

Transnasal Endoscopic Repair of Post-traumatic Cerebrospinal Fluid Fistula and Meningoencephalocele: Successful Closure of a Big Breach (18 × 15 mm) with Septal Cartilage and Temporalis Fascia

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ABSTRACT

Transnasal endoscopic repair of cerebrospinal fluid fistula is recommended for patients with post-traumatic cerebrospinal fluid leaks who do not respond to conservative treatment. It is a safer and more successful alternative to transcranial surgery.

We present our experience of using septal cartilage and temporalis fascia in this transnasal endoscopic approach for the repair of the large defect of anterior skull base cerebrospinal fistula and meningoencephalocele. Use of microdebrider is highlighted in the technique for the debridement of the encephalocele and complete exposure of the defect.

Keywords: CSF rhinorrhea, Meningoencephalocele, Transnasal endoscopic repair.

INTRODUCTION

Endoscopic approach is safe and effective even in large traumatic anterior skull base defect. Complete exposure of the defect, appropriate selection of a fitting graft as well as accurate placement and stabilization of the graft are critical to the success of repair.

Golusinski¹ used adipose tissue and temporal muscle fascia in two cases of recurrence of cerebrospinal fluid rhinorrhea. In all patients of traumatic rhinorrhea, he used a piece of mucous membrane together with perichondrium of nasal septum or lyophilized dura and final sealing was done with tissue adhesive.

Endoscopic approach was successful in 90% of the patients at the first attempt and 95% of patients at second approach. The fluorescence technique is extremely helpful for the diagnosis of cerebrospinal fluid leak.² Endoscopic closure of the skull base fistula in the repair of cribriform plate, performing an “underlay” procedure with synthetic dura and covering the graft with free mucosal graft from the nasal septum is minimally invasive and highly successful procedure.³

CASE REPORT

A 28-year-old male presented to a neurosurgeon with watery discharge from right nasal cavity and recurrent headache for 6 months. Patient had a history of road traffic accident 6 months back. Since then he had watery nasal discharge. Neurosurgeon referred the case to ENT Department, SMS Hospital, Jaipur, India.

Patient’s MRI showed a large meningoencephalocele in right nasal cavity from anterior skull base defect. CT cisternogram showed a large skull base defect with meningoencephalocele projecting into the nasal cavity in serial coronal sections (Fig. 1). Nasal endoscopy revealed large soft tissue mass medial to middle and superior turbinate (Fig. 2). Patient was planned for the transnasal endoscopic repair of anterior skull base defect.

SURGICAL PROCEDURE

Patient was placed in a supine position under general anesthesia with the head turned towards the surgeon. Since the defect was large, a lumbar drain was placed before starting the procedure and was clamped for the duration of

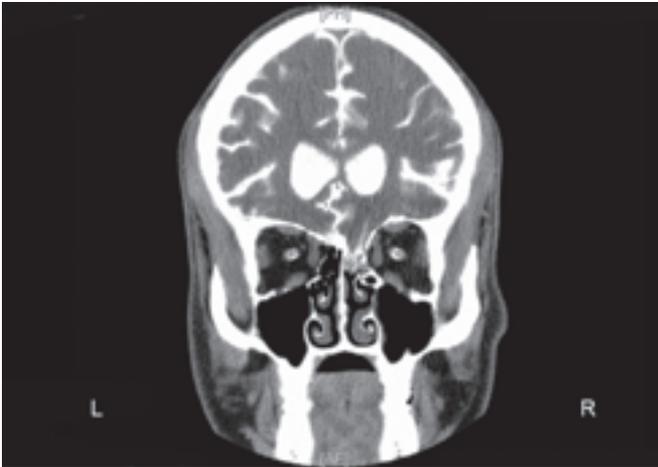


Fig. 1: CT cisternogram showing skull base defect with meningoencephalocele

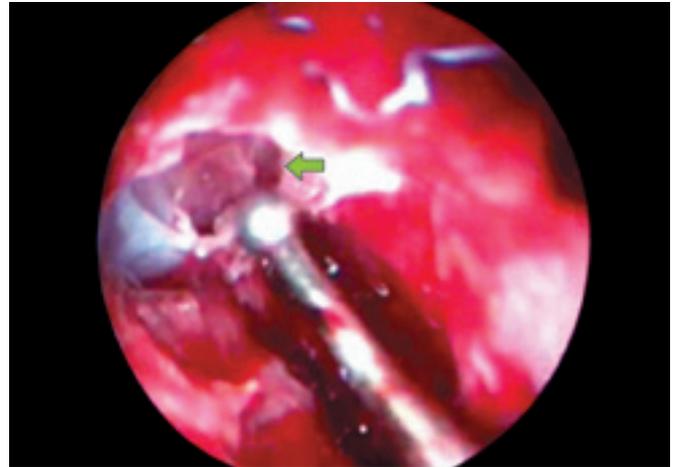


Fig. 3: Endoscopic picture showing anterior skull base defect after resecting encephalocele (arrow)

