International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2020): 7.803

Clinical Features, Treatment Modalities and Outcome in Empyema Thoracis - A Retrospective Study

Pratik Raut[1], Paras Kothari[2], Shalika Jaiswal[3], Abhaya Gupta[4], Shahaji Deshmukh[5], Apurva Kulkarni[6]

Abstract: ***This is a retro spective study, evaluating various treating modalaties used in empyema thoracis and see the patient response to various treatment modalities. response of patients has been noted as number of redo surgeries, number of days of ICD insertion, complications to surgery etc. The study has been done in paediatric surgery dept of LTMMC hospital, Mumbai.***

Keywords: empyema thoracis, thoracotomy, VATS, ICD

1. Introduction

An empyema is, by definition, pus in the pleural cavity. The diagnosis and treatment of empyema by surgical drainage was first described by Hippocrates in around 600 B. C. [1] Since then the management of this condition has posed a challenge to physicians and surgeons alike. From ancient times to the middle of last century, most empyemas were the result of pneumonic, traumatic or tuberculous processes. With thoracotomy becoming a commonly performed procedure, postsurgical empyema now constitutes 20% of all cases.

The empyema commission formed to address the high mortality rates secondary to the institution of open drainage in all cases of empyema occurring in American soldiers during the World War I laid emphasis on the following principles: 1. the necessity to drain the pleural fluid and the need to avoid an open pneumothorax in the acute pneumonic phase, 2. the rapid sterilization and obliteration of the infected cavity in order to avoid a chronic empyema and 3. proper nutrition of the patient. The same guidelines framed decades ago continue to provide the basis for the treatment of empyemas even today. [2]

Tube thoracostomy, image directed catheters, thoracoscopic drainage, intrapleural thrombolytics, decortications and open drainage have all been used with success rates ranging from 10 to 90%. [3, 4] The variable success rates of these procedures can be attributed, in part, to the stage of the empyema at presentation.

The present study is aimed at studying the etiology, the clinical presentation, diagnostic modalities, the different modalities of treatment available for this condition and the overall treatment outcome in a teaching hospital.

2. Material and Methods

This is a retrospective cross - sectional study of 87 consecutive indoor patients with empyema thoracis admitted to the paediatrics ward at a tertiary healthcare institute, conducted over a duration of 6 months. Posttraumatic and postsurgical empyema patients were excluded from the study. Diagnosis was established by the aspiration of gross pus from the pleural space. Cases wherein the aspirated pleural fluid was nonpurulent, a positive gram stain or a positive culture was also accepted as empyema and included in the study. A detailed history was taken in all cases as per a planned pro forma. Besides the routine investigations, pleural fluid was sent in all cases for gram stain and Ziehl Neelsen stain (ZN), and culture sensitivity was done for both aerobic pyogenic organisms and mycobacteria (Lowenstein Jensen method). Sputum was examined for acid fast bacilli (AFB) in all cases. Radiological assessment included chest radiographs taken at admission, after intercostal tube insertion and after ICD removal/at discharge. Where needed, ultrasound thorax or computed tomography (CT) of the thorax was done. Evaluation of these patients included the demographic profile, the presenting clinical features, the organisms isolated, etiology of the empyema and the response to various modes of treatment. The data was analyzed using the method of descriptive statistics and the results expressed as percentage of the total.

3. Results

Majority of the patients belonged to the age group of 1 to 5 years (57.47%), followed by less than 1 years in 20.69%.62.07% study subjects were males, whereas 37.03% were females.

Table 1: Age distribution

Age group	Number of subjects	Percentage
Less than 1 year	18	20.69
1 to 5 years	50	57.47
6 to 10 years	16	18.39
11 to 15 years	3	3.45
Total	87	100.00

Table 2: Genderwise distribution

Genderwise distribution	Number of subjects	Percentage
Males	54	62.07
Females	33	37.93
Total	87	100.00

Table 3: Duration of symptoms

In the present study we assessed the duration of symptoms among study subjects. We observed that majority of the subjects presented with duration between 6 to 10 days (31.03%), followed by more than 15 days (29.89%)

Duration of symptoms	Number of subjects	Percentage
Less than 5 days	15	17.24
6 to 10 days	27	31.03
11 to 15 days	19	21.84
More than 15 days	26	29.89
Total	87	100.00

Table 4: Procedures

In this study we assessed the types of procedures performed among the study subjects. We observed that thoracotomy was the commonest procedure preformed among 63.22% subjects, followed by ICD insertion among 24.14%, and VATS among 12.64%.

