

# Perioperative Nursing Care in two cases of Empyema Thoracis

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## ABSTRACT

**Introduction:** Empyema thoracis is a dreaded complication of a bacterial infection of the upper or lower respiratory system. It has been associated with a mortality rate between 6-24%. The incidence of empyema in the community is increasing with no known etiology for that. A proportion of out of community-or hospital-acquired pneumonia results from iatrogenic causes, especially antibiotic use.

**Methods:** Two cases of anaerobic empyema thoracis with excellent clinical course are presented.

**Results:** Correct and timely diagnosis is the main determinant of a successful outcome. Patients were operated after the complication was diagnosed and had an uneventful clinical course. Presumed that any delay in operation could result in major postoperative disastrous complications.

**Conclusions:** Medical staff must be aware of this complication that may result from respiratory bacterial infections. Diagnosis, perioperative care and long term follow up rely on optimization of the nursing process and its timely and accurate management. It is obvious that perfect co-ordination of all medical and nursing staff resulted in successful outcome.

**Key words:** Empyema Thoracis, Parapneumonic Effusion, Thoracic Surgery

### HIGHLIGHTS / KEY POINTS

- Empyema thoracis is a dreaded complication of respiratory infections with a mortality rate between 6-24%.
- 'Organizing phase' is the last stage and may result in a 'trapped- lung' that prevents lung expansion.
- Empyema Thoracis demands a multidisciplinary approach for which staff nurse plays a crucial central role in its proper management and successful outcome.

### INTRODUCTION

Empyema thoracis, is the presence of pus in the pleural space. This surgical entity has been described along with its management since the Hippocratic era. Hippocrates was the first to suggest evacuation of the pus with removal of one or two ribs overlying the pleural cavity. It has been associated with a mortality rate as high as 30%. Nosocomial or community acquired pneumonia has been traditionally recognized as the main etiologic factors. Medical co-morbidities and iatrogenic complications account for the rest of the cases (Table 1). In some cases, however, there is no clear etiology. Parapneumonic effusion (P.E) is the collection of fluid in the pleural cavity as a result of a bacterial infection. Three stages have been described in the natural course of empyema: the exudative, fibrinopurulent, and organizing phases (Andrews et al 1962). Pulmonary interstitial fluid from a lung infection produces the first or exudative phase. Treatment in this stage is with antibiotics. The fluid in this stage, although, is not contaminated. Positive gram stain and/or positive bacterial culture is the major characteristic of the second or fibrinopurulent phase. 'Organizing' is the last stage and may result in a 'trapped- lung' which is the formation of a pleural peel that prevents lung expansion. It may solely lead to respiratory failure irrespective of a concomitant septic condition. The successful nursing care in the management of two patients with empyema thoracis is presented.

### CASE REPORTS

#### Case Report 1

A 79 year old male who was in full occupational activity as a financial counselor in a company, ex-smoker (80p/years). His symptoms started one week ago with a feeling of heaviness in the left hemithorax, generalized malaise and shortness of breath. A fever of 38.5 $^{\circ}$ C was started which was partially falling on paracetamol

tablets. On admission respiratory silence with peripheral crackles on auscultation of the left lung were noticed. Radiography revealed a shadow in the left pleural space. Computerized Tomography was diagnostic of an organized cavity that was consistent with a thoracic empyema (Figure 1). Laboratory exams revealed WBC: 19.500 (P: 85/L: 9/M: 6). Intraoperatively the organized cavity was full of pus (Figure 2) The removal of the empyema wall and the fibrous peel, through a small thoracotomy, released the trapped lung (Figure 3) He had an uneventful postoperative course. Full nursing care was employed.

#### Case Report 2

A 37 year old male self- employed, who had a non smoking history. He had a slight deterioration in movements due to a car accident that happened 5 years ago. His disease started one week ago with a low grade fever that did not fall with antipyretic pills. It gradually progressed to a septic fever (40 $^{\circ}$ C) with shiver and deterioration of the mental status. On admission, he was started on empirical triple antibiotic regimen and Radiography revealed a shadow in the right hemithorax. Computerized Tomography was diagnostic of an organized cavity that was consistent with a thoracic empyema. Laboratory exams revealed WBC: 25.500 (P:79/L:17/M:4) A right thoracotomy was performed. The pus and the pleural peel were thoroughly removed and the lung re-expanded. Postoperative course was uneventful. Nursing management was fully employed for an excellent outcome.

