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Reconstructive

Dynamic Reconstruction Using Accessory-innervated Pedicled Latissimus Dorsi Flap for Upper Trapezius Muscle Defect

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Summary: The upper part of the trapezius muscle attaches to the acromion and elevates the shoulder, so a defect in the trapezius muscle greatly impairs shoulder-brachial movement. We encountered a case in which the upper trapezius muscle was completely resected due to myxofibrosarcoma that occurred in the upper part of the left trapezius muscle, and reconstruction was performed using a pedicled latissimus dorsi flap with the accessory nerve transferred, resulting in favorable motor function. A 74-year-old woman developed myxofibrosarcoma in her left neck 1 year and 4 months ago, and underwent two surgical excisions at a nearby hospital. However, two months prior, she relapsed again, and was referred to our hospital, where she underwent submandibular lymph node dissection, wide tumor resection, and reconstruction using a latissimus dorsi flap. For latissimus dorsi myocutaneous flap transfer, the stump of the thoracodorsal nerve and accessory nerve were anastomosed to facilitate nerve transfer. Four months after surgery, she was able to raise her shoulder, and surface electromyography showed potentials comparable to her unaffected side. The innervated latissimus dorsi myocutaneous flap is frequently used for dynamic reconstruction of facial, brachialis, rectus abdominis, and deltoid muscles, but this is the first case report describing its use for dynamic reconstruction of the trapezius muscle. *(Plast Reconstr Surg Glob Open 2024; 12:e5748; doi: 10.1097/GOX.0000000000005748; Published online 17 April 2024.)*

INTRODUCTION

Innervated latissimus dorsi myocutaneous flap grafts are often used as dynamic reconstructive materials for rectus abdominis defects, facial nerve paralysis, and post-traumatic brachial plexus palsy.[1–3] Although the latissimus dorsi flap can adequately cover trapezius muscle defects and is useful as a pedicled flap, there are no reports of changing the innervation to the accessory nerve and restoring the original motor function. We report a case in which the upper trapezius muscle was completely resected after removal of a malignant tumor, and we reconstructed it with a pedicled latissimus dorsi muscle flap with the accessory nerve as the nerve source, restoring favorable motor function.[4]

CASE PRESENTATION

A 74-year-old woman visited a nearby hospital 1 year and 4 months before, complaining of a subcutaneous tumor in her left neck and underwent surgical removal. Pathological diagnosis was sarcoma, but she received no additional treatment. One year after surgery, the mass recurred, so she underwent another removal surgery. However, two months later, it recurred again and she was referred to our hospital. This patient had thyroid cancer 30 years earlier, and had received radiation therapy to her neck.

A diagnosis of myxofibrosarcoma was made after examining the pathological specimens from the previous doctor. At her initial examination, she had a 12×10-cm hard subcutaneous mass on the left side of her neck. Contrast-enhanced computed tomography revealed a localized tumor within her left upper trapezius muscle and metastasis to the left submandibular lymph node.

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The patient's disease was T3N1M0, stage 3B. Therefore, we planned to perform wide excision, submandibular lymph node dissection, reconstruction using the latissimus dorsi flap, and adjuvant chemotherapy (doxorubicin: 60 mg/m^2, ifosphamide: 10 g/m^2). Radiotherapy was not selected because she already had a history of radiotherapy.

A 16 × 14-cm skin excision was made with a 2-cm margin from the tumor, the upper trapezius muscle was completely resected, and the tumor tissue was removed in one piece without exposing it, while the accessory nerve stump was confirmed (Fig. 1). The left latissimus dorsi muscle was elevated, including a 10×5-cm skin paddle. After microsurgical epineural suture of the accessory and thoracodorsal nerve, the latissimus dorsi muscle was placed in the same direction as the original trapezius muscle fibers and sutured to the trapezius muscle stump (Fig. 2). For wounds that could not be covered by the skin paddle, split-thickness skin grafting was performed. The skin flap and skin graft were engrafted, and the wound was healed without any fixation (Fig. 2C). Two weeks after surgery, passive exercise rehabilitation was initiated to raise the shoulder, and 2 months later, automatic movement of the transferred latissimus dorsi muscle was confirmed.

The patient was able to fully lift her shoulders and arms 4 months after surgery [Fig. 3 and **Video (online)**]. Surface electromyography of the transplanted muscle flap 4 months after surgery confirmed a potential level equivalent to that of the unaffected trapezius muscle (Fig. 4).

Fig. 1. Photograph showing the accessory nerve stump (arrow) that was cut when the tumor-containing trapezius muscle was completely removed.

Takeaways

Question: Consideration of dynamic reconstruction methods for trapezius defect.

Findings: A pedicled latissimus dorsi myocutaneous flap with accessory nerve transfer was able to restore shoulder elevation motor function 4 months postoperatively without educational rehabilitation.

Meaning: This surgery is a simple and useful method, and this is the first report.

During this rehabilitation period, two cycles of chemotherapy were completed, and no recurrence was noted for 6 months postoperatively. [**See Video (online),** which shows shoulder and upper arm elevation in the patient 4 months after surgery.]