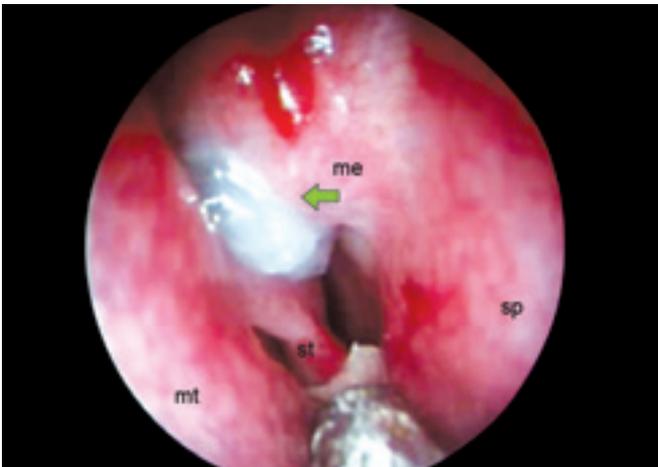


Fig. 2: Nasal endoscopy showing meningoencephalocele projecting from anterior skull base defect lying medial to middle and superior turbinate (mt—middle turbinate, st—superior turbinate, me—meningoencephalocele, sp—septum)

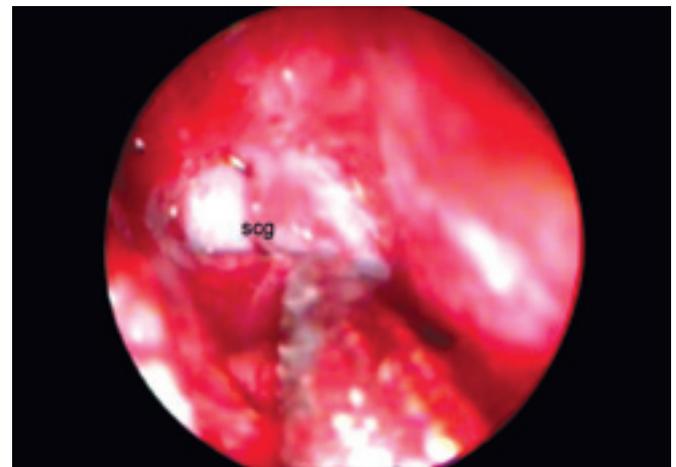


Fig. 4: Endoscopic picture showing septal cartilage graft sealing the defect (scg—septal cartilage graft)

the procedure. Right nasal cavity was packed with neurosurgical patties soaked in saline and adrenaline in the ratio of 1:4 for 10 minutes. Packs removed, area was infiltrated with 2% xylocaine and adrenaline (1:2,00,000). Base around the encephalocele was carefully exposed.

Encephalocele was resected using microdebrider and cautery so as to flush with the skull base. A large skull base defect was noted (Fig. 3). Mucosa was meticulously removed from all around the defect. Intracranial edges of the defect were freed up using an elevator. Recipient site was carefully prepared for the placement of the graft.

Cartilage graft was harvested from nasal septum. Incision was given on the left side of the nasal cavity so that the bleeding may not interfere with our operating field.

Temporalis fascia graft was also harvested. Cartilage graft was carefully inserted under the edges of the defect. Complete seal of the defect was observed (Fig. 4). There was no more cerebrospinal fluid leak. Temporalis fascia

graft was placed as a free graft over the bone defect and secured in place by fibrin glue (Fig. 5). Piece of gelfoam was placed over it. Nasal cavity was packed with Meroceel. Pack was left *in situ* for 5 days.

Spinal drain monitoring was done for 5 days and then removed. Patient was followed at weekly interval for 4 weeks, than at 3 months, 6 months and at 1 year thereafter.

Examination of graft site revealed complete healing of anterior skull base defect with well mucosalization (Fig. 6).

DISCUSSION

Cerebrospinal fluid leakage may develop when a defect is formed in dural layers by traumatic or iatrogenic processes. CSF leak is an associated feature of 12 to 30% of skull base fractures.⁴ Numerous treatment modalities are proposed for the management of CSF leaks.

