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MANAGEMENT OF THORACIC EMPYEMA IN CHILDHOOD *

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In purulent pleurisy or empyema, purulent material collects in the pleural cavity and this is a common complication following bronchopneumonia in childhood [1-4]. Non-tuberculous empyema most frequently occurs in the young infant who has been given medical treatment late in the course of the illness or who has been inadequately treated. Successful therapy depends on appropriate antimicrobial drugs and adequate drainage of the pleural space; decortication for empyema is rarely indicated [1,4,5].

The present study covers 31 cases of non-tuberculous empyema in children, treated at the Anadolu University Hospital over a period of five years. The aim is to find out what course of treatment was, in our series, most reliable, and to point out possible complications.

Material and Methods

Thirty-one patients (0.1% of the total pediatric admissions) were admitted to the hospital, with a diagnosis of empyema, between January 1978 and January 1983. Of these 22 were boys and 9 were girls (giving a ratio of 2.4:1), ranging in age from four months to ten years. Pneumonitis was noted in each patient before the development of the empyema. The duration of the symptoms prior to hospitalization varied from one to four weeks. All the patients had received two or more antimicrobial drugs prior to admission.

The postpneumonic empyema began with fever, coughing and respiratory distress. The physical signs most often apparent were decreased excursion of the chest, dullness to percussion and reduced breathing sounds over the affected area. Etiolo-

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gical agents were looked for in the blood and in the pleural fluid. In addition to the routine cultures, the smears of the pleural fluid were stained with Gram's stain. Materials were not cultured for anaerobic bacterias nor for Mycobacterium tuberculosis since no tuberculosis cases were included in the series.

A systemic antimicrobial drug treatment was selected which had a proven antibacterial action against the organism recovered in the cultures of the pleural fluid and the blood. Gentamicin was a reasonable choice for all gram-negative bacilli and high-dose penicillin was the initial choice of drug for apparent gram-positive infections. If there were any doubts concerning the etiological bacterial agents, combined antimicrobial therapy was started.

Antimicrobial drugs were administered until the patient was clinically well and until the chest roentgenograms indicated either complete resolution or a minimal stable residue.

Multiple thoracentesis was used if the pleural fluid was thin and easily drained, but intercostal tube drainage with slow suction was the procedure chosen for most patients. This treatment was followed by irrigation of the pleural cavity with saline solution and appropriate antibiotics. Decortication was performed in cases where drainage had not been successful.

Results

This series includes only patients with postbronchopneumonic bacterial empyema. Eleven patients were under one year, 23% were under three years and 42% were under 10 years of age. The right side was involved in 16 patients; none had bilateral empyema. In one patient the empyema was a complication of postmeasles bronchopneumonia. Severe anemia was observed in 15 patients.

Micro-organisms were identified in 83.8% (26 out of 31) of the cases, on the grounds of positive cultures of the pleural fluid and/or of the presence of the organism on Gram-stained smears. A positive pleural culture was obtained in 70.9% (22 out of 31) of the cases. Coagulase positive staphylococcus was the offending organism in 61.9% of the positive pleural fluid cultures. Klebsiella was recovered in five patients. One pleural fluid specimen revealed pneumococcus and another one Proteus. Positive blood cultures were found in three cases only (9.6%). Bronchopleural fistulas were seen in 22 (70.9%) of the patients; Staphylococcus aureus was cultured in 48% of these cases.

In this series six patients (19.3%) showed associated diseases: salmonellosis in two, acute otitis externa in three and meningitis in one case.

Antimicrobial drugs and multiple thoracentesis were used in ten cases, and of these two were cured (20%). Twenty-one patients (72.4%) were successfully treated with

antimicrobial drugs and with intercostal tube drainage with slow suction. Five patients were successfully treated with decortication (Table I).

TABLE I

Results of the Surgical Treatment of Empyema

Treatment	No of cases	Cured	Died
Multiple thoracentesis	10	2	—
Intercostal tube drainage	29	21	3
Decortication	5	5	—

Three patients with severe malnutrition, anemia and staphylococcal septicemia, on whom intercostal tube drainage was used, died (9.6%).

Discussion

In developing countries the incidence of complications with infectious diseases of the lungs and pleurae in children has not declined in spite of effective antimicrobial drugs[2,3]. Bronchopneumonia is a very common pediatric problem in Turkey, and empyema is a rather common complication following upper respiratory tract infections in children[6]. Empyema as a complication of measles has rarely been reported[1,2]. In this series only one of the 31 cases of empyema was associated with post-measles bronchopneumonia.

