Endoscopic Transmaxillary Transposition of Temporalis Flap for Recurrent Cerebrospinal Fluid Leak Closure

Regi Thomas¹ Shabari Girishan² Ari George Chacko²

¹ Department of Otorhinolaryngology, Christian Medical College, Vellore, Tamil Nadu, India

² Department of Neurosurgery, Christian Medical College, Vellore, Tamil Nadu, India

Address for correspondence Regi Thomas, MBBS, DLO, DNB (ENT), Department of E.N.T. Unit-1, Christian Medical College Vellore, Vellore 632004, Tamil Nadu, India
(e-mail: reganupthomas@cmcvellore.ac.in).

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Abstract

Objective To describe the technique of endoscopic transmaxillary temporalis muscle flap transposition for the repair of a persistent postoperative sphenoidal cerebrospinal fluid leak.

Design The repair of a recurrent cerebrospinal fluid leak for a patient who had undergone endoscopic transsphenoidal excision of an invasive silent corticotroph Hardy C and Knosp Grade IV pituitary adenoma was undertaken. The patient had completed postoperative radiotherapy for the residual tumor and presented with cerebrospinal fluid leak, 1 year later. The initial two attempts to repair the cerebrospinal fluid leak with free grafts failed. Therefore, an endoscopic transmaxillary transposition of the temporalis muscle flap was attempted to stop the cerebrospinal fluid leak.

Results The endoscopic transmaxillary transposition of the vascularized temporalis muscle flap onto the cerebrospinal fluid leak repair site resulted in successful closure of the cerebrospinal fluid leak.

Conclusion Endoscopic transmaxillary transposition of the temporalis flap resulted in closure of recurrent cerebrospinal fluid leak in a patient with recurrent pituitary adenoma, who had undergone previous surgery and radiotherapy. This technique has advantages over the endoscopic transpterygoid transposition of the same flap and could be used as a complementary technique in selected patients.

Keywords

- cerebrospinal fluid leak
- temporalis muscle flap
- internal maxillary artery
- sphenopalatine artery
- pituitary adenoma

Introduction

The introduction of the pedicled nasoseptal flap^{1–3} (NSF) was a significant advance in the repair of dural defects following expanded endoscopic approaches (EEAs) to the anterior skull base, as it reduced the incidence of postoperative cerebrospinal fluid (CSF) leaks. Revision surgery or situations when the nasal septum is not available due to either disease or postradiation pose further difficulties and has been overcome by harvesting other vascular flaps.⁴ The use of a temporalis muscle flap (TF) for the repair of skull base defects transposed via the transpterygoid

route^{5,6} has been previously described. The technique of transposing the muscle via a transmaxillary route, as that is advantageous in a selected group of patients, is described in this article.

Material and Methods

An endoscopic transsphenoidal subtotal excision of an invasive silent corticotroph Hardy C and Knosp Grade IV adenoma in a 61-year-old woman was done in May 2012. The residual tumor in the clivus and both cavernous sinuses was treated with stereotactic radiotherapy in December 2012. A year

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Fig. 1 CT scan prior to third revision CSF leak repair. White arrow: tumor destruction of the pterygoid plates and involvement of the pterygopalatine fossa.

later, she was readmitted with CSF rhinorrhea with meningitis, and two endoscopic repairs were attempted in October and November 2013. At these repairs, fat and fascia lata were placed at the site of the leak on the sella floor. She was asymptomatic till August 2014 when the pyogenic meningitis recurred, requiring antibiotics. The computed tomography (CT) image showed destruction of the pterygoid plates by probable residual tumor in both pterygopalatine fossae (►Fig. 1) and multiple small defects in the clivus and sella. The magnetic resonance imaging showed no tumor in the sella or suprasellar areas, but primarily in the sphenoid sinus.

Procedure

In view of the large postoperative septal defect and the post-radiotherapy status, it was decided not to use any intranasal vascular flap. Instead, an endoscopic transmaxillary transposition of the TF was planned. As there was possible residual tumor or fibrous tissue in the pterygopalatine fossa, the transpterygoid route, the technique reported in literature for temporalis transposition in EEAs, was avoided.

The zygoma was exposed through a right temporal incision and a TF, based inferiorly on the deep temporalis artery, was raised. Sufficient care was taken to get an adequate length of this flap since the transmaxillary route was taken. A wide middle meatal antrostomy on the right side was performed via a binostril endoscopic approach. Following the removal of the posterior wall of the right maxillary sinus, the TF was mobilized into the right maxillary sinus via the infratemporal fossa (►Fig. 2). The multiple CSF leak sites were freshened by removing mucosa and granulation tissue, and fascia lata overlaid with the TF was placed over the bone (►Fig. 3).

Surgicel, tissue glue, and Gelfoam were placed sequentially over the flap. Bilateral Merocel packs and the lumbar sub-arachnoid drain were removed after 5 days. The patient was

Fig. 2 Temporalis transposition into the right maxillary sinus via the infratemporal fossa. Black star: temporalis flap.

started on acetazolamide 250 mg thrice a day and antihistamines and laxatives for 6 months. Endoscopic postoperative cleaning was done on the 10th and 14th postoperative day.

Results

The transposition of the vascularized TF as an overlay flap onto the CSF leak repair site resulted in successful closure of the CSF leak. The postoperative endoscopy at 6 months

Fig. 3 Temporalis flap placement in the sphenoid sinus via right middle meatal antrostomy. White star: temporalis flap.

Fig. 4 Postoperative endoscopic image at 6 months. Black star: healthy mucosa covering the temporalis flap.

showed that the flap and the defect site were completely covered with intact mucosa (►Fig. 4).