Procedures	Number of subjects	Percentage
VATS	11	12.64
Thoracotomy	55	63.22
ICD insertion	21	24.14
Total	87	100.00

Table 5: Clinical presentation

The commonest clinical presentation was fever (95.4%), cough (80.46%), breathlessness among 19.54% subjects.

Clinical presentation	Number of subjects	Percentage
Fever	83	95.40
Cough	70	80.46
Breathlessness	17	19.54
Chest pain	4	4.60

In the present study we assessed the organisms isolated. Among the isolated organisms, MRSA was the commonest (5.75%), followed by mycobacterium (3.45%), Streptococcus (3.45%), MSSA (2.3%)

Table 6: Organism isolated

Organism isolated	Number of subjects	Percentage
Kleibsiella	1	1.15
MRSA	5	5.75
MSSA	2	2.30
Pseudomonas	1	1.15
Mycobacterium	3	3.45
Streptococcus	3	3.45
No growth	73	83.91

Table 7: Duration of hospital stay

We studied the hospital stay duration among the study subjects. We observed that majority of the subjects had hospital stay between 16 to 30 days (39.08%), followed by 11 to 15 days (22.99%).

Duration of hospital stay	Number of subjects	Percentage
Less than 5 days	1	1.15
6 to 10 days	15	17.24
11 to 15 days	20	22.99
16 to 30	34	39.08
More than 30 days	17	19.54
Total	87	100.00

Table 8: Comparison between parameters among various procedures

In this study we compared the demographic features, clinical parameters among various study procedures. We observed that mean age of the study subjects was 3.56 years, male: female ratio was 1.63: 1, right side was more commonly affected. The mean duration of symptoms was 19.4 days, for VATS and thoracotomy it was 22 days, while for ICD it was 13 days.

Mean duration of hospital stay for VATS and thoracotomy was around 26 days, while for ICD it was 14.19 days.

Mean hemoglobin level was 9.51, mean TLC count was 16736.

Failure was noted in 9% subjects with VATS and ICD, while it was note among 3.63% subjects with thoracotomy.

Air leak was noted among 9.09% subjects with VATS, and fistula was noted among 1.81% subjects with thoracotomy.

Parameters	Overall (n=87)	VATS (n=11)	Thoracotomy (n=55)	ICD (n=21)
Mean age	3.56	5.26	3.46	2.93
Gender	1.63: 1	2.66: 1	1.39: 1	2: 01
Lateratlity (R: L)	0.77: 1	0.83: 1	0.66: 1	0.90: 1
Duration of symptoms	19.4 days	22 days	21.32 days	13 days
Hb	9.51	10.27	9.5	9.15
TLC	16736	20072.72	15743	17630
Hospital stay	23.08 days	26.90 days	25.81 days	14.19 days
Failure (re - do surgery)	5 (5.74%)	1 (9.09%)	2 (3.63%)	2 (9.52%)
Air leak	1 (1.1%)	1 (9.09%)	0	0
Fistula	1 (1.1%)	0	1 (1.81%)	0

Table 9: Mean ICD duration among various procedures

Parameters	Mean ICD duration
Post Primary ICD	8.52 days
Post Thoracotomy	5.49 days
Post VATS	8.63 days

In the current study the mean duration for post primary ICD was 8.5 days, while posgt thoracotomy it was 5.49 days, and post VATS it was 8.63 days.

4. Discussion

This retrospective study indicates the microbiology and changing trends in the management of empyema thoracis and emerging role of fibrinolytic therapy in management of empyema thoracis at a late stage.

