

Pradhan B¹
Shreepaili A²

Ganesh Man Singh Memorial
Academy of ENT and Head Neck
Studies, Institute of Medicine (IOM),
Maharajgunj, Kathmandu, Nepal¹

Seti Zonal Hospital, Dhangadi,
Nepal²

Correspondence:

Prof. Bibhu Pradhan
Ganesh Man Singh Bhawan
Ganesh Man Singh Memorial
Academy of ENT and Head Neck
Studies, Institute of Medicine (IOM),
Maharajgunj, Kathmandu, Nepal

Email: bibhuduga@yahoo.com

ENDOSCOPIC REPAIR OF CSF RHINORRHOEA: OUR EXPERIENCE

Objectives:

To present a case series of endoscopic repairs of spontaneous CSF rhinorrhoea.

Materials and Methods:

Retrospective review of ten patients who underwent endoscopic CSF leak repair between July 2011 to July 2015 at Ganeshman Singh Memorial Academy for ENT and Heck Neck Studies, TU Teaching Hospital, Kathmandu, Nepal. Repair was performed by identifying the defect site, debriding the defect margins and sealing the defect with a fascia lata graft or middle turbinate mucosal graft.

Results:

Leaks were identified in cribriform plate area in nine patients and frontal recess area in one patient. Fascia lata graft was used in nine patients and middle turbinate mucosal graft was used in one patient. Nine out of ten patients had successful repair after first surgery and one patient had successful repair after second surgery.

Conclusions:

Endoscopic repair is a safe and effective treatment for CSF rhinorrhoea.

Key words: CSF rhinorrhoea, Endoscopic repair

INTRODUCTION:

Cerebrospinal fluid rhinorrhoea denotes a communication between subarachnoid space and the pneumatized portion of skull base.¹ Ommaya et al^{2,3} classified CSF leak etiologically as idiopathic or secondary to iatrogenic, traumatic, inflammatory, neoplastic, and congenital. Idiopathic, or spontaneous, CSF leaks are usually associated with elevated intracranial pressure and commonly associated with idiopathic intracranial hypertension.⁴

Trauma, iatrogenic or non iatrogenic is the most common cause of cerebrospinal fluid rhinorrhea, which is responsible for 81 to 90% of the cases.⁵ Nontraumatic causes include spontaneous leaks that can be associated with elevated intracranial pressure (ICP), neoplasms, congenital defects, meningoceles and encephaloceles. Nontraumatic leaks are much less common (3-4% cases)⁶, insidious in onset and may present for years. Headache is common in nontraumatic cases, anosmia is rare.⁵ Non traumatic variety affects adults mainly over 30 and female twice as common as male. Traumatic CSF leaks bear no relationship to age or sex, anosmia is common (up to 78%). In most traumatic cases (>50%), rhinorrhea stops within one week and at the most within 6 months.⁵

The workup of CSF leaks includes a beta trace protein, beta-2 transferrin test of nasal discharge, intrathecal fluorescein with nasoendoscopy, computed tomography (CT) scan, and magnetic resonance imaging (MRI), which identify the leak site in more than 90% of cases. High resolution CT is a useful screening examination for the initial workup of CSF rhinorrhoea.⁶ The most common defect location is the ethmoid roof and cribriform region followed by the sphenoid sinus.⁷ The most common site of iatrogenic injury is along the ethmoid roof and lateral lamella.⁴

Cerebrospinal fluid rhinorrhoea may be managed conservatively.^{8,9} Surgical treatment is required due to serious risks of complications e.g. meningitis, brain abscess and pneumoencephalocoele, etc.⁹ CSF rhinorrhoea persisting for more than 7 days had a significantly increased risk of developing meningitis.¹⁰

Various surgical procedures have been described to repair CSF leak like intracranial, extracranial and endoscopy surgery. Intracranial procedure was first reported by Dandy for closure of CSF leak using a frontal craniotomy in 1926.¹¹ These procedures involved direct visualization of the defect and the use of vascularized pericranial flaps.

The main advantage of intracranial approach are ability to treat associated problems such as intracranial bleed, tumour and closing associated dural defects. The main disadvantages are anosmia, intracerebral hemorrhage, retraction related brain edema and a success rate of about 60% after the first attempt.^{11,12}

First extracranial approach to repair CSF leak was described by Dohlman in 1948 using nasoorbital incision.¹³ Subsequently, other procedures were described using transmastoid and trans-septo-sphenoid approaches with higher success rate and comparatively less morbidity.^{12,13}

The endoscopic approach is a subset of the extracranial, extradural approach to CSF leak first described by Wigand in 1981. Endoscopic endonasal approach is now gaining popularity as it provides excellent visualization, precise graft placement and shortened operating time.¹⁴ Transnasal endoscopic surgery minimizes intranasal trauma and preserves the bony framework supporting the frontal recess and other critical areas. This approach has high success rate ranging from 83 to 100% without any increase in morbidity and mortality.^{15,16}

Various materials are used for CSF leak repair¹⁷ like fat, fascia lata, temporalis fascia, bones from nasal septum and turbinates, cartilage from concha and nasal septum, lyophilised dura, hydroxyapatite, pedicled mucoperichondrial flap, mucosal graft, recombinant human basic fibroblast growth factor, fibrin glue. Less commonly used materials are autologous dura, synthetic dura, synthetic vicryl, silicone plate, alumina ceramic.

