

Profile of Tuberculosis Empyema at a Tertiary Care Centre

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Abstract

Background. Tuberculosis (TB) empyema is a chronic infection of pleural space which carries a significant morbidity and mortality.

Methods. A retrospective study of clinical, radiological, bacteriological features and management of 54 patients with TB pyothorax admitted to a medical college tertiary care teaching hospital at Cuttack, Odisha.

Results. Their mean age was 43.2 years; there were 45 (83.3%) males. History of TB was available in 13 (24%) patients, among whom two patients had multidrug-resistant TB. Cough (92.5%), expectoration (87%), fever (75.9%), chest pain (66.6%), were most common presenting symptoms; pallor (46.2%), digital clubbing (44.4%) were the most frequently evident signs. Thirty-one (57.4%) patients had underlying comorbid conditions; diabetes mellitus, alcoholism (n=11 each), were the most frequently present. TB empyema occurred on the right-side in 30 (55.5%), left side in 21 (38.9%) and was bilateral in three patients. Direct smear of pus and sputum revealed acid-fast bacilli in four (7.4%) and eight (14.8%) patients, respectively; mycobacterial culture of pus was positive in 11 (20.3%) cases. Six patients were managed with simple aspiration, 47 patients required tube thoracostomy, one patient was managed with open drainage; two patients were referred to thoracic surgery for the decortication. Category I, II and IV anti-TB treatment was administered to 41 (76%), 11 (20.3%) and two patients, respectively. Secondary bacterial infection in pleural fluid occurred in 26 (48%).

Conclusion. Drainage of pyothorax using tube thoracostomy along with effective anti-TB drugs results in good outcome, and many patients may not require surgery. [Indian J Chest Dis Allied Sci 2019;61:199-201]

Key words: Pyothorax, Empyema, Tuberculosis, Intercostal Chest tube drainage, Computed tomography thorax.

Introduction

Empyema remains a common problem both in the developed as well as developing world. In the former pulmonary infections, surgical procedures and thoracic trauma are the usual causes¹ while pulmonary infections including tuberculosis (TB) account for the majority of cases in the latter.² Clinical outcomes of tubercular pyothorax are generally believed to be worse as compared to those of non-TB empyema, because of protracted illness, presence of concomitant fibrocavitary lesions, high bacillary load, development of broncho-pleural fistulae and requirement for complicated surgeries in face of compromised lung function.³ Management for TB empyema consists of prompt drainage of infected pleural space, effective anti-TB treatment regimen and treatment of associated secondary infection of pleural space.⁴ Secondary infection by other pyogenic organisms may add to the severity of illness that may prolong the time to cure the illness, as well as increases morbidity and mortality. In this study, our objectives were to document the clinical and bacteriological features and to review our experience with mainly medical management (intercostal tube drainage or aspiration of pus as only minor surgical procedures) of TB pyothorax.

Materials and Methods

We prospectively studied patients with TB empyema admitted under the Postgraduate Department of Pulmonary Medicine, SCB Medical College, Cuttack, Odisha, India over a 2-year period between 2012 and 2014.

Patients with TB empyema diagnosed either by, presence of acid-fast bacilli (AFB) in pus or sputum samples, or radiological chest radiograph/computed tomography thorax findings suggestive of TB were included. Patients aged less than 15 years; empyema secondary to other causes were excluded from the study. Written informed consent was taken from all the patients and the study was cleared by the Institute's Ethics Committee. Demographic details and clinical parameters were recorded in all patients including age and gender, symptoms (fever, cough, expectoration, haemoptysis, chest pain, dyspnoea, and loss of appetite and weight) and their duration.

Physical examination was done as per a planned proforma. Complete blood counts renal and liver function tests and blood sugar were done in all the patients to identify the presence of any co-morbid illness; testing was also carried out for human immunodeficiency virus (HIV) infection and rheumatoid arthritis. Chest radiographs were obtained in all the patients while ultrasonography (USG)

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and computed tomography (CT) of thorax/abdomen were carried out when deemed necessary.

Pleural fluid was collected under strict asepsis by thoracentesis and total leukocyte count (TLC), differential leucocyte count (DLC); protein, glucose; gram stain and culture sensitivity, *Mycobacterium* smear and culture were performed in all the patients unless pleural fluid was grossly purulent in which case only the latter investigation was sent. Aetiology of empyema was decided based on the history, physical examination, radiology, empyema pus analysis as well as other clinically relevant investigations. A diagnosis of TB empyema was definitive if pleural fluid smear and/or culture were positive for *Mycobacterium tuberculosis*. TB empyema was probable when there were concomitant positive sputum smears for AFB; or there was radiological evidence of active pulmonary TB.

Results

A total of 54 patients were included in the study. Their mean age was 43.2 years. There were 45 (83.3%) males; male-to-female ratio was 5:1. Majority of the patients belonged to the age group 41-50 years (n=14, 25.9%) and 21-30 years (n=11, 20.3%).

