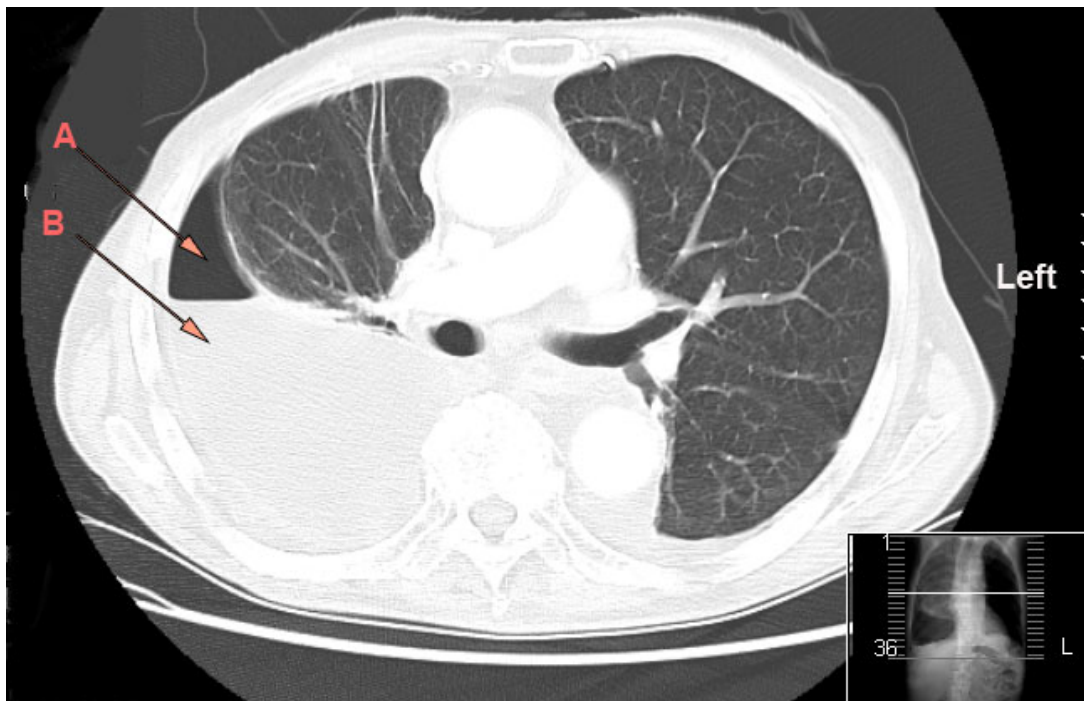


## Empyema and Pleural Thickening — Symptoms and Treatment

[See online here](#)

**Pleural thickening, diffuse pleural thickening (DPT), is a result of severe inflammation of the pleural sheets, a thin membrane that covers the lungs, leading to the consolidation of the tissue due to a specific scarring. One of the causes of the condition is empyema that develops when pus builds-up in the space between the lung tissue and pleural space (the inner surface of the chest wall). With the advance of the scarring, the lungs may be encapsulated with the thick tissue, with the further disappearance of the natural space between the pleural cover and the lungs. The after-effect of this condition is a reduction of total lung capacity (TLC), thus, the deterioration of respiratory function and hemodynamic disorders due to growing hypoxemia.**



### Definition and Background of Empyema

**Other names for this condition are Empyema — plural; Pyothorax; Pleurisy — purulent**

Pleural effusion is frequently found in the patients with [pneumonia](#) and is considered as a **common complication of the lungs infections**, accounting for 40 % of all bacterial pneumonia and 60 % of pneumococcal respiratory ways infections. Parapneumonic pleural effusions are grouped according to the qualitative features of the pleural exudate.

Pleural thickening may be divided into two basic groups: **non-malignant pleural diseases affecting the outer lining of the pleura (diffuse pleural thickening-DPT) and pleural plaques**. The most common cause of this pathology is asbestosis. It is an irreversible condition, commonly complicated if untreated with the development of mesothelioma.

## Etiology of Empyema

**Bacterial, viral, atypical pneumonia may become the reasons** for the pleural effusion of various degrees. Mycoplasma and viruses are responsible for 20 % of pleural complications, though 70 % of such conditions are the after-effects of bacterial invasion.

