Empyema

15

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Paediatric empyema is usually secondary to an underlying pneumonia. *Streptococcus pneumoniae* continues to be the main causative organism. Other organisms include Group A *Streptococcus, Streptococcus viridans*, *Streptococcus anginosus, Staphylococcus aureus*, *Haemophilus influenzae*, *Streptococcus milleri*, and the anaerobic *Peptostreptococcus*. The incidence of paediatric thoracic empyema is increasing globally, and is estimated to be 3.3 per 100,000 children. The highest reported incidence occurs in children under the age of 5 years (53%). The resulting untreated effusion progresses through three stages: exudative, fibropurulent, and organization. Prompt medical management may halt the progression.

15.1 Diagnosis and Treatment Options

The initial investigations include blood cultures, radiograph, and chest ultrasound. Computed tomography (CT) scans of the chest are reserved for complicated patients. The mainstay of treatment includes intravenous antibiotics for sepsis control, and drainage of the effusion to improve lung expansion. If initial medical management fails, then surgical intervention is necessary. The use of intrapleural fibrinolysis (urokinase, tissue plasminogen activator) via a chest drain can produce good results. The surgical options include thoracoscopic debridement, mini thoracotomy and debridement, and thoracotomy with decortication. Thoracotomy and decortication is reserved for advanced and chronic cases.

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15.2 Operative Procedures

15.2.1 Thoracoscopic Debridement

General anaesthesia with central endotracheal intubation is used. Single-lung ventilation is unnecessary. The instruments used include a 5-mm, 0-degree thoracoscope; straight and curved graspers; a suction irrigation set; three 5-mm ports (blunt trocars); and a 16 Fr chest drain.

The patient is positioned laterally on an axillary roll with the affected side up. The surgeon stands towards the patient's back with the stacking system and monitor opposite. The first 5-mm port is inserted bluntly into the intercostal space anterior to the inferior angle of the scapula (Fig. 15.1). Local anaesthetic is infiltrated into the skin and muscles prior to port insertion.

A 5-mm suction device is inserted next, to aspirate as much of the effusion as possible in order to create some working space (Fig. 15.2). A pneumothorax of 6 mm Hg with flows of 1.5 L/min is established.

The second 5-mm working port is inserted under direct vision, in a location so as to give good access to the fibrin peel and septations (Fig. 15.3). The fibrin septations are broken down bluntly and are removed via the working port. The fibrin peel should be removed from the surface of the lung and diaphragm (Fig. 15.4). The result should be good lung expansion.

Any residual blood and effusion should be aspirated, and a 16 Fr chest drain is inserted via one of the ports. The ports are removed; it is not necessary to close the muscle at the port site. The skin can be closed with either sutures or skin glue.

Postoperatively, the chest drain is left on free drainage and a chest x-ray is done the following day. The chest drain is removed when the output is minimal and a chest x-ray shows no reaccumulation of the effusion. Oral antibiotics (co-amoxiclav) are continued for 4 weeks postoperatively.

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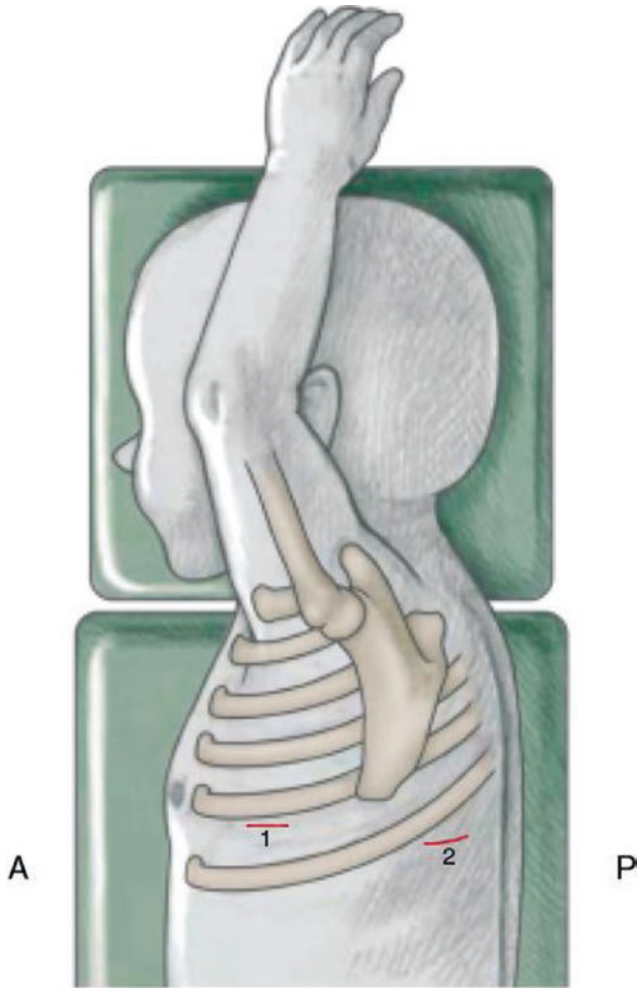