The common symptoms at presentation were cough (92.7%), expectoration (87%), fever (75.9%), chest pain (66.6%) and dyspnoea (53.7%). In addition, constitutional symptoms, like, anorexia, malaise and weight loss, were noted in 26 (48.1%) patients. Physical signs included pallor (46.2%), digital clubbing (44.4%), pedal oedema (18.5%) and peripheral lymphadenopathy (11.1%). Right side (n=30; 55.5%) was more frequently involved in comparison to the left (n=21; 38.9%). Bilateral involvement was evident in three (5.6%) patients. Uniloculated and multiloculated empyema were observed in 15 (27.8%) and six (11%) cases, respectively. Associated pneumothorax was present in 24 (44.4%) cases. Empyema necessitans was present in one case. History of TB was available in 13 (24.1%) patients, among which two patients had multidrug-resistant (MDR) TB. Co-morbidities were present in 31 (57%) cases. Diabetes mellitus (n=11; 20.4%) and alcoholism (n=11 20.4%) were most commonly associated diseases. Other co-morbidities were chronic kidney disease (n=3, 5.5%), hepatic diseases (n=2, 3.7%), constrictive pericarditis, sickle cell anaemia, chronic obstructive pulmonary disease and silicosis one patient each.

Of the 54 TB pyothorax patients, the diagnosis was definite in 11 (20.3%) cases; in 43 (79.7%) cases, probable diagnosis was made on the basis of sputum AFB smear/culture positivity (n=8, 14.8%) and/or radiological appearances consistent with active TB (79.7%, n=43 cases) (Table 1). Direct smear of pus and sputum revealed AFB in four (7.4%) and eight (14.8%) patients, respectively; mycobacterial culture of pus was positive in 11 (20.3%) cases.

Table 1. Diagnostic confirmation

Spectrum of TB Pyothorax	No. (%)
Definite TB pyothorax (pleural fluid AFB smear positive and/or pleural fluid mycobacterial culture positive)	11 (20.3%)
Probable TB pyothorax (sputum AFB smear positive and/or chest X-ray suggestive of active TB)	43 (79.7%)
Total	54

Definition of abbreviations: TB=Tuberculosis; AFB=Acid-fast bacilli

Out of 54 cases of TB pyothorax, Gram staining of pleural fluid showed no bacteria in 45 (83.3%) cases; of the remaining nine cases, Gram positive cocci were found in five and Gram negative bacilli in four cases. Secondary infection with aerobic bacteria during drainage of pus was observed in 26 (48%) cases. The organism isolated by aerobic culture in superinfection were *Pseudomonas* (18.5%, n=10), *Staphylococcus aureus* (11%, n=6), followed by *Citrobacter* (3), *Acinetobacter* (2), *Escherichia coli* (2), *Klebsiella* (1), *Proteus* (1), *Morganella morganii* (1) (Table 2).

Gram staining of sputum revealed Gram positive cocci in 29 (53.7%) and polymicrobial (both Gram positive cocci and Gram negative bacilli) in 10 (18.5%) cases. Gram negative bacilli were seen in 4 (7.4%,) cases. No bacteria were seen in 11 (20.3%) cases.

Table 2. Superinfection in 54 cases of TB empyema thoracis in pleural fluid cultures

Organisms	No. (%)
<i>Staphylococcus aureus</i>	6 (11%)
Gram negative bacilli	20 (37)
<i>Pseudomonas aeruginosa</i>	10 (18.5)
<i>Citrobacter spp</i>	3
<i>Acinetobacter spp</i>	2
<i>Escherichia coli</i>	2
<i>Klebsiella spp</i>	1
<i>Proteus spp</i>	1
<i>Morganella morganii</i>	1
Total	26 (48%)

Sputum culture showed Gram negative bacteria in 13 (24%) cases and no growth in 41 (76%). Among the Gram negative bacteria isolated, *Escherichia coli* (9.2%, n=5) and *Pseudomonas* (5.5%, n=3) were the most common organisms followed by *Klebsiella* (n=2, 3.7%), *Moraxella catarrhalis* (n=1, 1.8%), *Proteus* (n=1), *Acinetobacter* (n=1). Four (7.4%) cases had pleural fluid AFB smear and 11 (20.3%) of cases had mycobacterial culture positivity.

Fifty-three (98.1%) cases were managed with closed drainage (simple thoracocentesis in 6 and intercostals tube drainage under water seal in 47 patients) (Table 3). One patient required open drainage. Two cases were referred for decortication. Under the Revised National TB Control Programme patients received anti-TB treatment as follows:

Category I treatment in 41 (75.9%) cases, Category II treatment in 11 (20.3%) patients; and Category IV treatment in two (3.7%) cases. The treatment had to be extended to one year in 23 cases on Category I and in all 11 cases on Category II treatment. In addition to anti-TB treatment, 26 patients were treated with appropriate antibiotics for secondary infection for 6 - 12 weeks.

