Closure of postpneumonectomy bronchopleural fistula by means of single, perforator-based, latissimus dorsi muscle flap

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Bronchopleural fistula (BPF) is one of the most serious complications after pulmonary resection, with an incidence of 1.2% after lobectomy and between 2% and 20% after pneumonectomy.¹ The reported mortality rate can be as high as 71% despite aggressive treatment.¹ The diversity of treatment modalities indicates that no single regimen satisfies all conditions, and treatment options have to be individualized.

We successfully treated an elderly man who had postpneumonectomy empyema and BPF by the use of a perforator-based distal latissimus dorsi (LD) muscle flap.

Clinical Summary

A 72-year-old Chinese man had BPF and empyema 1 month after a left pneumonectomy. Examination with a fiberoptic bronchoscope revealed a 4-mm fistula at the left main bronchial stump. Tube thoracostomy and systemic antibiotics were commenced, followed by surgical exploration, debridement of the infected cavity, and repair of the fistula after achievement of general anesthesia 4 days after presentation.

The patient was placed in a full right lateral decubitus position, with wide exposure of the left side of the chest and flank. The previous thoracotomy wound was used, and debridement of the pleural cavity and refashioning of the stump with 3-0 Prolene sutures (Ethicon, Inc, Johnson and Johnson Intl, Brussels, Belgium) were then performed. The heavy soiling of the cavity and the poor tissue quality of the stump warranted the use of a muscle

flap. The whole distal LD muscle based on one segmental perforator with a diameter of 1.5 mm and good pulsatility was raised through extrafascial planes (Figure 1, A), and an 8-cm posterolateral segment of the eighth rib was removed for entry. Threaded through the fenestration, the muscle flap was draped into the pleural cavity. The muscle was sutured onto the refashioned stump with 3-0 polyglactin 910 sutures (Vicryl, Ethicon), as well as secured onto the inner surface of the chest wall to avoid avulsion of the vascular pedicle. A chest drain was inserted, and the wound was closed in layers. The patient recovered well and was discharged 2 weeks postoperatively. A contrast magnetic resonance image (Figure 1, B) performed 3 months after the operation revealed a viable muscle flap and a secured stump. At 10 months' follow-up, he remained well and showed no signs of BPF recurrence.

Discussion

Successful management of empyema associated with BPF requires aggressive control of infection, reduction of dead space, and avoidance of further soiling by the fistula.

Vascularized autologous tissue brought into the pleural cavity can assist in eradicating the infection, reducing the dead space, and securing the refashioned bronchial stump. Muscle, myodermal tissue, and omentum, in addition to pleural and pericardial tissues, have previously been used.

Since the application of muscle transposition by Robinson in 1915 and later popularized by Pairolero and colleagues,² as well as Miller and associates,³ muscle has become the tissue of choice.

Mathes and coworkers⁴ demonstrated that muscle flap is superior in delivering activated leukocytes, immunoglobulins, complement factors, oxygen, and antibiotics and thus has a better antimicrobial ability.

In considering an appropriate flap, the size and location of the flap, the requirement of an extra wound and additional operative time, the morbidity of the donor muscle loss, and the possibility of infection tracking into the donor site have to be balanced. The distal LD muscle is large; its immediate location under the thoracotomy wound requires no separate incision or patient repositioning intraoperatively and thus reduces operative time.

Transferring this muscle will not lead to potential infection tracking back into the peritoneal cavity, as in omental transposi-

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Figure 1. A, Illustration viewing caudally through the thoracotomy wound, showing the distal LD muscle based on one segmental perforator (arrow). The shaded area represents the pleural cavity. B, T1-weighted contrast magnetic resonance imaging showing left hemithorax with viable LD muscle (arrow).

tion, or result in winging of scapula, as in the case of serratus anterior flap. Moreover, its lower thoracic position allows draping of the dependent part of the pleural cavity. Despite these advantages, the larger distal LD was seldom considered because of its uncertain blood supply.

The distal LD muscle can be reliably supported by the multiple perforating branches of the intercostal and lumbar vessels, as shown by the reversed LD flap.⁵ Experience in other perforator flap surgery demonstrated that a single perforator has the ability to support a large volume of tissue. A single perforator LD flap, with its small pedicle, allows a smaller segment of the rib removal for entry and owns a higher mobility so that the whole distal muscle can be transposed into the pleural cavity (Figure 2).

The distal LD muscle is rendered functionless after transection during thoracotomy; any possible application of this muscle will

Figure 2. Illustration with anterior intercostal spaces made transparent. The transposed distal LD flap within the pleural cavity is supplied by an extrathoracic perforating vessel.

be an important benefit to the patient. We report this case, which, for the first time, illustrates the successful application of the functionless distal LD muscle on the basis of a single segmental perforator in the treatment of BPF.

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