwent open thoracotomy and decortication. Drain removal was performed on the first or second day. Fever resolved within 48 hours. Median hospital stay was four days. All patients had complete clinical and radiological resolution.

Conclusions—Treatment must be tailored to the disease stage. In stage II and III diseases, open decortication followed by early drain removal results in rapid symptomatic recovery, early hospital discharge, and complete resolution. In the early fibrinopurulent phase, alternative strategies should be considered. However, even in ideal cases, neither fibrinolysis nor thoracoscopic adhesiolysis can achieve more rapid resolution at lower risk.

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Keywords: empyema; decortication

Empyema is a rare complication of community acquired pneumonia in children. Diagnostic and staging criteria have been described.1 2 Thoracentesis and antibiotic treatment remain the cornerstones of treatment for stage I disease. The management of disease progression or late presentation is controversial. Open thoracotomy and decortication have been perceived to be synonymous with protracted recovery and prolonged hospitalisation. Advocates of thoracoscopic adhesiolysis cite earlier chest drain removal (median, 7 days) and hospital discharge (median, 8 days).3 4 The purpose of our paper is to emphasise the need to tailor the treatment modality to the stage of disease, to encourage early surgical referral, and to challenge traditional prejudice towards open surgery.

Methods

An analysis of all admissions to the hospitals within the Northern Health Region over a seven year period was performed to determine the yearly prevalence of pneumonia, pleural effusion, and parapneumonic empyema in children under the age of 16 years. Using international disease classification codes, a regional database was searched for community acquired pneumonia cases admitted to these hospitals, excluding post-traumatic and tuberculous groups.

In a consecutive series of childhood empyema referrals to a regional cardiothoracic surgical centre, patterns of referral, previous clinical course, stage of disease at referral, subsequent surgical management, and outcome were examined.

MANAGEMENT PROTOCOL

Patients were transferred to the surgical unit, had chest radiographic and ultrasound examinations, and were transferred to the operating theatre on the day of referral. The patients were anaesthetised and underwent rigid bronchoscopy to: exclude the presence of a foreign body or structural abnormality in the airway; perform bronchial lavage; and obtain specimens for microbiological examination. Treatment was based on empyema stage. In stage I disease, when ultrasound examination identified anechoic collections and absent loculation, needle aspiration confirmed the presence of fluid and an intercostal drain was positioned. Early stage II disease (fibrinous septation, absence of homogenous echogenic loculations or thickened parietal rind on ultrasound) was evaluated for video assisted thoracoscopic adhesiolysis by needle aspiration, followed by creation of a single port and thoracoscope insertion. Late stage II disease and stage III disease were treated by open thoracotomy and decortication. The aims of surgery were to per-
Before surgical referral, individual patients had been administered between three and seven antibiotic agents including penicillin derivatives, cephalosporins, aminoglycosides, macrolides, and metronidazole. Treatment had commenced blindly. Pleural aspiration attempts had been made in 13 patients after commencement of antibiotic treatment. The organism responsible had been identified in only two patients. Both had pneumococcal infection. Intercostal drainage had been undertaken in seven patients. Fifteen of the patients had undergone chest ultrasound examination and five patients had undergone computed tomography.

At the time of surgical referral, anaemia, leucocytosis, fever (>38°C), and weight loss were noted in most patients. One child had an immunological deficiency (IgG₂ absence). Three patients had a pleural exudate and absent septation (stage I disease). One patient had fibrinous septation and minimal rind formation (stage II disease). Eighteen patients had organised, multiloculated empyema with lung entrapment (stage III disease). Three of the patients with organised collections had intraparenchymal lung abscess formation (stage IIIc disease). It is only recently that children with stage I and II diseases have been referred for assessment and treatment.

**SURGICAL MANAGEMENT**

At bronchoscopy, no foreign bodies were found. Three patients with stage I disease were treated by intercostal drain insertion alone. The site was determined by prior ultrasonic examination. One patient with early stage II disease underwent video assisted thoracoscopic adhesiolysis (using three port sites) and insertion of a single intercostal drain. The remaining 18 patients underwent open thoracotomy and decortication. Three patients with a lung abscess underwent deroofing and debridement of the abscess. In two cases, an intercostal muscle flap was applied to the underlying open bronchi. In one case, a strip of pericardium was used to reduce the air leak.

**SURGICAL RESULTS**

There were no complications. The removal of intercostal drains was accomplished within 48 hours in all patients. The drain was removed within 24 hours in 16 patients. Fever resolved within 48 hours. Median hospital stay was 4 days (range, 3–7). The organisms responsible remained unidentified. In two cases, pneumococcal antigen was identified in purulent fluid obtained at the time of surgery. No organisms were grown from any intrapleural specimen. Virological screening was also negative. Patients were seen in outpatient clinics at 4 weeks. All patients had complete clinical and radiological resolution.

**Discussion**

The immediate objectives in the treatment of empyema are to eradicate persistent fever, to evacuate pleural contents, and to fully re-expand the lung. The long term objective is to prevent chronic lung damage. Simple para-
Key messages

- Management principles: treatment must be based on radiological staging and clinical status.
- Antibiotics and drainage are usually successful in stage I disease.
- Factors contributing to development of stage II and stage III disease: late presentation, failure to identify responsible organism, inadequate antibiotic treatment, reluctance to drain, suboptimal drain placement, under use of ultrasound imaging for initial staging and assessment of treatment response, and late surgical referral.
- Surgical results: in stage II and stage III empyema, open thoracotomy and decortication is followed by drain removal within 48 hours, prompt hospital discharge, and complete resolution. Using these results as a benchmark, alternative treatments should only be undertaken in carefully selected patients.

In conclusion, treatment must be tailored to disease stage. We advocate precise radiological planning, with the following key principles:

- Early diagnosis and treatment are critical.
- Antibiotics should be selected based on culture results and sensitivity testing.
- Drainage is essential for effective treatment.
- Surgical intervention should be considered in cases where simpler methods fail.
- Postoperative care should focus on ensuring a prompt recovery.

The key to successful treatment is a multidisciplinary approach that considers the patient's overall health, the nature of the lesion, and the specific stage of the disease.

In summary, the treatment of pleural space infections requires a balanced approach that considers the patient's individual needs and the specific characteristics of the infection. The use of advanced imaging techniques and minimally invasive procedures allows for safer, more effective treatment with improved outcomes.

References

staging at presentation, thoracentesis, vigilance following commencement of appropriate antibiotic treatment, and early referral of those patients who fail to respond to avoid open thoracotomy. Children who present with stage II or III diseases should be assessed and treated by a multidisciplinary team at the regional cardiothoracic surgical centre. In stage II and III diseases, open decortication followed by early drain removal results in rapid symptomatic recovery, early hospital discharge, and complete resolution. In the early fibrinopurulent phase, alternative strategies should be considered. However, even in ideal cases, neither fibrinolysis nor thoracoscopic adhesiolysis can achieve more rapid resolution at lower risk. The benchmark is set by the results achieved with open thoracotomy and decortication.

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