PRESENTATION AND MANAGEMENT OF EMPYEMA THORACIS AT LADY READING HOSPITAL PESHAWAR

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Background: Empyema thoracis remains a common thoracic problem with challenging management strategies. We undertook the present study to outline key aspects of the presentation and management of this condition at our tertiary care hospital. **Methods:** We analyzed 105 consecutive patients treated for empyema thoracis over a one-year period at Thoracic Surgical unit, Lady Reading Hospital Peshawar Pakistan. The study included patients aged 10–60 years of either sex. Patients were subjected to detailed diagnostic and management protocols with a view to define successful diagnostic and management strategies. **Results:** The majority of patients (68%) were male, with a mean age of 28.5±14.2 years, a majority (42%) being in the 10–20 years age group. Common presentation was with fever (73%), cough (65%) and chest pain (60%). The mean duration of symptoms was 6.1 weeks. Common aetiologies of empyema were pneumonia (46.7%), iatrogenic (21.9%), traumatic (16.2%) and malignancies (11.4%). Forty patients (38%) underwent an unsuccessful therapeutic procedure prior to admission to the Thoracic unit. In the unit, 58 patients received closed intercostal drainage (31 of which required further intervention), five patients were treated with repeated thoracentesis and 8 patients were subjected to fibrinolytic therapy. The majority of patients underwent a surgical procedure like rib resection (7), decortication (23), thoracoplasty (3) and other procedures in the first instance with only 4 patients requiring further surgery. Majority of patients (97/105, 92.4%) were cured of their disease. The hospital mortality was 7.6%. **Conclusion:** Multiple therapeutic options exist for the treatment of thoracic empyema. Optimal therapy requires selection of the most appropriate first procedure for each patient with post procedure imaging to avoid inordinate delays between interventions. Early referral of all empyema patients to thoracic units for definitive therapy is recommended.

Key Words: Empyema, Chest Tube, Fibrinolysis, Decortication, Pneumonia.

INTRODUCTION

Hippocarates[1] in 600 B.C. defined Empyema Thoracis as a collection of pus in the pleural cavity and advocated open drainage as its treatment. Since then the management of this condition has posed a challenge to physicians and surgeons alike.

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%[2,3]. The variable success rates of these procedures can be attributed, in part, to the stage of the empyema at presentation. In the initial exudative stage, an exudative effusion forms during the first 72 hours, which will usually resolve with the resolution of the pneumonia. In this stage antibiotics and thoracentesis or chest tube placements usually result in cure. In the second fibrino-purulent stage, antibiotics with properly positioned chest tube drainage may resolve the empyema thoracis. Failures are due to improperly positioned tube, loculations, increased fluid viscosity, or early peel on the lung. Failures are managed with rib resection, intrapleural thrombolytics, thoraco-scopic drainage and decortication.

Empyemas that have reached the organized phase are characterized by the presence of thick pleural peel causing varying degree of pulmonary parenchymal entrapment. Customarily, rib resection has been required to manage the organized empyemas. Limited thoracoplasty and muscle flap rotation are also needed in some instances to obliterate the pleural space problem[4].

Because many of the infections that cause empyema are indolent, a physician often sees patients after their parapneumonic empyema has already reached the fibrino-purulent or organizational stage. These patients often are subjected to multiple surgical procedures and long hospital stay before the empyema is successfully treated.

Keeping in view the possible difficulties encountered in successful management of empyema thoracis, we undertook the present study to outline key aspects of the presentation and management of this condition at our tertiary care hospital.

MATERIAL AND METHODS

We reviewed our experience with thoracic empyema over a one-year period (September 1999 to August 2000) at Postgraduate Medical Institute, Government Lady Reading Hospital Peshawar, with special attention to the presentation, procedure used, success rates of each procedure, duration of hospital stay and outcome. Patients were selected on the basis of ages 10-60 years and those who gave informed consent to the various procedures to be undertaken. Patients with empyema thoracis due to generalized sepsis, extension of subphrenic abscesses and secondary to perforated oesophagus during endoscopy were excluded from the study. Data were collected prospectively from patients' histories, clinical examination, radiological investigations (chest X-ray, chest ultrasound, CT chest) and laboratory investigations (Blood CP, Urine RE, Pleural fluid biochemistry and C/S). Proformas were used to record the data, which were then entered into SPSS ver 8.0 software for analysis.

The diagnosis was suspected on clinical symptoms, signs and chest radiography, and was confirmed by needle aspiration demonstrating purulent exudates, pleural fluid with positive cultures, and in some instances the pleural fluid was submitted for mycobacterial and fungal smears. Biochemical evidence of empyema was defined as a pleural fluid pH less than 7.1 and either lactate dehydrogenase (LDH) level more than 1000 IU/l or Glucose level less than 40 mg/dl.

Treatment included multiple therapeutic aspirations, closed tube drainage, rib resection, open window thoracostomy, decortication, empyema tube or other more extensive surgical procedures like thoracoplasty. Selection of appropriate treatment protocol was dependant on the duration and extent of the disease, age and fitness of the patient, and the site and nature of the collection.