Table 3. Modalities of treatment

Mode of Treatment	No. (%)
Closed drainage	53 (98.1)
Simple thoracentesis	6
Intercostal chest tube drainage	47
Open drainage	1 (1.9)
Decortication	2 (3.7)
Anti-TB treatment	
Antibiotics	26 (48)
Category I	41 (75.9)
Category II	11 (20.3)
Category IV	2 (3.7)
Pleural fibrinolytics	4 (7.4)
Streptokinase	2
Hyalase	2

Discussion

Tuberculosis is a common cause of pyothorax in countries like India where the disease burden is high,² whereas in the developed countries post-pneumoni and post-surgical aetiology is more common.¹ TB has been found to be the cause of pyothorax in approximately 65% of cases in studies reported from high prevalence regions of the world.^{2,5,6} TB affects the patients commonly in their productive age⁵⁻⁷; we observed that 23.2% were in the age group 21-40 years; and 20.5% in the age group 21-30 years. Increased incidence of TB in 41-50 years age group may be due to the presence of co-morbid conditions, like diabetes mellitus, alcoholism, renal diseases. In our study, 20.4%, 20.4% and 5.5% cases had diabetes mellitus, alcoholism and renal diseases as co-morbid conditions, respectively.

Cough with expectoration and fever were seen in 92.7%, 87%, 75.9% cases, respectively in the present study. The pleural fluid (pus) AFB positivity in our study was only 20.3%, which is almost similar to another report.⁵ In other studies,^{6,8} AFB positivity of 71.6% and 50%, respectively was reported. Patients with TB empyema may develop secondary bacterial infection through a persistent broncho-pleural fistula. In our study 48% patients were found to have secondary bacterial infection.

In the present study, definite TB pyothorax was seen in 20.3% of cases and probable TB pyothorax was seen in 79.7% cases. Our criteria was similar with another study,² but there is a great discrepancy in detecting definite TB empyema thoracis and probable TB empyema

thoracis which might be due to previous chemotherapy or inadequate bacillary load due to minimal lesions or transport/storage of defect pleural fluid.

Medical management of TB pyothorax comprises drainage of infected pleural space, effective anti-TB drugs and treatment of associated secondary bacterial infections of pleural space.⁴ Secondary infection of pleural space increases the duration of intercostal tube drainage and needs timely treatment with antibiotics. In our study, 47 of the 54 were successfully managed with intercostal drainage for a prolonged period (mean 45 days).

Bronchopleural fistula and associated pneumothorax (pyopneumothorax) are important complications. Bronchopleural fistula may heal spontaneously with initial conservative management by intercostals tube drainage and anti-TB treatment. If this approach fails, surgery may be necessary to attempt primary closure of the fistula or closure of the potential space with other living tissue, such as muscle flaps. In the present study, no patient required surgery for repair of bronchopleural fistula.

Conclusions

Patients with TB pyothorax have chronic morbidity and may require hospitalisation. Confirmation of diagnosis of TB is feasible only in small number of cases. Imaging (chest radiography and/or computed tomography thorax) is useful to diagnose the underlying TB parenchymal disease. Drainage of pyothorax using intercostal tube drainage along with effective, adequate anti-TB drugs and timely treatment of secondary bacterial infections, results in cure; and many patients may not require further surgical management.

References

1. Light RW. Parapneumonic effusions and empyema. In: Rhyner S, Winter N, Koleth J, editors *Pleural Diseases*; 5th edition. Philadelphia: Lippincott Williams and Wilkins; 2007:p.179-210.
2. Malhotra P, Agarwal AN, Agarwal R, Ray P, Gupta D, Jindal SK. Clinical characteristics and outcome of empyema thoracis in 117 patients: a comparative analysis of tubercular vs. non tubercular aetiologies. *Respir Med* 2007;101:423-30.
3. Al-Kattan KM. Management of tuberculous empyema. *Eur J Cardiothorac Surg* 2000;17:251-4.
4. LeMense GP, Strange C, Sahn SA. Empyema thoracis: therapeutic management and outcome. *Chest* 1995;107:1532-7.
5. Acharya PR, Shah KV. Empyema thoracis: a clinical study. *Ann Thorac Med* 2007;2:14-7.
6. Goyal SP, Tandon RK, Patney NL, Misra OP. Management of tubercular empyema thoracis: a review of 53 cases. *Indian J Tuberc* 1976;23:103-9.
7. Tandon RK, Misra OP. Clinicopathological study of thoracis empyema and evaluation of its surgical treatment. *Indian J Chest Dis* 1974;16:21-30.
8. Kundu S, Mitra S, Mukherjee S, Das S. Adult thoracic empyema: a comparative analysis of tuberculous and nontuberculous aetiology in 75 patients. *Lung India* 2010;27:196-201.