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A novel technique for bronchopleural fistula closure: An hourglass-shaped stent

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Bronchopleural fistula (BPF) occurs in 4.5% of the patients having pneumonectomy.¹ It often causes life-threatening complications that delay the appropriate management of the underlying malignant or infectious disease. Small fistulae tend to close spontaneously with conservative management; however, larger ones usually require re-exploration, sometimes necessitating repeated and complex procedures. In recent years, there have been anecdotal reports on the closure of BPFs by stenting.²⁻⁴ In this article, we describe a novel technique involving the use of an hourglass-shaped tracheobronchial stent for the immediate closure of BPF.

TECHNIQUE AND COMMENT

In the case of a BPF, urgent drainage of the pleural cavity, together with appropriate antibiotic treatment, prevents the aspiration of infected material into the contralateral lung and is therefore mandatory to achieve infection control at the time of admission. Bronchoscopy should be undertaken at the earliest time possible to evaluate the bronchial stump and the size of the fistula. Management options are decided depending on not only the bronchoscopic findings but also the patient's general condition and underlying disease. We always prefer rigid bronchoscopy under general anesthesia concomitantly with drain revision and/or other drainage techniques, which depend on the further management plan. Removal of infected debris and cleaning of the empyema cavity with daily packing or irrigation are required for the

local control of infection. However, irrigation, when indicated, carries a risk of aspiration and is poorly tolerated by patients with a large fistula.

Furthermore, depending on the size of the fistula and the patient's preoperative respiratory functions, a BPF may have varying degrees of detrimental effects on respiration. Therefore, early closure of a BPF is essential but challenging in some patients in whom surgical intervention cannot be undertaken. In recent years, there have been anecdotal reports on the use of various types of stents for fistula closure.²⁻⁴ However, these reported techniques require the localization of the stents in the main airway and are therefore accompanied with increasing risks of potential complications of stenting.⁵

In our technique, which has been undertaken in 3 patients, a covered, distal-release, tracheobronchial stent (Tracheobronxane Silmet; Novetech La Ciotat Cedex, France) was placed in the bronchial stump. The applicability of stenting in a given case was determined during bronchoscopic evaluation; stenting was considered appropriate when the fistula was larger than 5 mm in diameter, because this diameter was required for the advancement of the introducer through the fistula into the chest cavity. The stent was withdrawn via the previous open-window thoracostomy (Figure 1). The drain incision was widened up to 2 to 3 cm, and the tip of the stent was withdrawn using thoracoscopic guidance in the remaining 2 patients in whom thoracostomy was not planned. The stent was then partially released depending on the length of stump in which the proximal part was to be positioned. Heavy silk suture (No. 0) was tied around the stent to give it an hourglass shape. The stent was withdrawn through the fistula until the proximal unfired part was localized in the proximal part of the stump. Prior to completely releasing the stent, appropriate positioning of the narrowest part of the stent was ensured by checking its position from both the sides under direct vision. It can be speculated that our technique reduces the potential risks accompanying stenting. On the other hand, in patients who require surgical

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FIGURE 1. Schematic illustration of the technique.

intervention for the permanent closure of the fistula, the stent can be removed while performing stump revision during thoracotomy. The stump was entirely dissected without any attempt to remove the stent in the last patient using this technique. The hourglass-shaped stent did not cause any technical difficulty during the dissection of mediastinal part of the bronchus.

A postoperative chest radiograph of a male patient who had undergone right pneumonectomy for T3N1 non-small cell lung carcinoma is depicted in [Figure 2](#). Four weeks after the operation, BPF developed and subsequent stump revision and thoracomyoplasty were performed. Unfortunately, the fistula persisted postoperatively, and he was referred to our clinic for further management with open-window thoracostomy. On admission, he was O₂ dependent and required noninvasive ventilatory support intermittently; hence,

FIGURE 2. Chest radiograph of a patient whose fistula was closed with an hourglass-shaped tracheobronchial stent.

surgical revision was contraindicated. We placed an hourglass-shaped stent in the bronchial stump during initial bronchoscopy and planned only supportive therapy. His respiratory functions improved after BPF closure; however, further surgery for fistula repair and obliteration of the cavity was not possible.

Our technique may not be an alternative to conventional approaches for the management of BPF; however, it appears to be an adequate and relatively simple procedure for patients who require immediate fistula closure.

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