Cavity drainage was commenced immediately if pleural fluid had a purulent appearance, Gram stains were positive, and pleural fluid had a pH below 7.1 and glucose level was less than 40 mg/dl.

Pleural fluid from patients not meeting the drainage criteria was followed during the next 24 hours by thoracentesis and pleural fluid was analyzed again.

Closed thoracostomy was carried out with a straight chest tube (Argyle™, Sherwood Medical Company), attached to a water seal system. Successful closed tube drainage was evidenced by improvement in clinical and radiological status within 24 to 48 hours. Continuous drainage was maintained until daily fluid output dropped to below 30 ml and improvement in the chest radiograph was noted. After chest tube insertion within 4 to 7 days, patients were sent home with the chest drain and asked to revisit outpatient department (OPD) after every two weeks until complete recovery.

Indication for Streptokinase instillation was persistent fluid collection not adequately drained by the tube thoracostomy. Streptokinase, 250,000 units per day, was instilled into the pleural cavity until complete radiological recovery.

Decortication was performed if there was a stage III empyema (organized stage), infected clotted hemothorax, multiloculated empyema and bronchopleural fistula. Decortication was carried out through a standard posterolateral thoracotomy with or without resections of ribs.

More extensive surgical procedures such as thoracoplasty were done after failed decortications, destroyed lungs and post pneumonectomy empyemas.

Open drainage, i.e., rib resection, open window thoracostomy and empyema tube were carried out in those patients who were too debilitated to undergo other surgical procedures and needed long term drainage.

As a routine, antibiotic cover was not provided as part of treatment protocol, and these were given in those patients having systemic symptoms such as fever, expectoration, cough, etc. Antibiotics were provided either empirically or guided by microbiological culture and sensitivity in most patients. Antibiotics given included first generation Cephalosporins and Gentamycin. According to the bacteria cultured and clinical evaluation antibiotic treatment was continued for at least two weeks.

The date and success of each procedure was recorded. Successful procedures were defined by empyema resolution such that no further intervention was needed. On successful completion of the treatment, patients were sent home with no further follow up.

RESULTS

During the study period, a total of 105 patients were included, comprising 68 males and 37 females. Their mean age was 27.87±14.15 years (Table-1). A mean of 9 patients were admitted per month (range 8–11 per month). Majority of the patients, i.e., 42% were in age group 10–20 years.

Table-1: Basic demographic data of patients

(n=105)

Category	Number & Mean	Percentages & SD
Age Groups (yrs)		
10-20	45	42.8%
21-30	28	26.6%
31-40	13	12.4%
41-50	08	7.6%
51-60	11	10.5%

Mean ages		
Overall	27.80	±14.15
Male	28.49	±14.20
Female	26.73	±14.18
Sex		
Male	68	64.8%
Female	37	35.2%

The mean duration of pre-admission symptoms was 6.4 weeks, ranging from 1–42 weeks. Forty patients presented with acute empyema, while the remaining 65 patients presented with chronic empyema.

Most of the patients had symptoms attributable to their empyema (Table-2), with fever being the most common symptom (73%), followed by cough (65%), chest pain (60%) and expectoration (60%). Other symptoms included dyspnoea (30%), weight loss (30%), lethargy (21%).

Table-2: Presenting symptoms in patients with empyema thoracis (n = 105)

Symptoms	**Number (%)**
Fever	77 (73)
Cough	68 (65)
Chest Pain	63 (60)
Expectoration	63 (60)
Dyspnoea	32 (30)
Weight loss	32 (30)
Lethargy	22 (21)

The aetio-pathogenesis is summarized in Table-3. Forty-nine (46%) of the 105 cases of thoracic empyema occurred during or after a broncho-pulmonary infection. Of the remaining 56 cases, 23 (21.9%) were due to iatrogenic causes, 17 (16.2%) occurred after gunshot wounds to the chest, and 12 (11.4%) occurred due to intra thoracic malignancies.

Table-3: Aetiologies of empyema thoracis in patients

(n=105)

Groups	**Number**	**Percentages**
Inflammatory	49	46.7

Iatrogenic	23	21.9
Traumatic (Gunshot)	17	16.2
Malignancies	12	11.4
Others	04	3.8
Totals	105	100

There was no preponderance for any side, with the left chest involved in 54 (51.4%) and the right chest in 49 (46.7%); two patients had bilateral disease.

