

Temporal Hollowing Augmentation with Titanium Mesh after Autologous Cranioplasty in Temporal Muscle Resected Case: A Case Report

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Temporal fossa hollowing can represent a serious cosmetic concern to patients after post-traumatic surgery, oncological resection, or surgical dissection for obtaining access to the temporal area. Various methods have been described to augment temporal fossa hollowing, such as use of autogenous bone and cartilage implants, high-density polyethylene implants, and dermal fat grafts. We report a case of 22-year-old man with temporal fossa hollowing after post-traumatic surgery, including temporal muscle resection, whose defect was augmented by using titanium mesh even though long after cranioplasty.

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KEY WORDS: Temporal fossa hollowing · Augmentation · Titanium mesh.

Introduction

Temporal fossa hollowing is a noted sequela of surgical dissection in this region for obtaining access to the temporal area.¹⁰⁾ In the field of neurosurgery, this finding is observed after oncological resection or post-traumatic surgery for providing sufficient decompression.¹⁾ Several methods are generally used to augment temporal fossa hollowing using materials such as bone grafts, hydroxyapatite, methyl methacrylate, autogenous tissue, and high-density polyethylene (HDPE) implants. However, such methods are associated with problems such as infection, resorption, hard to mold, and uncommon neurosurgical techniques.^{2-4,6,8,11,12,15,16)}

We describe an augmentation method for temporal fossa hollowing using titanium mesh in addition to previously performed cranioplasty.

Case Report

A 22-year-old man presented with a history of left middle cerebral infarction due to moyamoya disease and right-sided hemiplegia. He had undergone decompressive craniectomy at another hospital. At that time, his temporalis muscle had been resected for achieving sufficient decompression.

After that, he underwent 3 additional operations for post-operative epidural hematoma, intracerebral hemorrhage, and hydrocephalus. After tracheostomy and ventriculoperitoneal shunt, his condition was stable and brain swelling decreased.

Cranioplasty was performed 43 days after decompressive craniectomy. He started rehabilitation treatment, and his condition steadily improved. However, temporal fossa hollowing became more prominent. The patient and his parents requested augmentation surgery for a favorable cosmetic appearance. On computerized tomography (CT) scan (Figure 1A), the left temporal area showed a defect when compared to the right temporal area, because of previous temporal muscle resection. Surgery was performed under general anesthesia at 6 months after cranioplasty. Temporal fossa augmentation was performed using titanium mesh (74×50

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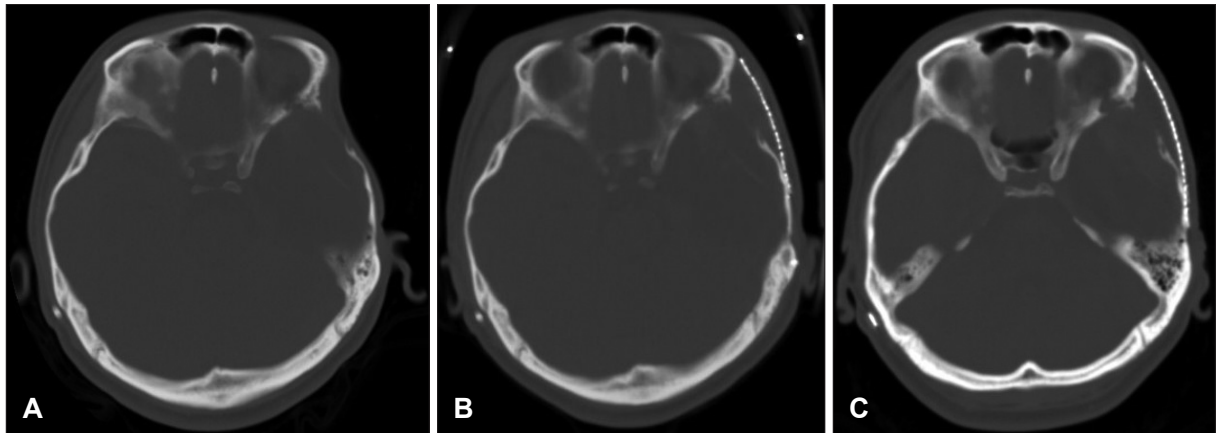


FIGURE 1. Sequential brain computerized tomography (CT) scan. A: Before the surgery for temporal hollowing, the left temporal area shows a defect compared to the right temporal area, because of previous temporal muscle resection. B: Two months after operation, the scan shows temporal fossa hollowing disappeared by augmentation using titanium mesh. C: Six months after operation, the cosmetic improvement persisted throughout the outpatient follow-up period.