Table 1. Showing various technique of graft placement to repair CSF leak

Type of graft	Type of defect
Overlay (most common)	Dura adherent, cannot be elevated, repair from nasal side
Inlay	Dural fibres can be elevated, graft placed internally on the cranial aspect
Bath plug	Cribriform area, fovea
Cuff - link	Sella, clivus
Cartilage/bone	Large defects requiring support
Multiple	Large defects of fovea, sphenoid, several layers of fat, fascia, cartilage, etc.
Obliterative	Sphenoid sinus after removing the mucosa

MATERIALS AND METHODS:

It is a retrospective review of ten patients who underwent endoscopic CSF leak repair between July 2011 to July 2015 at Ganeshman Singh Memorial Academy for ENT and Heck Neck Studies, TU Teaching Hospital, Kathmandu, Nepal. Out of ten, there were 8 female and 2 male patients. Most of patients were in the age group of 30-50 years (n=9) with one patients being 13 years of age. Spontaneous leak was etiology in all the cases. Site of leak was in cribiform plate area in nine cases, defect being on left side in five patients and right side in two patients and bilateral in two case. In one patient leak was identified on left frontal recess area. All patients had CT cisternography done prior to surgery to detect the site and size of the defect. All patients underwent repair of CSF leak under GA, with 15 degree head up position. Adrenaline soaked ribbon gauze packing was done at the cribiform area and middle meatus area. 2% lignocaine with 1:200,000 adrenaline was injected at superior, middle and inferior attachment of middle turbinate. Routine endoscopic sinus surgery like complete uncinectomy with middle meatal antrostomy and complete frontoethmoidectomy was done. The anterior ethmoidal artery (AEA) was identified and traced up to its insertion into nasal cavity. Most of the time, the defect was located at this area. The superior attachment of the middle turbinate was cut with scissors flushed with skull base and was pulled downwards towards lower attachment. The bleeding from the branch of sphenopalatine artery was cauterized with bipolar cautery. Middle turbinate mucosal graft was prepared. Middle turbinate bone was preserved in saline. In other cases, fascia lata graft along with fat was harvested from the thigh. After the middle turbinate was removed, the defect and the leak was visualized. The defect was cauterized with bipolar cautery to decrease its size and seal it if possible. The graft bed was prepared by debriding the area around anterior ethmoid artery and the adjacent area around the septum. The fat graft was placed over the defect and the fascia lata or the mucosal graft was placed over the entire raw area exposing the frontal and maxillary sinus openings. Fibrin glue if available was flushed over the graft and again a layer of fat graft is placed over the graft. Surgicel was placed over the graft and the two nasal pack soaked with povidine iodine solution was placed in the nasal cavity. One case had defect more than 2cm in size, in which fat wrapped in surgicel was kept to seal the defect and then fascia lata graft was used. One patient had herniation of piaarachnoid mater, repaired was done with fat and fascia lata graft.

Table 2. Various graft materials used for repair (n=10)

Grafts materials	No. of cases
Fascia lata	9
Middle turbinate mucosa	1

Postoperatively patients were advised for complete bed rest for 2 days. Intravenous ceftriaxone was given for 5 days then continued on oral antibiotics for two weeks. Patients were also given acetazolamide 250mg three times a day for two weeks, phenobarbitone 120mg per day in divided dose for five days. Nasal pack were removed after five days and discharged. Patients were followed up monthly till 6 months, then three monthly for one year.

RESULTS:

One patient with fascia lata graft had leak after primary surgery for which revision surgery was done 3 months later. All patients are doing well till date.

DISCUSSION:

In our case series all patients had spontaneous CSF leak. Trauma including iatrogenic and non surgical trauma is the most common cause of CSF leak (80-90% cases). Spontaneous leak accounts for 3-4 % of cases.⁷ Risk factors for spontaneous CSF leak are middle-aged, obese females with intracranial hypertension. In a study by Woodworth et al,¹⁹ 46 of the 56 (77%) patients who underwent spontaneous CSF leak repair were women and the average age at presentation was 61 years. In our study eight out of ten patients were female. In our series nine patients had leak on cribiform plate area and one patient on frontal recess area. The most common sites reported for spontaneous leaks are sphenoid and cribiform plate of ethmoid.²⁰ The most common sites reported for iatrogenic injuries include sphenoid, ethmoid, and multiple sites.^{20,21}

The management of CSF rhinorrhea includes both conservative and surgical management. The endoscopic endonasal approach to treat CSF leaks has become the preferred technique for the majority of defects as it provides excellent visualization and access for successful reconstruction. Removing the mucosa around the bony defect will help the graft adhere to the skull base. A multilayer reconstruction technique helps to ensure a watertight seal and successful closure.^{20,21} In our series, multilayer closure was done in all cases. Appropriate postoperative care is also integral to success. Recurrence rates have been shown to be associated with high-flow CSF leaks and benign intracranial hypertension.²² Several types of graft material such as, free grafts as well as pedicled flaps have been used with good results in treatment of CSF rhinorrhea. Pedicled flaps have advantages of intrinsic blood supply and viability but shown to interfere with nasal function.²³ Posterior nasoseptal flap based on posterior nasoseptal artery is currently the work horse of endoscopic skull base repairs.²⁴ In their meta-analysis, Hegazy et al.²² found no statistically significant difference among different grafting techniques and materials with 90% success rate after a first attempt and a overall success rate of 97%. Kirtane et al.²⁵ reported high success rate of 96.63% in the first instance and 98.88% after revised surgery to repair the CSF leak using fascia lata and fat without the use of fibrin glue. In our case series nine out of ten patients had successful repair after first surgery and one patient had successful repair after second surgery. The main limitation of this study was small number of cases. Larger and comparative series are required to validate these early results.

CONCLUSION:

Endoscopic endonasal approach is currently the preferred approach for CSF rhinorrhoea. Endoscopic approach provides a better field of vision with enhanced illumination, magnified angle of visualization and accurate positioning of the graft under direct visualization. It has high success rate and less morbidity.

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