

REVIEW ARTICLE

Surgical Management of Empyema

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HISTORICAL BACKGROUND:

Thoracic surgery as a specialty had its beginning in the surgical treatment of pulmonary tuberculosis and its pleural space problems¹. This began with using sand bags and positioning of patients with the diseased side down. Fowler (1893) and Delorme (1894) were the first physicians to describe how to free the entrapped lung and in 1886 Delorme first used the term decortication². Decortication departed from the classic approach of aspiration, open drainage and Thoracoplasty for the treatment of chronic empyema³. More than 50 years from its inception decortication of the lung in the treatment of chronic empyema was finally established³⁻⁴.

PRINCIPLES OF MANAGEMENT:

As for pus collection anywhere in the body, the principles of management are to drain the pus, obliterate the space and treat the infection. Best tissue to obliterate the space is to get the lung to expand, fill the chest cavity. For the lung to expand constricting fibrous peel over the lung and constricting thickened parietal pleura have to be removed. This is decortication whether open or VATS. If the lung fails to expand, then either the space has to be obliterated by a space obliteration procedure, or permanently drained via a stoma/ Eloesser. Pros & Cons, indications & limitations of each procedure are detailed below⁵.

TUBE THORACOSTOMY:

Acute thoracic empyema is usually an extension of pulmonary infection. Adequate dependant drainage of an acute exudative empyema can be provided by chest tube with closed water seal drainage and suction⁶. However if the tube is positioned improperly or if the collection has progressed to a stage in which it has become semisolid (Fibrino purulent), the drainage will be incomplete. Closed chest tube drainage is the first step in the treatment of acute empyema⁷. It is rightly effective in treating uncomplicated Para pneumonic effusions and classic empyema without loculation⁸. After placement, underwater seal drainage with moderate suction (-10cm H2O) is then applied to drain the purulent fluid and obliterate the space. When this approach is successful, clinical improvement is generally noted within 48 to 72 hours. Chest radiography reveals evacuation of fluid and re-expansion of the lung. Drainage should progressively decrease and the fluid should clear⁹. When the drainage has decreased to 50ml in 24 hrs period and the lung has expanded, the chest tube can be removed. This usually occurs within 5 to 10 days. The success of closed drainage depends primarily on the state of empyema when treated¹⁰⁻¹¹.

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FIBRINOLYSIS:

Thoracostomy tube may provide incomplete drainage of thick pus. Loculation of empyema cavities is produced by membranes composed of fibrin¹²⁻¹³. Fibrinolytic agents can be used to dissolve these membranes. Streptokinase and streptodornase instilled into empyema pockets, dissolve and breakup loculations and aid in the drainage of thick pus. Significant systemic reactions are often associated with the use of these enzymes¹⁴. More recently streptokinase has been purified and it along with urokinase which is not as allergenic has been found useful. These agents are efficient debriding agents. Success rate upto 80% the use of streptokinase in patients with loculated empyema despite the fact the only small catheters were used for drainage¹⁵. The enzyme is instilled into the empyema cavity through the chest tube while the patient is in decubitus position, empyema side up. Streptokinase (250000 U) mixed in 100ml of normal saline is injected via syringe through the tube. The procedure is repeated daily. Fibrinolytic therapy is valuable adjunct to chest tube drainage and despite the cost urokinase may be desirable because of local systemic reactions to streptokinase¹⁶⁻¹⁷.

DECORTICATION:

VIDEO ASSISTED THORACOSCOPY: Video assisted thoracoscopy (VATS) has become the primary modality for treating complicated empyema after initial treatment with or without chest tube drainage¹⁷⁻¹⁸. VATS allows better adhesiolysis and debridement with better exposure. Decortication for lung expansion before fibrosis, can be accomplished with equal facility. Although chest tube drainage combined with enzymatic debridement is effective, VATS therapy results in higher success rate (90%) shorter hospital stay and less cost¹⁹. In early case a fairly effective decortication can be accomplished. Once the peel has become thick and well organized decortication is much more effectively done by open thoracotomy²⁰.

OPEN THORACOTOMY:

The key to restoring good health to a patient with thoracic empyema is thorough cavitory debridement with removal of all pus and necrotic tissue and re-expansion of healthy lung to fill the pleural space. Controlling any residual pulmonary disease and removing any constricting tissue that prevent full expansion are therefore important considerations²¹⁻²². Decortication is successful when the fibro elastic peel that traps the lung leaves the visceral pleura relatively normal and the lung itself expandable so that the empyema space can be obliterated by pulmonary re-expansion when the peel is removed²³. Best results are obtained with decortication in the early chronic phase of empyema secondary to pneumonia or traumatic Pneumothorax²⁴. Decortication has also proved extremely successful in children. However this is a major procedure which may be unsuitable in frail and elderly patients. Decortication is contraindicated in major bronchial obstruction, pulmonary destruction, uncontrollable sepsis, contra lateral disease, chronic debilitation or prohibitive concomitant organ system dysfunction. Fibrothorax must be differentiated from Mesothelioma and malignancies metastatic to pleural space²⁵.

SPACE OBLITERATION PROCEDURES:

THORACOPLASTY:

If the lung does not expand to the chest wall, then collapse therapy can bring the chest wall to the lung or mediastinum. There are three basic types of thoracoplasty³⁰. The conventional Thoracoplasty (Alexander) involves the subperiosteal, extrapleural, posterolateral resection of sufficient ribs to obliterate the intrathoracic space. Thoracoplasty does obliterate the intrathoracic space very successfully and permanently controls the empyema. It also often closes a Bronchopleural fistula. The overall success rate of thoracoplasty in eliminating thoracic space problem is 73%³¹. The major disadvantage of an extensive Thoracoplasty is the disability that occurs postoperatively. The immediate physiologic sequelae are the development of a paradoxical motion of the chest wall. If the mediastinum was mobile, Mediastinal flutter occurs. The cough mechanism is reduced as a result of inability to generate a high positive pressure. The late physiologic changes are skeletal deformities³².

MUSCLE TRANSPOSITION:

Although plombage is now of only historic significance, the concept of filling the pleural space led to transposition of chest wall muscles into a chronic empyema cavity. Muscle is an ideal tissue to place in a contaminated space because it obliterates the space and its rich blood supply not only resists infection but helps to control it³¹⁻³³.

The latissimus dorsi, pectoralis major, pectoralis minor, serratus anterior and rectus abdominal muscles and the omentum can be rotated singly or in combination to obliterate any residual pleural space. An interesting new development is the use of intrathoracic free flaps using microvascular techniques³⁴.

ELOESSER FLAP:

The Eloesser flap was devised to provide tubeless drainage of a loculated space within the pleural cavity or entire pleural space for a post Pneumonectomy empyema. The procedure as originally conceived by Eloesser was designed to produce a one way valve allowing pus to drain but not allowing the ingress of air, thus maintaining the pleural negative pressure while allowing drainage of the pleural space without a tube²⁵⁻²⁶. The procedure made a U shaped skin incision producing a skin flap that is based towards patient's head. A segment of rib is resected over the most dependent portion of the empyema cavity. The skin flap is folded into the opening and sutured to the pleura so that the drainage site through the chest wall is lined by skin on the upper half of the tract²⁷. Any loculation are broken down and fibrinous debris removed. The wound is packed to debride the empyema space and to keep the tract open until the pleural space is obliterated²⁸. The packing is changed daily with wet to dry dressing using saline or Dakins solutions. However it may take many months until the cavity is obliterated. In many of these patients Thoracoplasty or muscle flap can be used to obliterate the cavity and attain early healing²⁷⁻²⁹.

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