Discussion

In revision repair for CSF rhinorrhea, the NSF¹⁻³ is often not available and therefore other vascular flaps⁴ were introduced. The TF has been used for many years in external approaches for reconstruction of various postoperative defects,⁷⁻⁹ including skull base defect closure.¹⁰ In EEAs, the TF has been transposed into the nasal cavity via a transpterygoid approach (►Fig. 5)

Fig. 5 Endoscopic transpterygoid temporalis transposition. 1—Temporal fossa; 2—infratemporal fossa; 3—pterygopalatine fossa; 4—sphenoid sinus. Black star—temporalis flap.

Fig. 6 Endoscopic transmaxillary temporalis transposition. 1—Temporal fossa; 2—infratemporal fossa; 3—pterygopalatine fossa; 4—maxillary sinus; 5—middle meatal antrostomy; 6—nasal cavity; 7—sphenoid sinus. Black star—temporalis flap.

with good results.^{5,6} TF can also be transposed via a transmaxillary corridor (►Fig. 6) and the comparison of both techniques is described in ►Table 1.

Transpterygoid Approach

The ligation of the ipsilateral sphenopalatine pedicle and the smaller arteries supplying the posterior nasal cavity tends to decrease the vascularity of the region that may already be compromised from prior surgery and radiotherapy. The pterygopalatine fossa is a narrow pyramidal space, and the removal of bony walls is a critical step in enlarging the access. The pterygopalatine fossa and infratemporal fossa contents are then displaced inferolaterally to make space for the TF transposition into the sphenoid sinus.

Transmaxillary Approach

The reconstruction site has probably better vascularity in this approach since the residual sphenopalatine pedicle and the smaller posterior nasal arteries are preserved. This approach enables the surgeon to take a larger robust flap since infratemporal fossa is a wide space with soft tissue boundaries and the maxillary sinus is a large air-filled cavity. The neurovascular complications tend to be lesser since in this approach one avoids working on the maxillary nerve, vidian nerve, and descending palatine artery, and also avoids the drilling of the pterygoid plates.

It was the presence of tumor encasing the internal carotid arteries, extending into the pterygopalatine fossa, that resulted in adopting the transmaxillary approach for this patient. This approach offers a few advantages, as noted above, over the endoscopic transpterygoid approach and hence can be considered as a complementary approach for TF transposition in EEA.

Table 1 Comparison of endoscopic transpterygoid and transmaxillary transposition of temporalis flap

Parameter	Transpterygoid approach	Transmaxillary approach
Arterial status of postoperative bed	Involves ligation of ipsilateral sphenopalatine and smaller posterior nasal arteries	Spare these arteries
Exposure involves	Removal of the posterior and part of the lateral wall of the maxillary sinus, dissection of the descending palatine artery from its canal, dividing the vidian nerve, and partial excision of the pterygoid plates	Removal of the posterior and part of the lateral wall of the maxillary sinus, spares the other structures
Length of flap	Shorter route, smaller flap	Longer route, larger flap
Additional measures	Involves lateral canthotomy and the usage of percutaneous tracheal dilators for the transposition of temporalis muscle flap	Avoids lateral canthotomy and usage of percutaneous tracheal dilators; direct transposition under vision via infratemporal fossa

Conclusion

Endoscopic transpositions of temporalis flap via the transpterygoid and transmaxillary routes are complementary approaches. While the former shorter route involves drilling of pterygoid plates, ligation of the sphenopalatine and posterior nasal arteries, and manipulation of nearby nerves, the latter longer route avoids these steps and the potential neurovascular complications. Both techniques can be kept in the armamentarium for repairs of persistent CSF dural fistulae after EEAs.

Note

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Conflict of Interest

None.

References

- Hadad G, Bassagasteguy L, Carrau RL, et al. A novel reconstructive technique after endoscopic expanded endonasal approaches: vascular pedicle nasoseptal flap. *Laryngoscope* 2006;116(10):1882–1886
- Kassam AB, Thomas A, Carrau RL, et al. Endoscopic reconstruction of the cranial base using a pedicled nasoseptal flap. *Neurosurgery* 2008;63(1, Suppl 1):ONS44–ONS52, discussion ONS52–ONS53
- Kassam AB, Prevedello DM, Carrau RL, et al. Endoscopic endonasal skull base surgery: analysis of complications in the authors' initial 800 patients. *J Neurosurg* 2011;114(6):1544–1568
- Patel MR, Taylor RJ, Hackman TG, et al. Beyond the nasoseptal flap: outcomes and pearls with secondary flaps in endoscopic endonasal skull base reconstruction. *Laryngoscope* 2014;124(4):846–852
- Fortes FSG, Carrau RL, Snyderman CH, et al. Transpterygoid transposition of a temporoparietal fascia flap: a new method for skull base reconstruction after endoscopic expanded endonasal approaches. *Laryngoscope* 2007;117(6):970–976
- Lund V, Stammberger H, Nicolai P, et al. European position paper on endoscopic management of tumours of nose, paranasal sinus and skull base. *Rhinol Suppl* 2010(Suppl 22):1–143
- Brent B, Upton J, Acland RD, et al. Experience with the temporoparietal fascial free flap. *Plast Reconstr Surg* 1985;76(2):177–188
- Cheney ML, Varvares MA, Nadol JB Jr. The temporoparietal fascial flap in head and neck reconstruction. *Arch Otolaryngol Head Neck Surg* 1993;119(6):618–623
- Panje WR, Morris MR. The temporoparietal fascia flap in head and neck reconstruction. *Ear Nose Throat J* 1991;70(5):311–317
- Kim YO, Park BY. Reverse temporalis muscle flap: treatment of large anterior cranial base defect with direct intracranial-nasopharyngeal communication. *Plast Reconstr Surg* 1995;96(3):576–584