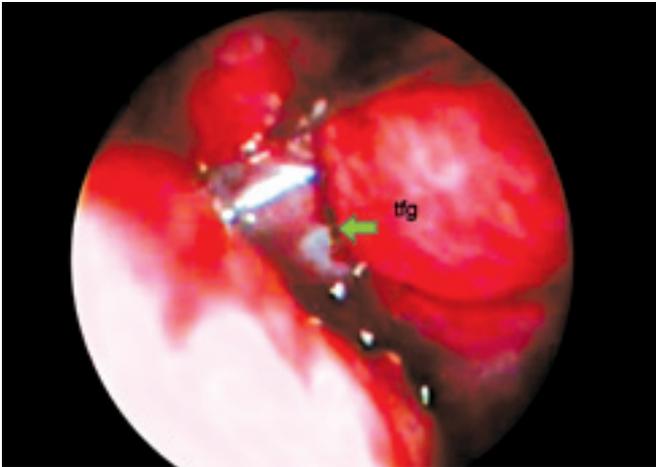


Fig. 5: Endoscopic picture showing securing the temporalis fascia graft with fibrin glue (tfg—temporalis fascia graft)

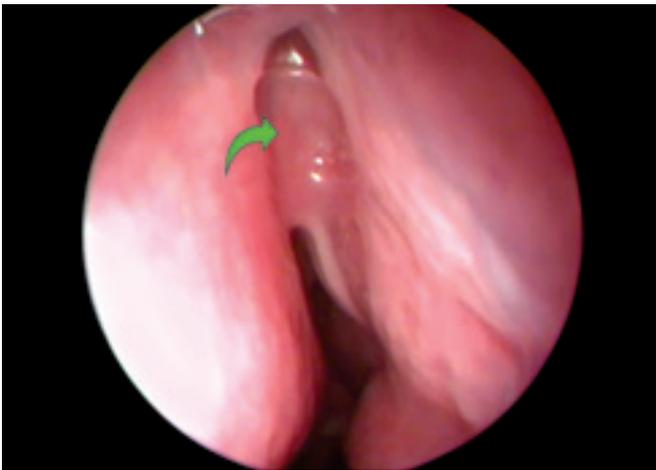


Fig. 6: Follow-up (1 year) endoscopic picture showing a completely healed and well-mucosalized skull base defect

Endoscopic repair of CSF leak is a challenging procedure. Surgical management now relies on an extracranial endoscopic approach where the success rate is over 90% when compared to intracranial approaches where success rate is generally accepted as being 67 to 73% after the first procedure and up to 90% after multiple procedures.⁵

With advanced endoscopic and extracranial techniques, otolaryngologists can now close most CSF leaks and avoid the morbidity of a craniotomy. Thin section spiral CT scan and three-dimensional reconstruction make the leak localization more accurate.

Excellent field of vision, allowing exact localization of leak; the ability to precisely clean the mucosa from bony defects, without significantly increasing the size of the defect; accurate positioning of the graft material over the defect are the advantages of endoscopic technique.⁶ Reconstructed skull base will be exposed to dural pulsations and intracranial pressures for many years. A thin reconstruction may expose the patient to a significant risk

of delayed failure.⁷ In our case, since the defect was large, we have used underlay septal cartilage, so as to avoid delayed failure with dural pulsations and intracranial pressures. Use of a free graft prevents the tenting and folding of the graft that might lead to an inadequate seating of the graft against the defect.⁶ The free graft helps the wound healing by acting as a scaffold and adhere to bone after 1 week and they are replaced by fibrous connective tissue after 3 weeks.⁵

The intranasal technique of Vrabec and Hallberg⁸ used a pedicled graft from the entire middle turbinate. The mucosa was elevated from the entire middle turbinate, turbinate was resected and the mucosa was reflected over the cribriform area. Lehrer and Deutsch⁹ combined the submucosal resection of nasal septum for adequate visualization. The technique we used, permits the precise localization of the defect endoscopically, complete closure of the defect with the underlay septal cartilage, reinforcing it with overlay temporalis fascia graft. Finally the graft was secured in place with fibrin glue. The graft was further held in position with gelfoam soaked in antibiotic drops followed by packing the nasal cavity with Meroceel. We did not sacrifice the normal nasal structures for the exposure of the defect, therefore, preserving the normal nasal anatomy.

Gelfilm or silastic sheeting used between multiple layers of packing may prevent the inadvertent removal or movement of all layers of packing and possible disruption of the graft during the early postoperative period.¹⁰ Lumber drainage is usually recommended in patients having long standing or exceptionally vigorous CSF rhinorrhea who may have their CSF pressure reduced for the first few days with serial lumbar punctures or a lumber drain.¹¹ Lumber drain was suggested for defects in frontal and sphenoid sinus and defects associated with meningocele and encephalocele.¹²

Endoscopic approach is safe and effective treatment for skull base defects, use of underlay septal cartilage is highlighted to take care of large defects and to avoid delayed failure.

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