Fig. 15.1 Patient positioning and port placement for thoracoscopic debridement

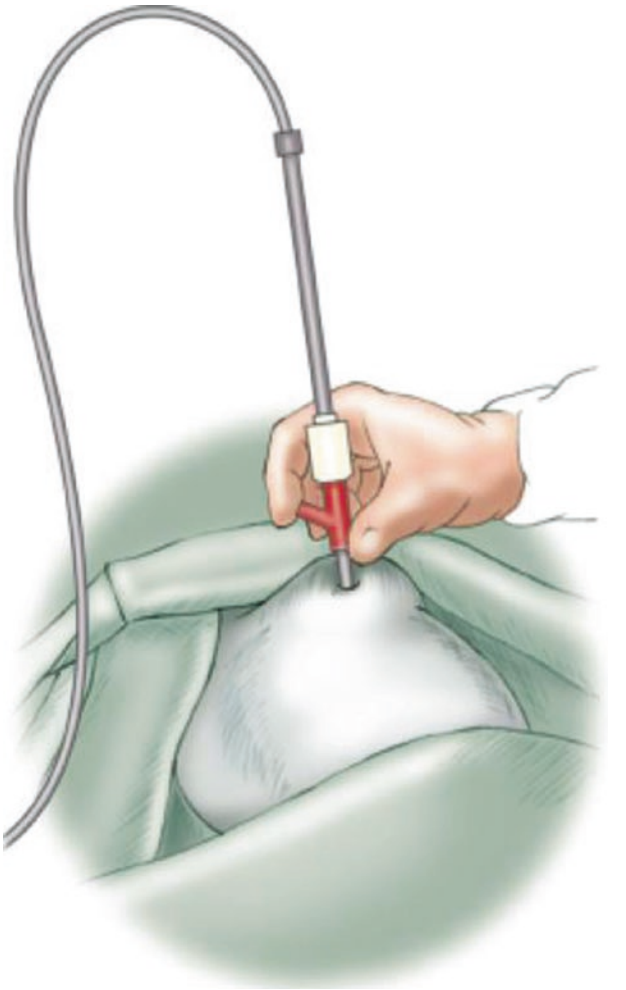

Fig. 15.2 Suction device inserted to aspirate the effusion

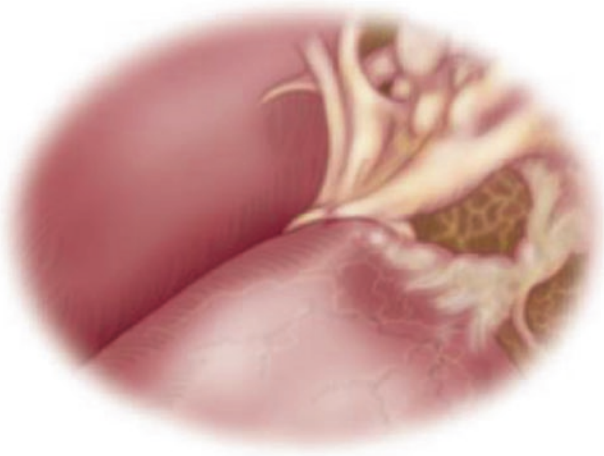

Fig. 15.3 The fibrin peel and septations

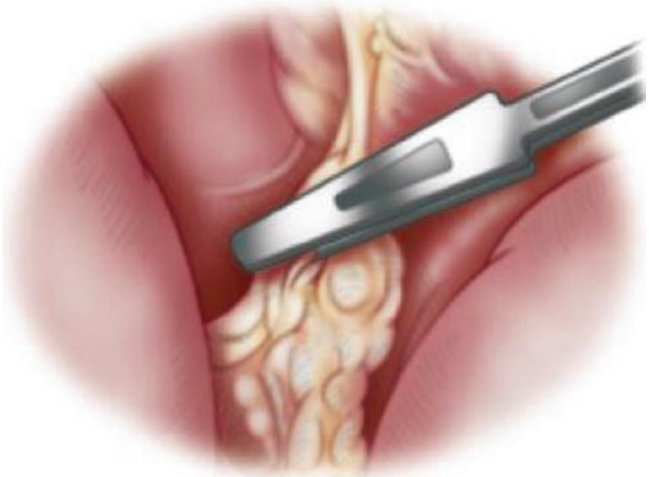

Fig. 15.4 Removal of the fibrin peel

15.2.2 Mini Thoracotomy

Mini thoracotomy is indicated in early empyema when fibrinolysis or thoracoscopic debridement is not available. The patient is positioned as for a thoracoscopic debridement. A 3- to 5-cm transverse incision is made between the anterior and posterior axillary lines over the 5th or 6th intercostal space (Fig. 15.5).

