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Case report

Chest wall reconstruction using the pectoralis major flap with dual-partitioned partially cut ribs: A useful method for preventing deformation and preserving the strength of the donor site

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ABSTRACT

In some cases, skeletal and soft issue elements are required for chest wall reconstruction. Although muscle flaps and ribs are commonly used for achieving ideal reconstruction, deformation and loss of bone strength are unavoidable in such cases. In the present report, we describe a technique for chest wall reconstruction that can help avoid such donor site deformity. A 59-year-old woman with metastasis of a malignant mixed tumor in the parotid gland underwent resection from the sternoclavicular joint to the first and second ribs, including the manubrium and part of the sternum body. To achieve chest wall reconstruction, we used a pectoralis major flap along with two dual-partitioned ribs. In this modified procedure, instead of simply using the flaps with the whole ribs (which is common), we only used the anterior cortical portion of the ribs. This helped preserve the chest wall strength and prevented deformity at the donor site. At 7 months after surgery, the cut ribs in the reconstructed area and the original donor site appeared stable, without any complications, on computer tomography. Although the thickness of the bone used was half of that used with the conventional method, the skeletal strength was sufficient for her daily activities. Our modified method requires some additional effort for cutting the ribs, but the

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rest of the procedure involves the use of a conventional, simple rib-muscle flap. With this method, donor site deformity can be prevented, and the procedure can not only be adapted for chest wall reconstruction but also for other skeletal reconstructions that require the use of ribs.

Background

Chest wall defects are often observed following procedures such as the resection of tumors or metastases in the bone. Both bony and soft tissue elements are required for chest wall reconstruction, which makes it challenging for plastic and reconstructive surgeons. Several reports have described cases requiring skeletal reconstruction with soft tissue augmentation. In general, flail chest may develop following resection of two or three ribs in the anterior chest, resection of three or four ribs in the posterolateral chest, or resection of more than two-thirds of the sternum.[1,2] Furthermore, instability of the superior limb girdle may develop in cases where the resection area extends to the sternoclavicular joint or shoulder joint.[3]

Successful reconstruction requires appropriate skeletal and soft tissue augmentation.[4] To achieve an ideal reconstruction, the use of several types of prosthetic material[5,6] and various methods for local or distant free autologous tissue transfer has been reported. The rib-pectoralis major osteomuscular flap is one of the most common autologous tissues used for the repair of chest wall defects. Although this flap enables the inclusion of bony and soft tissue elements within the same flap, donor site deformity is unavoidable, particularly in cases where more than one rib is required for reconstruction. To resolve this donor site problem, we modified this technique by including only half the ribs in the flap.

In this report, we describe a case of anterior chest wall and sternoclavicular joint resection wherein this method was employed for reconstruction, by using dual-partitioned ribs (wherein the ribs were cut into two parts, one of which was retained at the donor site and the other was used for the flap) and a pectoralis flap, and discuss this surgical technique.

Case report

The patient had undergone surgery for the treatment of a malignant mixed tumor of the parotid gland at 28 years of age; subsequently, lobectomy was performed for metastasis of the tumor. At 59 years of age, she presented with tumor metastasis at the bilateral clavicular head, first and second ribs, manubrium, and part of the sternum body. The resection was performed by thoracic surgeons, and we were then consulted for the reconstruction of these structures. As the resection ranged from the sternoclavicular joint and resulted in the exposure of deep structures underlying the sternum, we believed that in addition to soft tissue augmentation at the dead spaces, skeletal reconstruction would also be needed.

Surgical planning

A specific muscle flap volume was required to augment the dead spaces; hence, the use of a pectoralis major flap and ribs was planned. After considering the expected resection area, we assumed that one or two ribs would be needed. Moreover, to avoid donor site deformity, we planned to use the cortical bone on the anterior side of the rib so that the posterior side of the rib would remain in the original position (Figure 1 a,b).