Endoscopic Repair of Lateral Sphenoid Recess Cerebrospinal Fluid Leaks

Milind V. Kirtane · Abhineet Lall · Kashmiri Chavan ·
Dhruv Satwalekar

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Abstract Endoscopic repair of anterior cranial base has been widely reported. However there is still no uniformity in the technique of endoscopic repair of lateral sphenoid cerebrospinal fluid (CSF) leaks. To highlight the management of CSF leak or encephalocele in the lateral sphenoid recess and relate our experiences. We retrospectively reviewed the medical records of all our patients who underwent an endoscopic repair of CSF leaks in the lateral sphenoid recess during the period from September 2003 to January 2010 at our tertiary hospital. Fifteen cases with CSF leaks/encephalocele that were repaired by the endoscopic approach were included. The majority of our cases were spontaneous leaks. In all our cases we approached the site of defect by an end on approach. All our patients were successfully treated in the first attempt. Endoscopic repair of lateral sphenoid recess has shown better surgical outcome with reduced morbidity.

Keywords Para nasal sinus · Sphenoid sinus · Rhinorrhoea · Cerebrospinal fluid rhinorrhoea · Spontaneous cerebrospinal fluid rhinorrhoea · Surgical procedure · Endoscopic

Work done at Department of ENT, P. D. Hinduja National Hospital and Medical Research Centre and Cumballa Hill Hospital, Mumbai.

M. V. Kirtane · A. Lall · K. Chavan
Department of ENT, P. D. Hinduja National Hospital and
Medical Research Centre, Mahim, Mumbai, India

D. Satwalekar
Cumballa Hill Hospital, Mumbai, India

A. Lall (✉)
Kirtane Clinic, 1st Floor, Amar Bhuvan, French Bridge, Near
Opera House, Mumbai 400007, India
e-mail: abhineetlall@hotmail.com

Introduction

Transnasal endoscopic repair of anterior skull base defect has been in vogue for quite sometime, and it is a natural progression that the same technique can be used to repair other parts of the skull base.

Initially, transcranial approaches were used to repair all CSF leaks. Subsequently extra cranial approaches were developed and popularized [1]. Most of the literature is limited to the anterior cranial fossa leak. Reports of middle cranial fossa leak into the lateral sphenoid are few. A microscopic transseptal approach will not give adequate visualization of the lateral wall and, an underlay placement of graft may not be possible because of the adjacent neurovascular structures. These patients present with profuse watery discharge on bending forward, salty taste in the mouth and nocturnal coughing. Few do present with meningitis and a history of watery nasal discharge can usually be elicited in them.

We present our experiences in managing CSF leaks and encephalocele in this region.

Methods

We retrospectively reviewed the clinical data of all patients who underwent endoscopic sinus surgery for lesions of the lateral recess of the sphenoid sinus with either an encephalocele or a CSF leak. The inpatient notes for the patients identified in the search of primary measure were collected, and each patient's data set thoroughly evaluated for history of previous trauma, previous sinus surgery, diagnostic work up including CT and MRI studies and postoperative course. Exemplary images from different imaging studies and intraoperative sites were gathered as

Fig. 1 Coronal CT showing the defect in the lateral sphenoid wall

well. Also data pertaining to perioperative management, including use of nasal packing, and the use of perioperative prophylactic antibiotics were analyzed (Figs. 1, 2 and 3).

Results

Between September 2003 and January 2010, 15 patients presented with a CSF leak in the lateral recess of the sphenoid sinus. Our study population was composed of seven male subjects and eight female subjects; their age ranged from 15 to 67 years (mean 45.80). 13 of our patients had spontaneous leaks and one each were following trauma and surgery. Follow up ranged from 6 to 40 months. Complication associated with the CSF leak, before repair, included meningitis in five patients (Table 1).

Characteristics of the Endoscopic Repair

All our patients presented with watery nasal discharge. Intraoperative endoscopic visualization and its correlation with CT cisternography was used to identify the site of leak. The grafting material used was fascia lata or rectus sheath and thigh fat or abdominal fat. Their order of placement was fat followed by fascia graft followed by fat, which was then supported by an absorbable gelatin sponge and tissue glue. Perioperative management included pre and postoperative antibiotics.

Fig. 2 Coronal CT of another patient showing the defect in the lateral sphenoid wall

Fig. 3 T2 coronal MRI of the same patient as Fig. 2

Operative Technique

The initial steps of our approach were the same as in any other endoscopic sinus surgery. An uncinotomy was done, anterior and posterior ethmoids were removed. The