### DISCUSSION

ACCP (American College of Chest Physicians) guidelines propose drainage for patients with moderate or high risk for a poor outcome (Colice et al 2000). Diagnosis is considered when there is pus in the pleural space, thickened parietal pleura, loculated effusion, large PE, and positive cultures. thoracocentesis, chest drainage thoracostomy, thoracoscopic operations and open surgery with lung decortication have all been proposed as curative strategies for empyema. Most agree that the pleural space should be drained in all patients with exudative PE with pleural fluid pH<7.2 and in those who have frank pus as was apparent in our cases. Patients who do not improve should be referred to the surgeon for further management.

#### Key Perioperative Nursing Practices (Table 2)

Staff nurse will assist in the recognition of the complication especially in hospitalized patients as well as the diagnostic process in outpatient setting. This will be achieved through proper laboratory and radiologic examinations. Registered nurse should take every action to relieve stress and emotional instability of these very sick people. Also, should regularly estimate the level of consciousness of the patient by asking selective questions about

**TABLE 1. ETIOLOGY OF EMPYEMAS**

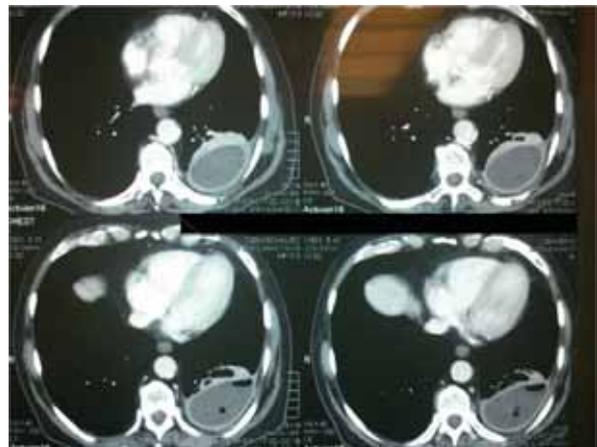
- Pneumonia (Streptococcus, Staphylococcus aureus, Escherichia coli, Haemophilus influenzae, Klebsiella)Trauma
- Iatrogenic Infection
- Thoracic Drainage System, Thoracentesis
- Blood or Lymph dissemination of extrathoracic infection
- Endocarditis
- Mediastinitis
- Esophageal rupture

**TABLE 2. BASIC CONCEPTS OF NURSING CARE**

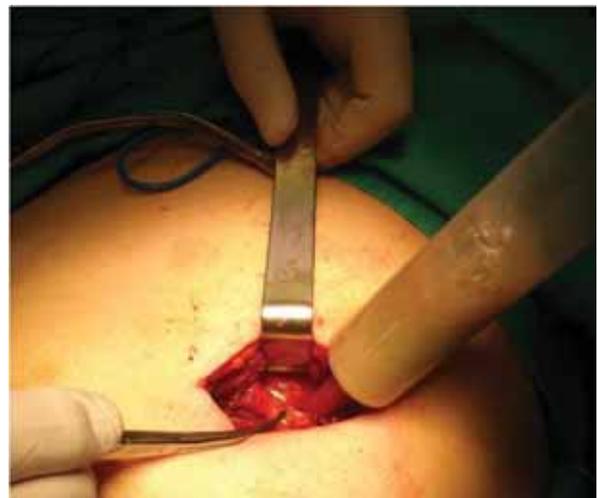
- Patient isolation
- Proper rest and position of the patient on the bed
- Vital signs every 3 hours, mental status
- Symptom oriented treatment
- Antibiotics, pain medication, oxygen therapy, respiratory optimization
- Proper diet and hydration
- Fluid balance
- Smoke cessation
- Respiratory physiotherapy
- Recognition of the etiologic factor
- Prevention of the dissemination of the infection
- Skin and oral hygiene
- Prevention of possible complications (atelectasis, pleural effusion, pulmonary edema, pulmonary abscess, septic shock)
- Keep daily records on the volume, color and biochemistry (pH, LDH, Glucose), of the drainage fluid

personal and other well known information (date, year, time, family, place etc). Also, assess of breath sounds bilaterally should be regularly recorded, especially checking for symmetry of breath sounds. Tube insertion site should be also checked for subcutaneous emphysema. All tubing should be kept free from kinking and fluid-filled dependent loops that can interfere with drainage should be checked. Make sure that the connections are securely taped and that the chest tube is secured to patient's chest wall (Arlene et al, 2006).

