

## Anterior Middle Chest Wall Reconstruction Using a Free Anterolateral Thigh Flap Resulted in Flail Chest: A Case Report

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Large defects of the anterior middle chest, including resection of the bilateral internal thoracic arteries, require free flap reconstruction. The anterolateral thigh (ALT) flap has advantages on less sacrifice at the donor site, enabling simultaneous operation with tumor resection and a long vascular pedicle; however, the flexibility of the ALT flap can cause flail chest. We used a free ALT flap for a large defect of the chest wall including the sternum and multiple ribs. This approach resulted in paradoxical respiration after surgery. We herein report the possible causes and our recovery strategy.

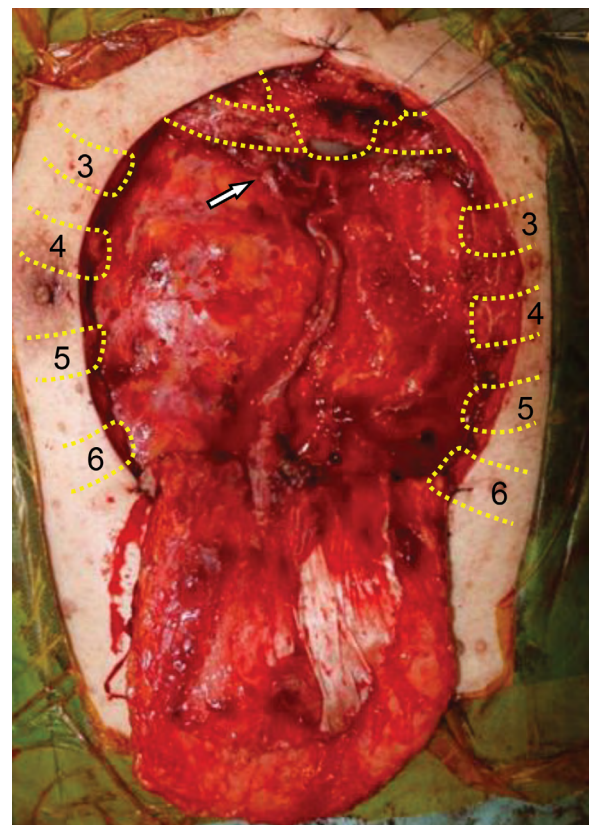
### CASE

A 41-year-old man presented with a 4-month history of a rapidly increasing mass in the anterior chest (see **figure, Supplemental Digital Content 1**, which displays a rapidly increasing malignant peripheral nerve sheath tumor in the anterior chest, <http://links.lww.com/PRSGO/B179>). He and his mother had a history of neurofibromatosis type 1. Many neurofibromas were recognized in his trunk and limbs. A needle biopsy resulted in the diagnosis of a malignant peripheral nerve sheath tumor. Contrast-enhanced computed tomography showed the infiltration of a 7-cm tumor to the muscular layer.

Tumor resection was performed with a 3-cm skin margin and a 5-cm subcutaneous margin. The entire sternum body, right third to fifth ribs, and multiple costal cartilage (right sixth and seventh, left third to fifth) were resected, including the bilateral internal thoracic arteries. The vascular pedicle of an ALT flap was anastomosed to the right internal thoracic artery and vein (Fig. 1). The fascia lata was sutured to the periosteum membrane of the ribs. During positive pressure ventilation, no significant flap bulging or recession was observed. After extubation in the operating room, large recession of the flap appeared. Remarkable tachypnea of 40/minute and a decreased SpO<sub>2</sub> value of 80% were detected under pure oxygen administration. Reintubation restored the breathing stability under positive pressure ventilation.

To add rigid reconstruction, a 166-mm titanium AO reconstruction plate (Johnson & Johnson, New Brunswick, N.J., USA) was used to bridge the bilateral sixth ribs. Holes were then drilled in the bilateral rib stumps, and a 2-mm Gore-Tex soft tissue patch (W. L. Gore & Associates, Newark, Del., USA) was sutured, taking care to provide sufficient tension. In addition, traction strings were placed between the third, fourth, and fifth ribs using nonabsorbable string (Fig. 2). The paradoxical respiration disappeared after surgery.

In general, defects of more than 2 ribs in the front or more than two-thirds of the sternum can cause flail chest.<sup>1</sup> Rigid reconstruction using a titanium plate and a Gore-Tex sheet,<sup>2</sup> sandwich prostheses with bone cement,<sup>3</sup> and a titanium staple-splint system<sup>4</sup> has been reported. How-

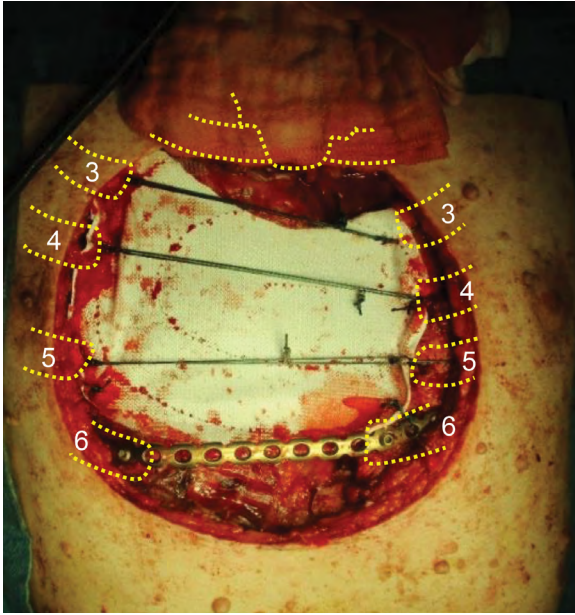


**Fig. 1.** Anterior chest wall reconstruction using a free ALT flap. The arrow indicates the anastomosis point of the right internal thoracic artery and vein.

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**Fig. 2.** Rigid reconstruction using a titanium plate and Gore-Tex sheet.

ever, the use of artificial materials carries a risk of infection and exposure. The fascia lata can prevent flail chest even after extensive chest wall resection as mentioned above by fixing tightly around the defect.<sup>5</sup> Although there was no apparent bulging or depression of the flap under positive pressure ventilation during surgery in the present case, the ALT flap was depressed by the negative pressure

of inspiration after extubation. The present observations highlight the need to perform a negative pressure overloading test during surgery to avoid flail chest.

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#### DISCLOSURE

*The authors have no financial interest to declare in relation to the content of this article.*

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