Table 1 Patients with lateral sphenoid recess CSF leak

Patient	Age (years)	Sex	Clinical presentation	Etiology	Side of defect	Type of defect (focal/multiple)	Encephalocoele	Method of repair	Co-morbid conditions
1	40	F	Rhinorrhoea	Spontaneous	Right	Focal	Absent	AF + RS + TG	Nil
2	40	F	Rhinorrhoea	Spontaneous	Left	Focal	Absent	AF + RS + TG	Nil
3	45	F	Rhinorrhoea	Spontaneous	Left	Focal	Absent	AF + RS + TG	Nil
4	67	M	Rhinorrhoea	Spontaneous	Right	Focal	Absent	AF + RS + TG	Nil
5	52	M	Rhinorrhoea	Spontaneous	Right	Focal	Absent	AF + RS + TG	Nil
6	41	M	Rhinorrhoea	Spontaneous	Right	Focal	Absent	AF + RS + TG	Nil
7	15	F	Rhinorrhoea	Spontaneous	Left	Focal	Absent	AF + RS + TG	Nil
8	49	F	Rhinorrhoea	Spontaneous	Right	Single focal defect with multiple small openings in lateral wall	Present	AF + pedicled nasal septal mucosal flap + TG	Hypertension
9	42	F	Rhinorrhoea	Spontaneous	Left	Focal	Present	AF + RS + TG	Nil
10	51	F	Rhinorrhoea; H/O meningitis	Spontaneous	Left	Focal	Absent	AF + pedicled nasal septal mucosal flap + TG	Nil
11	43	M	Rhinorrhoea; H/O meningitis	Spontaneous	Right	Focal	Absent	AF + RSL + TG	Nil
12	29	F	Rhinorrhoea	H/O Head injury; H/O embolization of dural AV malformation; H/O LP shunt surgery	Left	Focal	Absent	TF + FL + TG + Pedicled nasal septal mucosal flap	Nil
13	55	M	Rhinorrhoea; H/O meningitis	Spontaneous	Right	Focal	Present	TF + FL + TG	Nil
14	56	M	Rhinorrhoea; H/O meningitis	Endoscopic trans-sphenoidal excision of pituitary adenoma done twice; H/O radiation; Gamma knife excision for recurrence	Left	Focal	Absent	AF + RS + TG	Nil
15	62	M	Rhinorrhoea H/o meningitis	Spontaneous	Left	Focal	Absent	TF + FL + inferiorly based nasal mucosal flap	Nil

posterior end of the middle turbinate was the trimmed and the sphenoid ostium was identified. The same was widened laterally till the lateral end of the recess was reached. The defect was clearly visualized and identified in all its margins. The defect was then packed with fat. The bath plug technique [2] was used to pack the fat in such a way that part of the fat was intracranial and part extracranial. This was then supported by fascia, tissue glue, gelfoam and merocel.

Occasionally we have had cases where there were multiple small openings and the entire sphenoid wall thinned out. In such cases the entire sinus mucosa was denuded and packed with fat, which was supported by a septal mucosal flap based on the splenopalatine artery. The flap is similar to the Hadad flap [3] but smaller as the dissection was limited to the posterior end of the septum.

An angled scope [4] can be used to visualize the defect without drilling the anterior sphenoid sinus wall and an

angled bipolar can then be used to burn the gliotic tissue and then plug it with fat, fascia and tissue glue. However we found it more convenient to expose the entire recess. Drilling the anterior wall of the sphenoid sinus does not require much time and is very safe.

The merocel pack was removed on the 5th postoperative morning and the thigh wound sutures were removed on the 10th day.

Discussion

The sphenoid sinus is a developmental outgrowth of the sphenoid bone with variable pneumatization. It may involve a portion or the entire sphenoid bone. Pneumatization of even the pterygoid plates have been reported [5, 6].

Another anatomical variant which needs a mention here is Sternberg's canal. Originally described by Maximilian Sternberg in 1888, it is a canal extending from junction of the body of sphenoid bone and posterior root of the lesser sphenoid wing just medial to the superior orbital fissure inferiorly to connect with the pharynx at the processes vaginalis or when sufficient pneumatization has occurred into the lateral wall of the sphenoid sinus [7]. Authors have attributed the Sternberg's canal, as a common site of CSF leak in the lateral recess [7].

CSF leaks in the lateral recess may be due to a culmination of both the factors like anatomical variations mentioned in the previous paragraph and obesity.

Confirmation of the diagnosis is important before starting the treatment. A CSF related rhinorrhoea should be suspected in the presence of a unilateral, watery, clear, nonsticky nasal discharge that is commonly associated with a headache. A sphenoid sinus defect may be suspected with fluid gush on forward tilt of head [8].

We have used beta-2 transferrin to confirm presence of leak in all our cases. A high resolution CT cisternography helps to further confirm and identify the site of the defect. A diagnostic nasal endoscopy helps to further corroborate the site of leak.

MRI cisternography [9] is also becoming increasingly popular as non invasive technique which does not require intrathecal injection and is particularly useful in patients with meningitis.

A number of approaches have been described for the lateral recess of the sphenoid sinus. Historically, transcranial approaches have been used for the surgical management of encephaloceles of the lateral recess of the sphenoid sinus [1, 8, 10]. There have been reports of external approach to reach the lateral recess of the sphenoid sinus [11]. Rivierez and Valsant [12] used a frontotemporal approach with zygomatic osteotomies for accessing a meningoencephalocele in the right lateral sphenoid recess.

External approaches however, have a number of disadvantages and the endoscopic approach has firmly found its place as a standard of care [13, 14].

Even within the realm of endoscopy, a number of approaches have been described. Mehandale et al. [14] reported successful repair of three cases of CSF fistula involving the lateral recess using an endoscopic assisted sublabial transseptal approach. They also had their share of failures, which they attributed to lack of availability of instruments which allow manipulation of lesions at the lateral aspect of the sphenoid sinus and freedom to create only a small sphenoidotomy in order to preserve the rostrum to support the graft.

There have been reports of transpterygoid and transethmoidal pterygoidal sphenoidal approach to the lateral recess of the sphenoid sinus [1, 5].

Our approach has evolved from our own past experiences, whereas initially we used to pack the entire sphenoid sinus, we now believe in drillout out the anterior sphenoid wall as far laterally as required to expose the site of defect and close that site only.

Conclusion

Although a number of endoscopic approaches have been described for the lateral recess of the sphenoid sinus, our technique provides a simple direct approach and an orientation to all corners of the defect.

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