The anterior border of the latissimus dorsi muscle is retracted posteriorly, and the serratus anterior muscle is split (Fig. 15.6). The intercostal muscles are divided with monopolar diathermy and the pleura is opened. The effusion is aspirated and the fibrous peel is removed from the surface of the lung.

Once the lung is re-expanded, a 16 Fr chest drain is inserted and the chest muscles and skin are closed.

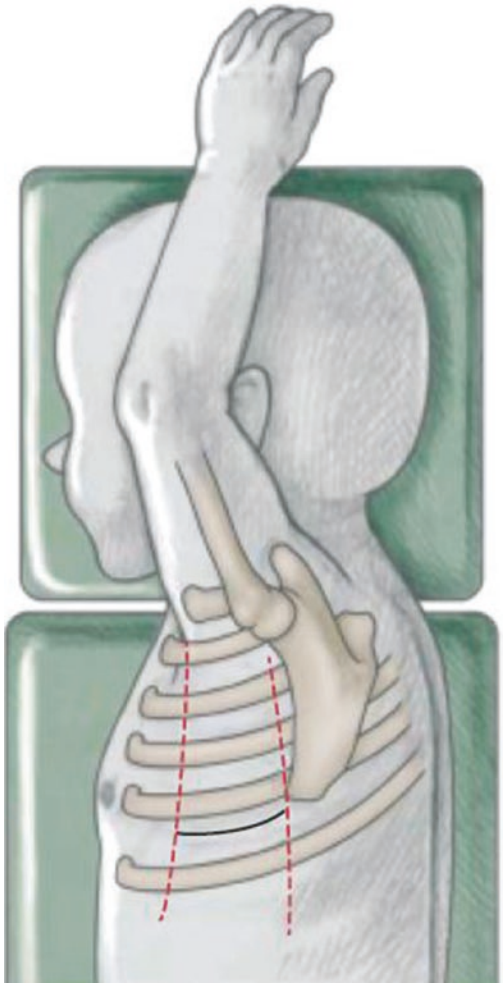

Fig. 15.5 Location of the transverse incision for a mini thoracotomy

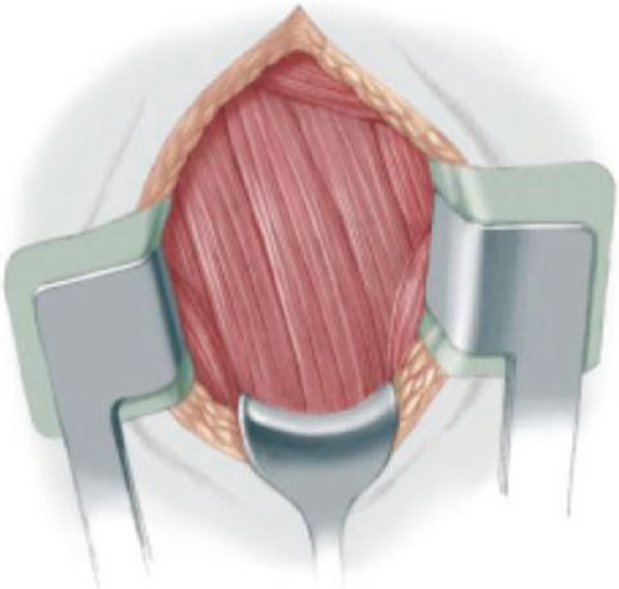

Fig. 15.6 Splitting of serratus anterior muscle

15.2.3 Thoracotomy and Decortication

Thoracotomy and decortication procedure is indicated in patients with advanced empyema, failed fibrinolysis, and bronchopleural fistula.

The patient is positioned as for a thoracoscopic debridement. A 5-cm transverse incision is made between the anterior and posterior axillary lines over the fifth or sixth intercostal space.

The latissimus dorsi and serratus anterior muscles are divided with monopolar diathermy.

The fourth or fifth rib is excised subperiosteally and the pleura is entered (Fig.15.7). The effusion is aspirated.

The loculations are broken down and the thick fibrous peel is removed from the surface of the lung. It is important to debride the interlobar fissures and release the lung from the diaphragm.

Once the lung re-expands, one or two 16 Fr chest drains are inserted. The inner layer of the periosteum is closed with an absorbable suture and the muscles are closed in layers.