Table-4: Procedures employed and their success rates

(n=105)

Procedure	Total	Success (%)
Tube Thoracostomy	58	27 (46.5)
Decortication	50	47 (94)
Rib Resection	15	14 (93)
Fibrinolytic therapy	8	5 (62.5)
Thoracoplasty	6	5 (83)
Aspiration	5	1 (20)
Window Thoracostomy	3	3 (100)
Empyema Tube	2	2 (100)

A total of 147 procedures were performed, as listed in Table 4. Tube thoracostomy was the most frequently employed procedure (58/147, 39.4%), followed by Decortication (50/147, 34.0%), Rib resection (15/147, 10.2%) and Fibrinolytic therapy (8/147, 5.4%). Of the commonly used procedures, Decortication had the best success rate (94%), followed by Rib Resection (93%), Thoracoplasty (83%) and Fibrinolytic therapy (62.5%).

The success rate for simple closed drainage was 46% (27/58); the closed drainage was maintained for an average of 6 weeks. Patients with unsuccessful closed drainage were subjected to other surgical procedures.

Postoperative morbidity (Table-5) was 21% (23/105), the most common complication being wound infection (7.6%) followed by air leak (3.8%) and wound dehiscence (1.9%).

Table-5: Postoperative Morbidity and Mortality in Empyema patients (n=105)

Morbidity			**Mortality**		
Complication	**No.**	**%**	**Cause**	**No.**	**%**
Wound Infection	8	7.6	Septicemia	3	2.8
Air Leak	4	3.8	Malignancy	2	1.9

Wound dehiscence 1.9	2	M. Infarct	1}
M. Infarct 0.9	1	P. Embol. 0.9%	1}
P. Embolism 0.9	1	R. Failure each	1}
Renal Failure 0.9	1		
Resp. Failure 0.9	1		
Septicemia 2.8	3		
Others 1.9	2		

The majority of patients (97/105, 92.4%) were successfully cured of their disease, while 8 patients (7.6%) died. Causes of death included empyemic septicaemia (three cases), advanced malignancy (two cases), myocardial infarction (one patient), pulmonary embolism (one patient) and renal failure (one patient).

DISCUSSION

The therapy of empyema thoracis requires appropriate antibiotics, prompt drainage and lung re-expansion. However, there is no clear consensus on the best way to obtain these objectives[5].

Tube thoracostomy is usually the first step in the treatment of acute empyema. The success rate for tube thoracostomy is 70-85%[6], but in our study, initially 27 patients had adequate drainage of their empyema with a success rate of 46.5%, more likely because most of our patients presented late with empyemas in organizing stage. Despite the expected low success rate for tube thoracostomy in the treatment of late empyema, it remains a first line therapy, if for no other reason than to attempt to decrease the severity of pleural sepsis until further therapy can be instituted[6].

The use of fibrinolytic therapy is associated with resolution of empyema thoracis in 69% of patients[7], and the success rate in our series was 5/8 or 62%.

Video Assisted Thoracoscopic Debridement was not used in any of our patients due to non-availability of this modality in our setting. VAT debridement has achieved satisfactory results in the management of empyema in the literature[8].

Rib resection and insertion of large bore drain was successful in 93% of cases in our study. This was only achieved when a large bore tube was placed accurately in the most dependent part of the collection for a sufficient duration before organization occurred[9].

Decortication represents the most invasive treatment for organized empyema cavities. Decortication allows a more rapid recovery with a decreased number of chest tube days, and decreased length of hospital stay. The success rate for decortication is 90-95%[6]. in our series it also had an excellent result (94%).

Thoracoplasty was a common procedure in the pre chemotherapeutic era of pulmonary tuberculosis. It plays an important but less prominent role in the treatment of tuberculosis and has relevance in non-tuberculous empyemas. If, after evacuation of infected material, obliteration of the space cannot be achieved, some form of thoracoplasty is mandatory. Young and Ungerleider[4] concluded that thoracoplasty is more successful if it is applied for patients with parapneumonic rather than post-resectional empyema, and preliminary drainage followed by thoracoplasty has a higher success rate in eliminating the empyema than thoracoplasty has alone. Thoracoplasty in our series had 83% success rate; three patients after failed decortication and three patients with post-pneumonectmy empyema underwent successful thoracoplasty.

For all stages, mortality rate may be as high as 10% in healthy patients and 50% in elderly or debilitated patients[10]. The hospital mortality was 7.6% in our series; it may have been lower due to younger age group and exclusion of post-oesophageal perforation empyema, which usually carries a poorer prognosis. Mortality rate was not significantly increased in patients with malignant diseases in contrast to other studies[11]. Nonfatal postoperative complications were few and there was no statistically significant difference between modalities of treatment; ultimate prognosis of the survivors depended on their underlying condition.

CONCLUSION

Management of thoracic empyema has to be individually tailored taking in consideration the age of the patient, duration and extent of empyema, presence and absence of systemic symptoms and signs and general condition of the patient.

Pneumonia remains the main aetiological factor behind empyema thoracis, although iatrogenic causes do not lag far behind.

This study emphasizes that decortication should be considered early in any patient who is a good surgical risk, because it has a high success rate, low morbidity and mortality.

It is further concluded that early referral of all empyema patients to thoracic units should be obligatory, where assessment and definitive procedures can be performed with high chances of success and low risk of morbidity and mortality.

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