DISCUSSION

Trapezius muscle deficiency can lead to dislocation of the scapula, decreased shoulder function, and other serious problems such as incapacitating pain, so its reconstruction is essential.[5,6] When attempting dynamic reconstruction of a trapezius muscle defect, pectoralis major and latissimus dorsi flaps are options as pedicled flaps with sufficient muscle strength. The latter of these can facilitate dynamic

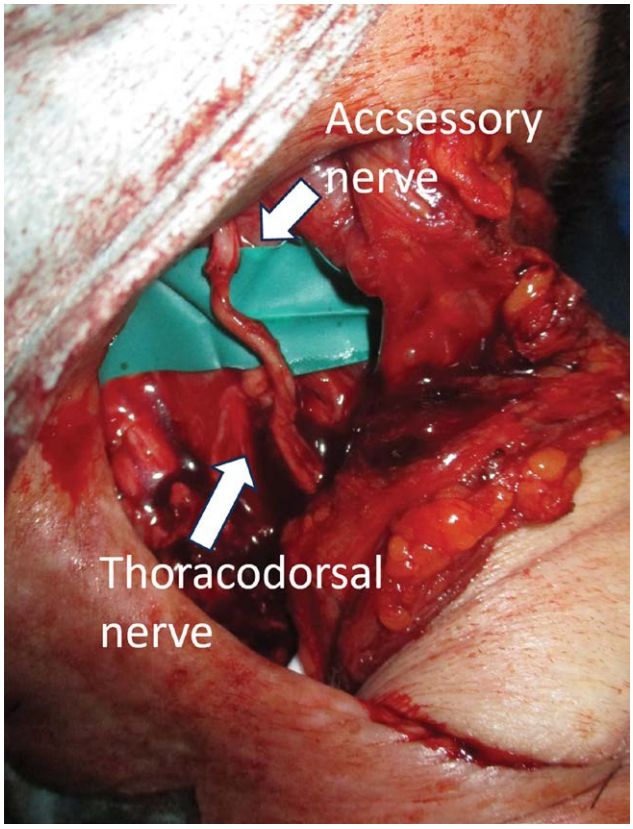

Fig. 2. Photograph showing the nerve anastomosis between the accessory nerve stump (upper arrow) and the thoracodorsal nerve (lower arrow).

Fig. 3. Photograph showing shoulder movement 4 months after surgery. The patient was able to elevate her left shoulder.

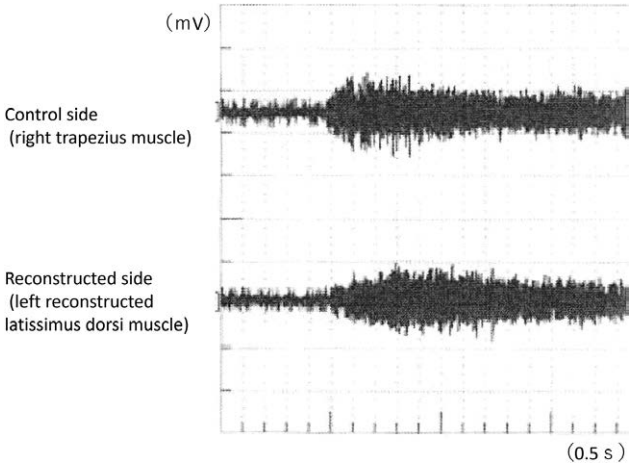

Fig. 4. Surface electromyograms measured from the unaffected trapezius muscle (upper row) and transferred latissimus dorsi muscle (lower row) 4 months after surgery. The transferred latissimus dorsi muscle shows a potential that is similar to that on the healthy side.

contraction with minimal donor site morbidity, which can resolve loss of function.[7] Along with these advantages, the pedicled latissimus dorsi myocutaneous flap has a long muscle belly that extends to the neck, shoulder, and forearm, and it has already been widely used for functional reconstruction of elbow and shoulder joints.[3,8]

Surprisingly, there is only one report by Ihara et al[4] regarding dynamic reconstruction of a trapezius muscle defect using a latissimus dorsi muscle flap. They reported that the thoracodorsal nerve innervating the flap was able to provide sufficient contraction, and functional reconstruction was achieved. However, trapezius muscle contraction causes a movement that pulls the upper arm back, and its contraction also causes the shoulder to rise. Because these two movements do not work together, educational rehabilitation is required to elevate the shoulder with the transplanted latissimus dorsi muscle.[4] In response to this problem, they reported that after 8 weeks of postsurgery fixation with a brace, rehabilitation and reeducation of the transplanted muscles could be performed using audiovisual biofeedback, and the patient was able to lift both hands 6 months after the surgery.[4] If the nerves are not replaced with the original controlling nerves, a long period of reeducation and rehabilitation is required to acquire the original movements. Also, if the patient is older, there is a risk of disuse joint contracture due to a prolonged rehabilitation period.

On the other hand, regarding the neural recovery in the case of muscle innervation, Barry et al examined functional outcomes after free muscle transfer for recovery of upper extremity movement after brachial plexus injury and reported a mean reinnervation period of 5 months.[9] Yang et al also investigated functional recovery of the brachial plexus treated with free functioning muscle transfers, and reported a mean reinnervation time of 5.8 months (range, 3–12 months).[10] As can be seen from these reports, the period of reinnervation after nerve transfer is less than half a year, which tends to be shorter than methods without nerve transfer. The advantage of this method is that it does not require rehabilitation for reeducation because the accessory nerve that originally controls the trapezius muscle is used as the donor.

CONCLUSIONS

This is the first reported case of pedicled latissimus dorsi muscle transfer using the accessory nerve as the donor nerve for trapezius muscle deficiency, showing that it is a satisfactory treatment for restoring a patient's shoulder elevation function.

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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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