Collection apparatus should be kept below the patient's chest level and water seal and suction control chambers should be frequently checked. The water seal level should fluctuate with respiratory effort; this is called tidaling. If it doesn't, the tubing may be kinked or clamped or the patient may be lying on it. Other possible problems



**FIGURE 1**



**FIGURE 2**



**FIGURE 3**

include a fluid-filled dependent loop in the tubing or blocked catheter eyelets. On the other hand if hopefully the lung has reexpanded, the lack of tidaling may be a good sign indicating that no more air is leaking into the pleural space (Arlene et al, 2006).

Promotion of the bed rest should be emphasized, because it helps them to maintain their natural defense. The placement of the patient on the bed is of equal importance. The diseased side must be placed underneath. There should be a daily care of skin and the hygiene of mouth because these participate in the general recovery of health of every patient.

These patients must be isolated in order to prevent the spread of the infection to other patients and to protect them from nosocomial infections. Oxygen administration must be continuously used in very low concentration just to keep an acceptable saturation and aid in patient discomfort.

It is very important to monitor the vital signs of each patient at least every 3 hours (arterial pressure, temperature, the number of breathings/minute, rate, pattern, depth, and ease of respirations-and SpO<sub>2</sub> level every 2 hours or as necessary heart rhythm).

Respiratory optimization during the course of the disease is very important. Bronchodilators and corticosteroids are used along with oxygen and mucolytics. Mucus plugs must be liquefied and removed from the bronchial tree. All specimens must be handled with utmost care and under extremely aseptic conditions. This is imperative to avoid cross infection and it will assist in the timely and correct interpretation. The right regimen is based on the right culture.

Aerobic bacteria predominate in most cases. Streptococcus pneumonia, Staphylococcus aureus, Escherichia coli, Haemophilus influenza and Klebsiella pneumonia are the commonest bacteria isolated from empyemas.

Antibiotic administration should be given to all patients with pleural infection. After cultures and sensitivities are known they can be specified for the etiologic factors. In the early period or in absence of positive culture results intravenous cefuroxime plus metronidazole or intravenous benzyl penicillin plus ciprofloxacin or intravenous meropenem plus metronidazole for community acquired infection are the antibiotics of choice. For oral therapy the proposal is for amoxicillin plus clavulanic acid, or amoxicillin plus metronidazole or clindamycin (Davies et al 2003). In most cases a three week treatment is usually good tolerated and effective.

Chest pain may be an important complication of the disease. Analgesics may be judiciously used. However it is preferably not to administer opioids as analgesia. Splinting of a thoracic incision is a lesson that the patient should be taught for. Pain should be monitored using a pain intensity rating scale. Optimal pain

management can prevent hypoventilation and complications such as atelectasis and pneumonia (Arlene et al, 2006).

Patient should be carefully monitored for a complete diet with good hydration. In some complicated cases this may warrant parenteral intravenous nutrition. Fluid and electrolyte balance is imperative for a perfect outcome. Smoking should not be allowed to patients and traditional or medical methods could be used to quit stop smoking. Influenza vaccine is also indicated in this high risk population.

If staff nurse notices change on the patient's clinical condition, it should be reported immediately to the attending physician in order to prevent any further complications such as atelectasis, lung edema, or septic shock. It is obvious that patients' condition may deteriorate at any time and may lead to complications or even to death.

### CONCLUSIONS

Proper management of empyema thoracis depends on the stage of the disease. The first step is the recognition of the presence of fluid in an otherwise uncomplicated pulmonary infection. This is usually accomplished through the anteroposterior and profile chest x-ray but it demands a high level of suspicion even if the clinical signs are not indicative. Once pleural fluid is suspected, it should be accurately diagnosed in regard its quantity and nature by Computerized Tomography. This will give information regarding the underlying pulmonary and pleura substrate. Patient history may be or may not be indicative of other pathologic conditions that may be accompanied with pleural fluid such as lung cancer, autoimmune diseases as well as liver, renal and heart failure. Empyema Thoracis demands a multidisciplinary approach for which staff nurse plays a crucial central role in its proper management and successful outcome.

### CONFLICT OF INTEREST:

none

### AUTHORS' CONTRIBUTIONS

MH, EK and KH considered and designed the study. PH and SM provided the medical archives and DM drafted the manuscript. All authors offered critical input and revisions on drafts of the manuscript, and approved the final version.

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