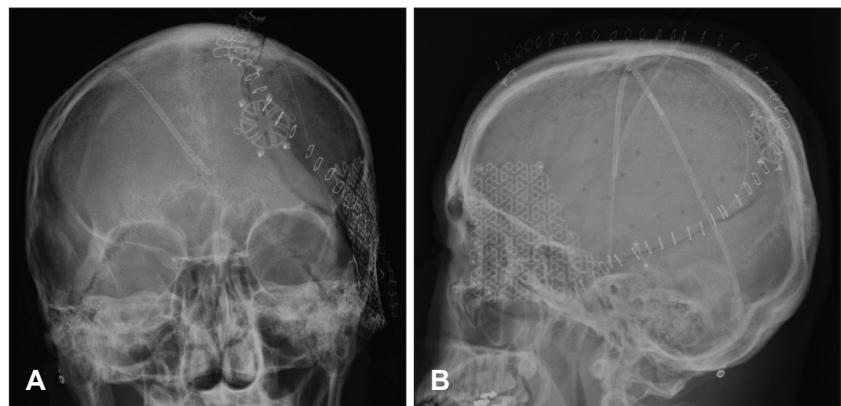


FIGURE 2. Immediate postoperative skull anteroposterior and lateral X-ray shows temporal fossa augmentation using titanium mesh. The mesh was fastened with screw on frontal and parietal bone and lateral orbital limb, and zygomatic arch.

mm, Jaeil Medical Corp., Seoul, Korea), which was fastened at the zygomatic arch, lateral orbital rim, and frontal and temporal bone with screws (Figure 1B, 2). After 6 months, comparative CT showed that the cosmetic improvement persisted throughout the outpatient follow-up period (Figure 1C).

Discussion

In the field of neurosurgery, temporal fossa hollowing can be observed after oncological resection, post-traumatic resection for providing sufficient decompression, or surgical dissection for obtaining access to the temporal area.¹⁾ Temporal fossa hollowing that occurs after surgical dissection for the pterional approach, bicoronal, or Dandy incision is theorized to be associated with atrophy of the superficial temporal fat pad secondary to ischemia, displacement, or denervation of the fat pad.⁸⁾ Temporal fossa hollowing may also occur because of temporalis muscle resection for achieving further decompression as same with in our case.

Various methods have been described to augment the defect, including the use of HDPE implant, polymaleinate ionomeric prosthesis (IONOS[®]) bone cement, methyl methacrylate, lipotransfer, autogenous bone and cartilage.^{2-4,6,8,9,11,12,15,16)}

Maas et al.⁹⁾ suggested that autogenous bone and cartilage were proper materials for covering temporal fossa hollowing. However, autogenous bone and cartilage implants are associated with considerable donor site morbidity, increased surgical time and complexity, the possibility of graft resorption, as well as difficulties in controlling appropriate graft volume.¹⁴⁾

More recently, many synthetic alloplastic materials have been developed and used. The ideal alloplastic materials have been described as inert, noncarcinogenic, noninflammatory, and nonallergenic. The material should resist mechanical strain and be easily malleable.^{1,6)}

Porous HDPE implants were developed in the early 1970s.⁶⁾ HDPE is flexible at room temperature, and when heated in hot water, it becomes malleable. These characteristics of

HDPE allow surgeons to maneuver the material with ease. Several authors have demonstrated rapid ingrowth of fibrous tissue through the characteristic porous structure of these materials, resulting in firm attachment and integration of the implant to the surrounding tissue. Furthermore, the rapidity of vascularized tissue ingrowth makes these materials more resistant to infection. However, although they are produced in a number of sizes, which can be shaped, their rigid nature can make it rather difficult to contour to complex surfaces and high cost problem.^{6,11,15)} As in our case, we could not get firm fixation with HDPE because the hollowing is not due to bony defect but is partial resection of temporalis muscle.

The use of dermal fat grafts for restoring facial contour was first reported in 1931 by Figi,⁵⁾ and its success has been well documented. In general, grafts are harvested from any preexisting abdominal scar in which the tissue is composed of a deep dermis layer and a subdermal fat layer. The graft is sutured securely below with its dermis facing superficially. In this way, tissue perfusion in this region is sufficient to allow graft acceptance. McNichols et al.¹⁰⁾ reported no case of graft loss or fat necrosis. However, most neurosurgeons are not familiar with this technique, which is more recommended only when the patients have a scar in abdomen skin.