Among pediatric hospital admissions in developing countries, empyema has been found in 0.11% - 0.21% of cases[2,3,7]. In our hospital 31 cases were seen over a period of five years, and this accounted for 0.10% of the total pediatric patients admitted.

Males outnumbered females by approximately 2.4:1 in our series. It has been postulated that there may be a sex-linked factor to explain this, related to a gene located on the X chromosomes[8]. Empyema is predominantly seen in children under three years of age[3,9,10]. In our series 58.1% of the children were aged three years or under.

Treatment of empyema should be directed towards prompt and effective drainage of the pleural cavity, adequate and effective antimicrobial therapy and nutritional support.

Antimicrobial drug treatment of pneumonia has decreased the incidence of empyema and the development, over the last 40 years, of antimicrobial drugs has produced a change in the etiologic organisms. Before the availability of antimicrobial

agents the leading causes of empyema were pneumococcus and streptococcus. Staphylococcus emerged as the most common isolate micro-organism in many series after the widespread use of penicillin[1,4,5,7]. In our series, the common pathogenic organisms causing empyema were staphylococcus, Klebsiella, pneumococcus and Proteus; in the majority of our cases (61.9%) the empyema was due to Staphylococcus aureus. Middlekamp *et al*[11] reported an incidence of 46% bronchopleural fistulas with staphylococcal pneumonia and empyema. Bronchopleural fistulas developed in 70.9% of our series.

Different authors are of diverse opinions regarding the drainage of the pleural space in thoracic empyema[1,9,12-14]. Some are of the opinion that multiple thoracentesis of the empyemic cavity should be tried initially in all cases and that if this fails, that intercostal tube drainage should then be instituted[10,14]. Comparative studies have shown that intercostal drainage is a more effective method than multiple thoracentesis. The cure rate in our series was 72.4% with intercostal tube drainage, but only 20% with multiple thoracentesis.

Our experience showed that intercostal tube drainage should be instituted as the first choice of treatment in cases of empyema with bronchopleural fistulas since multiple thoracentesis is not effective. Jain *et al*[13] have reported that slow suction may be useful in intercostal tube drainage in cases of childhood empyema. In the present series slow suction was found to be a useful support to intercostal tube drainage, not only in cases of empyema with bronchopleural fistulas but also in simple cases of empyema. In our opinion negative pressure suction should always be used, particularly in patients with bronchopleural fistulas.

The definition of decortication in the literature varies[15-17]. Some reports have advocated acute decortication as the procedure of choice for acute empyema[16,17]. The authors cite as advantages the evacuation of all pleural loculations and the removal of restrictive pulmonary peel associated with a prompt resolution of the toxic signs of infection and relatively low mortality and morbidity. Dugan and Samson[18] have emphasized the importance of the endothoracic facial plane for dissection and removal of an organized empyema. In our opinion decortication may be required in unresolved loculated empyema or persistent bronchopleural fistulas. Decortication was required in five of the 31 cases in our series, and in all these cases there were bronchopleural fistulas with the empyema.

Infant and child mortality from empyema has been dramatically reduced from 26% as reported by Forbes[19] in 1946 to 1.6% as reported by Stiles *et al*[10] in 1970. This marked reduction in mortality has been partly due to the availability of appropriate antibiotics. Adequate early surgical drainage of the empyema has also played on important role in the reduction of infant and child mortality from empyema. Delayed diagnosis and inadequate drainage tend to prolong hospitalization and increase morbidity. In our series the mortality rate was 9.6%. These patients were all of a low

socio-economic level and died of underlying sepsis and pulmonary disease despite adequate pulmonary drainage.

Summary

Over a five year period, 31 patients with empyema thoracis were treated at Anadolu University Hospital. Micro-organisms were identified in cultures of the pleural fluid of 22 of the patients. Only two children were treated by multiple thoracentesis. Twenty-one patients were successfully treated with slow suction intercostal tube drainage. Five patients had decortication for persistent bronchopleural fistulas. Three patients died as a result of severe malnutrition and staphylococcal septicemia. In spite of the fact that appropriate antibiotics have brought about a considerable decrease in the incidence of empyema in developed countries there are still cases requiring multiple thoracentesis and intercostal drainage. In Turkey empyema continues to be a significant problem in childhood.

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