Case report - Thoracic non-oncologic

Non-surgical closure of post-pneumonectomy empyema with bronchopleural fistula after open window thoracotomy using basic fibroblast growth factor

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Abstract

Empyema with bronchopleural fistula (BPF) is one of the severest complications following pneumonectomy. Many papers have reported that it is difficult to cure, with a high rate of associated mortality. Closure of the fistula and an appropriate choice of obliteration materials are crucial for successful treatment. However, obliteration is sometimes impractical because of a lack of suitable materials, excessive surgical risk, or lack of patient willingness to undergo the procedure. We report a case of post-pneumonectomy empyema with BPF that was treated by non-surgical closure after open-window thoracotomy (OWT) with the use of basic fibroblast growth factor (bFGF), which was sprayed into the unepithelialized empyema cavity transiting from epidermis and surrounding the fistula. After spraying, the orifice of the OWT was covered by a film dressing. This procedure yielded successful results after two months.

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1. Introduction

Post-pneumonectomy empyema is a severe complication of thoracic surgery, and most cases are associated with bronchopleural fistula (BPF). The treatment strategy for empyema with BPF consists of closure of the fistula and obliteration of the empyema cavity with one of a choice of fillings. Radical surgery can be accomplished by two procedures: single-stage closure, or obliteration after open-window thoracotomy (OWT) [1–3]. For obliteration of the empyema cavity following OWT, the materials used are usually omentum and local chest wall muscles overlying the cavity, abdominal wall muscles, or other vascularized muscles (e.g. an anterolateral thigh flap [4]). However, various conditions often prevent radical surgery. Here, we report a case of post-pneumonectomy empyema with BPF after OWT that was managed using basic fibroblast growth factor (bFGF) and a film dressing.

2. Case

A 68-year-old man was diagnosed as having sigmoid colon cancer at the age of 61 years, and underwent sigmoid colon resection and lymph node dissection. Metastatic lesions in the lung were detected later, and therefore the patient underwent left pneumonectomy. High fever was observed a month after the operation, and the patient was diagnosed as having empyema by bacterial culture of a thoracocentesis sample. Chest tube drainage and drip infusion of antibiotics were started immediately, and OWT was subsequently performed. Surgery revealed a bronchial fistula approximately 4 mm in diameter. Daily packing for one month resulted in clearance of the pleura and good granulation (Fig. 1a). Although the contralateral latissimus dorsi was considered as a material for obliteration of the fistula, the patient expressed a desire not to undergo any further surgical procedures. Because the stump of the left main bronchus was close to the edge of left main pulmonary artery, we considered that endobronchial procedures carried a high risk of damage to the artery. Therefore, we selected ex-bronchial techniques, but the use of fibrin glue and other covering agents failed to close the fistula. As there was no apparent evidence of recurrence or local residual tumors, we tried to encourage epithelialization and granulation by repetition of the closing package procedure daily or every other day (Fig. 2).

The procedure involved initial debridement of the empyema cavity and washing with 100 ml of normal saline, if necessary. This was followed by spraying of basic fibroblast growth factor (bFGF; up to 30 μg) into the unepithelialized empyema cavity transiting from epidermis and surrounding the fistula. Finally, a film dressing was laid over the open window and fixation from outside was added. When significant discharge was observed, some gauze was softly located into the empyema cavity to absorb the effusion. If evidence of severe sepsis was observed, such

were performed until the infection became stable. This procedure was continued until the entire empyema cavity was covered by skin. The fistula was successfully covered by good epithelium and granulation tissue two months after the start of the closing package procedure, without any sign of instability or aspiration pneumonia from the fistula to the right lung. The patient was able to wash the skin that covered the empyema cavity daily. Two years after pneumonectomy, the cavity was completely epithelialized (Fig. 1b) and the patient was well without any recurrence of the empyema or metastasis from the colon cancer. He is now enjoying a normal life, including bathing and travel.

3. Discussion

Post-pneumonectomy empyema with BPF is a very severe complication of thoracic surgery and still has high rates of associated mortality and morbidity [5, 6]. Various complications can compromise survival, such as ARDS, aspiration pneumonia, respiratory dysfunction, infection, or destruction of the vascular stump. Single-stage closure or obliteration following OWT is usually selected as the treatment strategy. However, some conditions occasionally prevent radical surgery for post-pneumonectomy empyema with BPF, such as a lack of suitable materials for obliteration, an excessively high risk of surgery or general anesthesia, or unwillingness of the patient to undergo the surgical procedure. In such cases, one strategy is conservative therapy. Ben-Nun et al. reported non-surgical treatment for post-pneumonectomy empyema using continuous soft tube drainage with intrapleural fibrinolysis and antibiotics, and considered that initiation of a normal healing process was important [7]. bFGF promotes epithelialization and granulation at the time of wound healing [8]. Wound healing and pressure around the fistula are very important factors affecting the outcome of non-surgical closure of BPF after pneumonectomy. Control of endobronchial pressure after OWT is difficult. Traditionally, daily gauze packing may achieve a certain degree of pressure control, but we consider that a strong packing of gauze into the empyema cavity may compromise the microcirculation and wound healing. In the present case, we tried to encourage wound healing using bFGF, and took care not to damage the epithelial cells, thus allowing the BPF to be closed conservatively. Pressure within the empyema cavity was adjusted using a film dressing. Fixation of the film dressing from outside made it easy to maintain stable pressure within the empyema cavity.

Some non-surgical procedures for closure of BPF have been reported, including the use of ethanol silver nitrate, cyanacrylate compounds, coils, lead plugs, balloons, fibrin or tissue glue, antibiotics, gel foam, spigots, and an autologous blood patch [9]. Our strategy for empyema with BPF consists essentially of infection control, closure of the fistula, and obliteration or reduction of dead space. Although the present case was an isolated one, conservative closure using bFGF and a film dressing appears to be a potentially useful non-surgical procedure.

References

Fig. 1. (a) Empyema cavity after open-window thoracotomy. White arrow shows bronchial fistula. (b) Two years later, black arrow shows the scar of the bronchial fistula.

Fig. 2. The closing package procedure involved initial debridement of the empyema cavity and washing with 100 ml of normal saline, if necessary. This was followed by spraying of basic fibroblast growth factor (bFGF; up to 30 μg) into the unepithelialized empyema cavity transiting from epidermis and surrounding the fistula. Finally, a film dressing was laid over the open window. When significant discharge was observed, some gauze was pressed into the empyema cavity to absorb the effusion. If evidence of severe sepsis was observed, normal daily packing and anti-infection therapy were performed until the infection became stable. This procedure was continued until the entire empyema cavity was covered by skin.

as WBC >12,000/μl or a fever of over 38 °C, or if aspiration pneumonia from the left empyema cavity was evident on chest X-ray, normal daily packing and anti-infection therapy were performed until the infection became stable. This