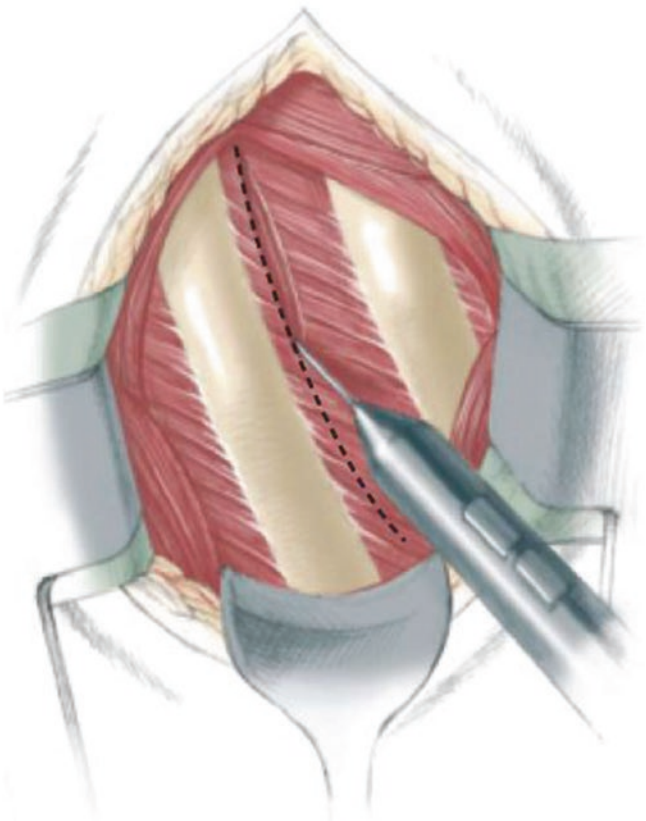

Fig. 15.7 Entry into the pleura

15.2.4 Serratus Anterior Muscle Flap

The serratus anterior muscle can be used to seal a bronchopleural fistula. After the latissimus dorsi is divided, a digitation of the serratus anterior muscle is detached from its anterior insertion and mobilised on its posterior blood supply (Fig. 15.8). After decortication of the lung, the muscle flap is inserted via an adjacent intercostal space and loosely sutured to the open bronchopleural fistula (Fig. 15.9). Chest drains are inserted and the chest closed as above.

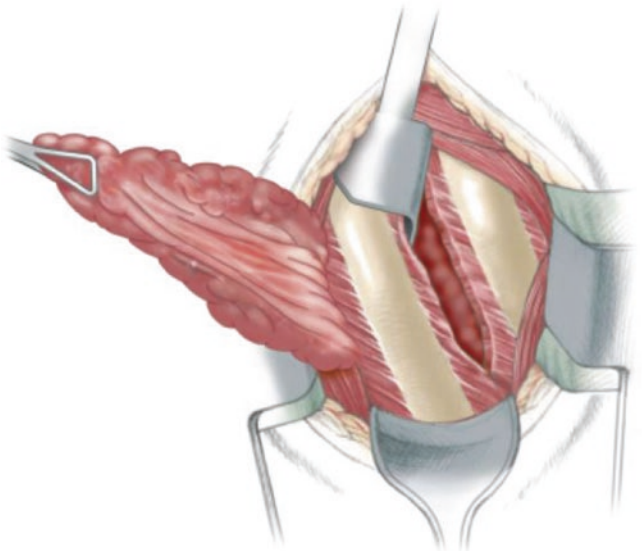

Fig. 15.8 Mobilising a flap of the serratus anterior muscle

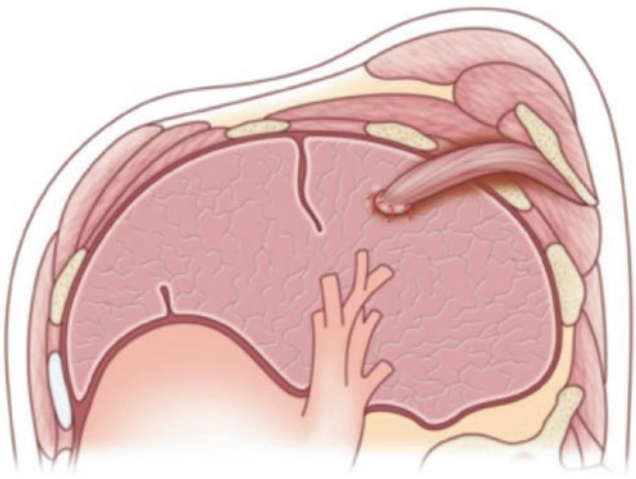

Fig. 15.9 Suturing of the muscle flap to the bronchopleural fistula

Conclusions

Early diagnosis and treatment of the postpneumonic effusion will result in a better outcome. If the effusion is not improving with intravenous antibiotics, then early referral to a paediatric surgical centre is recommended. The early use of drainage and either intrapleural fibrinolysis or thoracoscopic debridement of the empyema can result in resolution in most patients. Thoracotomy and decortication is the procedure of choice if empyema is advanced or complicated.

Suggested Reading

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