Majority of the patients belonged to the age group of 1 to 5 years (57.47%), followed by less than 1 years in 20.69%.62.07% study subjects were males, whereas 37.03% were females. In the present study we assessed the duration of symptoms among study subjects. We observed that majority of the subjects presented with duration between 6

to 10 days (31.03%), followed by more than 15 days (29.89%)

In this study we assessed the types of procedures performed among the study subjects. We observed that thoracotomy was the commonest procedure preformed among 63.22% subjects, followed by ICD insertion among 24.14%, and VATS among 12.64%. The commonest clinical presentation was fever (95.4%), cough (80.46%), breathlessness among 19.54% subjects.

The study done by Kamat reported cough (94%) to be the most common symptom. This was followed by fever (76%), chest pain (75%) and dyspnea (53%). [9] The prevalence of cough (92.5%), chest pain (80%) matches that of the study by Kamat, whereas dyspnea (92.5%), fever (87.5%) and constitutional symptoms (62.5%) were encountered more frequently in our patients. The clinical manifestations of an empyema can vary widely, depending on both the nature of the infecting organism and the competence of the patient's immune system. The spectrum ranges from an almost complete absence of symptoms to a severe illness with systemic toxicity. [10] In general, anaerobic and tubercular empyemas usually present with a subacute illness, whereas aerobic bacterial infections of the pleural space present with an acute illness.

Prior to the availability of antibiotics, streptococcus pneumoniae and streptococcus pyogenes accounted for most empyemas. After the discovery and widespread use of penicillin in the 1940s, staphylococcus aureus succeeded *S. pneumoniae* and *S. pyogenes* as the major cause of empyema. Since the advent of β - lactamase resistant semisynthetic penicillins in the early 1960s, the incidence of staphylococcal empyema has decreased, and infections due to anaerobic bacteria (Bacteroides, Peptostreptococci and Fusobacteria) and aerobic gram - negative bacilli (*E. coli*, Pseudomonas, Proteus, Klebsiella) have increased markedly. Approximately 75% of patients with empyema have multiple infecting organisms, averaging three bacterial species per patient. The pus is found to be sterile in only one - third of cases. [11] The pathogen isolated in empyema also depends on presence or absence of certain predisposing factors like community - acquired pneumonia (*S. pneumoniae*), h/o aspiration (anaerobes), subdiaphragmatic infections (aerobic gram - negative enteric bacilli), external trauma and hemothorax (*Staphylococcus aureus*) and immunosuppression (*Staphyhlococcus aureus, Mycobacteria, fungi*)

In the present study we assessed the organisms isolated. Among the isolated organisms, MRSA was the commonest (5.75%), followed by mycobacterium (3.45%), Streptococcus (3.45%), MSSA (2.3%). We studied the hospital stay duration among the study subjects. We observed that majority of the subjects had hospital stay between 16 to 30 days (39.08%), followed by 11 to 15 days (22.99%).

In this study we compared the demographic features, clinical parameters among various study procedures. We observed that mean age of the study subjects was 3.56 years, male: female ratio was 1.63: 1. Age is also an important deciding factor. Whereas coagulase - positive *Staphylococcus aureus* is common in childhood, gram - negative organisms other than Hemophilus influenza are relatively unusual causes of empyema in children; anaerobic organisms are rare in patients younger than 18 years.

Right side was more commonly affected. The mean duration of symptoms was 19.4 days, for VATS and thoracotomy it was 22 days, while for ICD it was 13 days. Mean duration of hospital stay for VATS and thoracotomy was around 26 days, while for ICD it was 14.19 days.

Mean hemoglobin level was 9.51, mean TLC count was 16736. Failure was noted in 9% subjects with VATS and ICD, while it was note among 3.63% subjects with thoracotomy. Air leak was noted among 9.09% subjects with VATS, and fistula was noted among 1.81% subjects with thoracotomy. In the current study the mean duration for post primary ICD was 8.5 days, while posgt thoracotomy it was 5.49 days, and post VATS it was 8.63 days.

5. Conclusions

Empyema thoracis is associated with significant morbidity. It was concluded that all cases of simple empyema with thin pus and only those cases of simple empyema with thick pus where size of empyema is small should be managed by aspiration/s. Cases failed by the above method, all cases of simple empyema with thick pus and with moderate to large size of empyema and all cases of empyema with bronchopleural fistula should be managed by intercostal drainage tube connected to water seal. It was also observed that all cases of empyema complicated by bronchopleural fistula were difficult to manage and needed major surgery.