**Thoracic surgery may lead to pleural effusion**, these cases make up 30 % respectively.

**Various traumatic agents may cause exudate of extra fluids** into the pleural space. Unfortunately, surgery may be complicated by secondary infection with *Staphylococcus aureus* as a rule.

### **Comorbidities associated with bacteremia responsible for the pleural effusion:**

- Subdiaphragmatic abscesses
- A ruptured esophagus due to primary traumatizing and tumor growth
- Mediastinitis of various genesis
- Osteomyelitis
- [Pericarditis](#)
- [Cholangitis](#)
- [Diverticulitis](#)
- Infections

Prior to the era of antibacterial cure, the pleural effusion was fraught with lethal outcome, the most common causative factor for that were *Streptococcus pneumoniae* and *Staphylococcus aureus*, aerobic Gram-positive cultures; *Klebsiella*, *Pseudomonas*, and *Haemophilus* species have often been found nowadays, as well as *Bacteroides* and *Peptostreptococcus* species.

Currently, empyema thoracis is **most often associated with aspiration pneumonia** with mixed bacterial flora containing aerobic and anaerobic bacteria. Hence, empyema thoracis is commonly linked with aspiration pneumonia reflecting mixed bacterial flora containing both aerobic and anaerobic bacteria.

### **The causes of pleural thickening:**

- Empyema – pus buildup in the pleural space
- Hemothorax – blood in the pleural space
- Fibrinous pleuritis – a form of pleural inflammation
- [Pulmonary embolism](#) – a main artery to the lungs blockage

## Epidemiology of Empyema

### USA

The rate of hospitalization of patients with empyema grew by 70 % in recent years in the US, thus, 1.3 million people undergo inpatient treatment with this diagnosis that makes up to 40 % of all patients with bacterial pneumonia or anaerobic pneumonia, 60 % of that

is referred to pneumococcal pathogens. Moreover, from 5 to 10 % of all patients admitted with pleural effusion require drainage of the exudate.

Children are at a higher risk than adults regarding this complication of the lower respiratory tract infections; however, there is no gender and racial predisposition regarding empyema.

## Internationally

Annually, pleural effusion in the form of empyema takes about 4,2 million lives worldwide due to the various factors, mainly the absence of an adequate medication and timely health provision. Pleural thickening affects incomparably more males than females (724 to 53 cases only).

## Physical Examination of Empyema

### History

The patients with [bronchiectasis](#), [rheumatoid arthritis](#), [alcoholism](#), [substances consumption](#), [diabetes](#), immune-compromised conditions-[HIV-AIDS](#) sufferers and [gastroesophageal reflux disease](#) tend to develop pleural effusion with consequent empyema. In addition, a history of **[chronic obstructive pulmonary disease \(COPD\)](#)** may lead to a predisposition to inflammatory conditions in the lungs and pleural effusion as an outcome.

### Presentation

#### Symptoms of empyema

- [Fever](#)
- [Tachypnea and tachycardia](#)
- Intoxication associated the systemic inflammatory response syndrome (SIRS)
- Weak or absent breath sounds
- Percussion produces dull sound in the place of the filled with pus pleural cavity.
- Tension and contralateral tracheal shift due to massive effusion
- Tactile fremitus lowered, as the symptoms of respiratory failure exacerbate, there may be cyanosis, and neck vein pulsation.

#### Auscultation

- Numb lung, surrounded with crackles above the area of empyema

#### Symptoms of pleural thickening:

- Breathlessness
- Feeling of tightness in the chest
- Chest pain, increasing with physical load
- As the process of scarring advances, there may be a reduction of TLC

## Differential Diagnosis of Empyema

# Empyema

- Aspiration pneumonitis and [pneumonia](#)
- Bacterial pneumonia
- [Boerhaave syndrome](#)
- Community-acquired pneumonia (CAP)
- Fungal pneumonia
- Hemothorax
- Lung abscess
- [Pleural effusion](#)
- Non-small cell [lung cancer](#)
- Peritonitis and abdominal sepsis
- Pleurodynia
- Pneumococcal infections
- Secondary lung tumors
- Small cell lung cancer
- [Tuberculosis](#)

## Pleural thickening

- [Asbestosis](#)
- [Sarcoidosis](#)
- Malignant tumors
- Autoimmune diseases

## Diagnosis of Empyema

### Aerobic pathogens

A complicated parapneumonic effusion is associated with a fever that lasts for over 48 hours after the administration of antibiotic therapy. The onset of the aerobic bacterial pleural space infection is similar to that of patients with common bacterial pneumonia: **a cough producing plentiful phlegm, fatigue and flu symptoms.**

### Anaerobic pathogens

The symptoms last for 7 days or so, they have a subacute flow, accompanied by a significant weight loss (60 %). Patients with anaerobic bacterial infections involving the pleural space usually present with a subacute illness. Most of the patients follow a social lifestyle and violate hygienic rules in their household.