The use of Mersilene mesh for craniofacial reconstruction has been reported since 1976, when Weidenbecher et al.¹³⁾ described its use in skull sinus reconstruction. This mesh is composed of polyester with interlocked fiber junctions. This characteristic allows it to be cut without folding the edges, while maintaining its easy maneuverability. It is smooth and pliable, and its elastic properties allow it to adapt to mechanical stresses and contour well to underlying defect, producing a soft reconstruction.¹⁾ There were several reports of temporal hollowing augmentation using titanium mesh, but the procedures were usually done by plastic surgeons with complication of zygomaticotemporal fractures or its repair.⁷⁾ In our case, the temporal hollowing was iatrogenic cause for the decompression, resecting temporalis muscle, during severe brain swelling in traumatic brain injury management. In such case, because of loss of temporal muscle, rather rigid titanium mesh would be much easier to make contour using zygomatic arch than using Mersilene mesh. Though there was time interval, about 6 months after cranioplasty, augmentation could be selected for the cosmetic cause. Also in case of temporalis muscle resection for decompression, temporal hollowing augmentation should be done at the time of cranioplasty to avoid another operation.

Conclusion

We have described the augmentation of temporal hollowing using titanium mesh after temporal muscle resected case. Augmentating with titanium mesh could be done long after the cranioplasty, but in case of temporal muscle resection, augmentation should be considered in one stage with cranioplasty.

■ The authors have no financial conflicts of interest.

REFERENCES

- 1) Atherton DD, Joshi N, Kirkpatrick N. Augmentation of temporal fossa hollowing with Mersilene mesh. *J Plast Reconstr Aesthet Surg* 63:1629-1634, 2010
- 2) Badie B. Cosmetic reconstruction of temporal defect following pterional [corrected] craniotomy. *Surg Neurol* 45:383-384, 1996
- 3) Cheung LK, Samman N, Tideman H. The use of mouldable acrylic for restoration of the temporalis flap donor site. *J Craniomaxillofac Surg* 22:335-341, 1994
- 4) Ducic Y, Pontius AT, Smith JE. Lipotransfer as an adjunct in head and neck reconstruction. *Laryngoscope* 113:1600-1604, 2003
- 5) Figi FA. Chronic stenosis of the larynx with special consideration of skin grafting. 1940. *Ann Otol Rhinol Laryngol* 103(4 Pt 1): 249-264, 1994
- 6) Frodel JL, Lee S. The use of high-density polyethylene implants in facial deformities. *Arch Otolaryngol Head Neck Surg* 124: 1219-1223, 1998
- 7) Guo J, Tian W, Long J, Gong H, Duan S, Tang W. A retrospective study of traumatic temporal hollowing and treatment with titanium mesh. *Ann Plast Surg* 68:279-285, 2012
- 8) Kim S, Matic DB. The anatomy of temporal hollowing: the superficial temporal fat pad. *J Craniofac Surg* 16:760-763, 2005
- 9) Maas CS, Merwin GE, Wilson J, Frey MD, Maves MD. Comparison of biomaterials for facial bone augmentation. *Arch Otolaryngol Head Neck Surg* 116:551-556, 1990
- 10) McNichols CH, Hatef DA, Cole P, Hollier LH, Thornton JF. Contemporary techniques for the correction of temporal hollowing: augmentation temporoplasty with the classic dermal fat graft. *J Craniofac Surg* 23:e234-e238, 2012
- 11) Rapidis AD, Day TA. The use of temporal polyethylene implant after temporalis myofascial flap transposition: clinical and radiographic results from its use in 21 patients. *J Oral Maxillofac Surg* 64:12-22, 2006
- 12) Schick B, Draf W, Schauss F. [Augmentation of the temporal fossa with Ionos bone cement]. *HNO* 44:467-470, 1996
- 13) Weidenbecher M, Waller G, Lehmann W. [Mersilene mesh in reconstruction of the osseous walls of the pneumatized skull (author's transl)]. *HNO* 24:351-353, 1976
- 14) Welling DB, Maves MD, Schuller DE, Bardach J. Irradiated homologous cartilage grafts. Long-term results. *Arch Otolaryngol Head Neck Surg* 114:291-295, 1988
- 15) Worley CM, Strauss RA. Augmentation of the anterior temporal fossa after temporalis muscle transfer. *Oral Surg Oral Med Oral Pathol* 78:146-150, 1994
- 16) Wright S, Bekiroglu F, Whear NM, Grew NR. Use of Palacos R-40 with gentamicin to reconstruct temporal defects after maxillofacial reconstructions with temporalis flaps. *Br J Oral Maxillofac Surg* 44:531-533, 2006