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Case report

Temporalis myofascial flap coverage for extrusion of internal device after cochlear implantation

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ABSTRACT

Two pediatric patients with internal device exposure of cochlear implant (CI) were treated successfully using vascularized temporalis myofascial flaps. The visible scarring was minimal, and the CI function was excellent. Although we used temporalis myofascial flaps for late complications of an implanted ear, it can also be used in a primary case to provide flap reinforcement. In conclusion, the temporalis myofascial flap technique is an ultimate surgical option that offers advantages for CI patients with flap-related problems.

1. Introduction

The cochlear implant (CI) has revolutionized the hearing rehabilitation of profound sensorineural hearing loss, but the postoperative complication rate ranges from 11.8 to 19.9% [1,2]. One of the major complications after cochlear implantation are flap-related problems, such as cutaneous ulceration with device extrusion, which occurs in up to 8.5% of CI patients [3,4]. Although depending on the recent advancements of surgical techniques, preoperative/postoperative wound care including antibiotics, and the surgical institutions, the major flap-related complications have been reported as low as 0.3–3.6%, the flap-related problems are still a compelling CI complication which sometimes warrants revision surgery [5]. Several factors have been known to be contributed to the flap-related complication in CI patients. Fashioning the surgical bed required for placing an internal device near or under the skin incision also may cause necrosis especially in patients with thin skin flap [6,7]. The pressure of the overlying magnet on the flap can lead to skin flap necrosis. A tight compression dressing, head trauma, or hematoma collection may also induce flap necrosis [7]. Excessive thinning of the flap or placement of the CI too close to the incision predisposes to postoperative soft tissue complications. The resulting flap necrosis and dehiscence may result in CI malfunction or failure.

Revision surgery may be required if there is insufficient pedicle length or thickness or an impaired vascular supply. Indeed, a CI flap defect requires the provision of healthy and well vascularized soft tissue to cover the implant. The temporal artery system constitutes a favorable donor site for head-and-neck reconstruction using a temporalis myofascial flap. It has three main blood supplies: the anterior and posterior deep temporal arteries (both branches of the internal maxillary artery) and the middle temporal artery (a branch of the superficial temporal artery). It is innervated by a branch of the trigeminal nerve. Therefore, a few previous studies described the successful reinforcement of the necrotic CI flap using a superior based temporal muscle and fascia flap. Here, we present two patients with internal device exposure who were treated successfully using vascularized temporalis myofascial flaps.

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2. Case report

Two pediatric patients (8 years and 13 months) needed revision surgery using the temporalis myofascial flap. Both patients suffered from the recurrent and intractable CI flap infections with necrosis. Their skin flaps were not thick enough to reinforce the coverage of CI internal device. They did not have any history of craniofacial surgery other than CI which could compromise the temporalis muscle, fascia, and accompanying blood vessels. Therefore, the temporalis myofascial flap was the choice of these two patients to minimize the surgery-related morbidity while guarantee the adequate flap to cover internal device.

Under general anesthesia, the margins of the ulcerated skin were debrided and a Y-shaped skin incision line was drawn for temporalis muscle elevation. The dissection passes in the sub-follicular plane above the superficial temporal fascia to preserve the superficial temporal vascularization, as well as the bulbs of the hair follicles. This dissection extends well beyond the surface of the temporalis muscle. Then, the periosteum is incised at the superior temporal line. Next, using a stripper, the muscle is removed from the temporal fossa in a subperiosteal plane up to the deep temporal pedicles. The temporalis muscle is elevated carefully along the tendinous lamina to its upper edge. Care is taken not to injure the deep temporal vessel pedicle and the temporalis muscle is transposed to cover the exposed device. The muscle is rotated around the vascular pedicle and anchored to holes made in the temporal bone adjacent to the device. The postoperative course was generally uneventful. The scalp skin ulcers healed completely without any long-term complications.

2.1. Patient 1

An 8-year-old male with a CI presented with scalp dehiscence with device extrusion (Table 1). He had undergone CI surgery at the age of 15 months and has been followed without previous complications. Since conservative treatment, including broad-spectrum antibiotics for 9 days, was ineffective, surgical debridement was performed and then the exposed internal device was covered with a postauricular soft tissue transposition flap via subdermal dissection. However, the wound broke down again and definitive wound revision surgery was necessary 2 months after the first surgery. To cover the skin defect and extruded device, a Y-shaped scalp incision was made (Fig. 1A). A skin flap was raised in the sub-follicular plane, taking care to preserve the temporoparietal fascia (Fig. 1B). The superior extent of the dissection was the origin of the temporalis muscle. The temporalis muscle was detached in a sub-periosteal plane, releasing its anterior and posterior attachments. This allowed the temporalis myofascial flap to cover the exposed receiver stimulator (Fig. 1C), which was secured to the holes around the internal device with vicryl 3-0 sutures to anchoring the internal device. The skin flap was repositioned and the wound was recovered without any surgery-related complications (Fig. 1D). There were no wound problems during follow-up for 29 months postoperatively (Fig. 1E) and his speech performance has been maintained, scoring 70% in a word perception test when auditory input was the only cue and 93.3% in a word perception test when the auditory input was augmented with visual input. He had a Categories of Auditory Performance test (CAP) score of 7, which means that he “can use the telephone with a familiar talker” [8].

2.2. Patient 2

This patient underwent left-side cochlear implantation at the age of 13 months. The device bed was swollen 1 month after surgery. Since conservative management, including systemic antibiotics and application of a compression bandage, was unsuccessful, incision and drainage were repeated 2 and 3 months after the initial surgery. Methicillin-resistant *Staphylococcus aureus* was cultured from the tissue. However, since the device bed remained swollen, the implant was removed, while the electrode was cut and left in place 4 months after the initial surgery. A purulent discharge was drained and massive amounts of granulation tissue surrounded the internal device. Cochlear implantation was performed simultaneously in the contralateral ear. Revision cochlear implantation in the left ear was performed 2 years after the initial surgery. Since the overlying skin was thinned markedly, following a parieto-occipito-temporal incision, a vascularized temporalis myofascial flap was designed to cover the internal device. The myofascial flap was advanced over the internal device and sutured to the skull using a tie-down hole in a tension-free manner. The device bed and overlying skin were in good condition without any wound problems. Her speech performance was excellent, with a word perception score of 75% using only auditory input and 90% using auditory and visual input; her CAP score was 5, which means “understands common phrases without lip reading”.

3. Discussion

Our two cases demonstrated the successful outcomes of temporalis myofascial flap coverage for the extrusion of CI internal device. Wound breakdown is one of the troublesome complications of CI surgery. Several preventable risk factors are associated with wound breakdown, including cochlear implant shape and excessive thinning of the flap. Placement of the cochlear implant near the flap incision may also result in pressure necrosis and subsequent wound breakdown [9,10]. The key to preventing flap problems is careful preoperative planning and optimization of the patient's medical co-

Table 1
Patient characteristics.

	Patient 1	Patient 2
Age at cochlear implantation	15 months	13 months
Sex	Male	Female
Onset of wound dehiscence after surgery	73 months	50 days
Cause of wound dehiscence	Device extrusion	Hematoma and wound infection
Time interval between initial surgery and TFF reconstruction surgery	75 months	28 months
Number of procedures including TMF reconstruction	2	5
Procedures performed other than TMF reconstruction	Transpositional soft tissue flap	Repeated incision & drainage Explantation of internal device & contralateral CI Revision CI
Postoperative follow-up	29 months	28 months
Postoperative complication	None	None

TMF, temporalis myofascial flap; CI, cochlear implant.