### Laboratory studies

- CBC reveals leukocytosis that is ( $> 12,000/\mu\text{L}$ ), in immunocompromised individuals anemia, ESR over 25 mm/h
- Thoracentesis; obtaining some biomaterial (pleural exudate)

### Pleural exudate examination

Uncomplicated parapneumonic effusions are **characterized by neutrophilic effusions coupled with increasing passage of interstitial fluid** that is stipulated by the

inflammation affiliated with pneumonia. The laboratory test reveals no bacteria in the somewhat opaque pleural exudate; it does not require drainage for the resolution.

Complicated parapneumonic effusions are a reflection of inflammatory progression in the lungs, namely **bacterial invasion into the pleural space**. This condition is marked by the presence of neutrophils, low glucose levels, acidosis of the pleural fluid, an increase in lactic dehydrogenase (LDH) concentration in the cloudy exudate. Bacteria do not filtrate into the exudate hence require drainage for resolution. Pleural fluid pH less than 7.20 regarded to a complicated pleural effusion.

Empyema thoracic is a **pus buildup in the pleural space**; the fluid obtained after thoracentesis is thick, viscous, and cloudy with numerous microorganisms in the smear. An LDH is greater than 1000 U/L, a pH is less than 7.00, and a glucose level is less than 40 mg/dL.

Serum laboratory tests are informative in parapneumonic effusion while differentiating an exudate from transudate: **considering the correlation between total protein and lactic dehydrogenase (LDH)**.

Transudates: leucocytes counts of less than 1000 cells/ $\mu$ L and empyemas are exudates, with WBC counts generally greater than 50,000 cells/ $\mu$ L.

Pleural fluid microflora studies /Microbiology (Gram stain, bacterial culture)

## Imaging studies

**Chest X-ray examination** reveals pleural thickening and the level of liquid in the pleural space.

**Ultrasonography** is informative while detection of fluid in the pleural, cavity for a thoracentesis.

**CT scanning of the thorax** with contrast helps to enhance the pleural surface and provides the opportunity in delineating the pleural fluid locations.

## Staging of Empyema

### Pleural effusion

- Uncomplicated parapneumonic effusions
- Complicated parapneumonic effusions
- Empyema thoracis

## Management of Empyema

Long-term monitoring is compulsory in patients with empyema and pleural thickening as the outcome of neglected patients may be irreversible and frequently lead to death. A diet **rich in vitamins and proteins and a healthy lifestyle** is contributing factors to the improvement of the patients with empyema. Those who suffer from asbestosis and pleural thickening are recommended to change their occupation.

## Pharmacotherapy

**Antibacterial therapy** is prescribed according to the stage of the disease and the pathogenic agent caused the illness, moreover, the ways of antibiotics intake depends on the severity of the disease.

**Fibrinolytic agents:** Alteplase helps to revive the blood flow through the vessels that were previously occluded due to the compression with pus.

**Mucolytic agents:** Dornase Alfa softens the passage of sputum with an increased viscosity that is produced by the large amounts of neutrophil-derived DNA released from dead neutrophils.

## Surgical intervention

Surgical intervention is directed on the removal of the pus exudate into the pleural cavity and incision of necrotized tissues of the lungs and pleura.

- **Thoracoscopy** is an alternate method of treatment for multiloculated empyema thoracis.
- **Thoracotomy** in severe cases of empyema
- **Rib resection** and open drainage of pleural space
- **Decortication** is administered in the uncontrolled case of empyema.

## References

[Pleural Thickening and Asbestos](#) via asbestos.com

[Parapneumonic Pleural Effusions and Empyema Thoracis Treatment & Management](#) via emedicine.medscape.com

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[Empyema Thoracis](#) via ncbi.nlm.nih.gov

[Treating Pleural Thickening](#) via pleuralthickening.org.uk

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