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Endoscopic endonasal repair of traumatic CSF rhinorrhoea

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INTRODUCTION

Communication between the subarachnoid space and the nasal cavity is called cerebrospinal fluid rhinorrhea, which can occur directly from the anterior cranial fossa into the nasal cavity, or indirectly from the middle and posterior fossa through the eustachian tube into nasal cavity[1]. While leaks due to blunt trauma do well with conservative management, most of the other causes of CSF rhinorrhoea require surgical intervention. Endoscopic repair of these defects is widely practiced, and has led to 90% success rate after first repair[2,3].

ETIOLOGY

CSF leaks are classified as traumatic, congenital, spontaneous, iatrogenic, or secondary to tumor invasion of the skull base. Etiology of the CSF fistula is the most important determinant of successful repair. Trauma is a major cause of CSF rhinorrhea, approximately 3% of closed head injuries and 30% of all skull base fractures result in CSF rhinorrhoea. Usually, the rhinorrhea presents within the first 48 hours, however at times it may take up to three months before rhinorrhea manifests. Many of these leaks are intermittent due to blockage of dural defect by edema, bone chips, or blood clot.

The most common locations for injury are the lateral lamella of the cribiform plate and the posterior ethmoids near the anteromedial wall of the sphenoid. During transphenoidal hypophysectomy, damage to the sellar diaphragm can causes a leak. Skull base surgery also carries the risk of iatrogenic CSF fistula.

SURGICAL REPAIR OF CSF RHINORRHEA

The first repair of CSF leak was performed by Dandy in 1926 using a frontal craniotomy. In 1981, and the first endoscopic CSF rhinorrhea repair was performed by Wigand. Since then this procedure has become the standard of care due to less morbidity, and almost 90% first time success rate.

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The key to endoscopic surgical repair of CSF rhinorrhea is an accurate preoperative assessment of location of the fistula, its dimensions, and the anatomy of the surrounding area. HRCT, MRI, radioisotope cisternography, metrizamide CT cisternography, and MR cisternography are all useful for preoperative localization of the defect. HRCT and MRI (Figs 1 & 2) are the most widely used[4].

Indication of Endoscopic Repair of CSF Rhinorrhoea:

Defects less than 1.5 cm in size of the cribriform, ethmoid, sphenoid, and frontal sinuses, most of which are easily assessable transnasally are best repaired by the transnasal endoscopic technique. However, defects less suited for endoscopic repair are:

- Defects greater than 1.5cm
- Frontal sinus defects with lateral extension
- Defect of posterior wall of frontal sinus

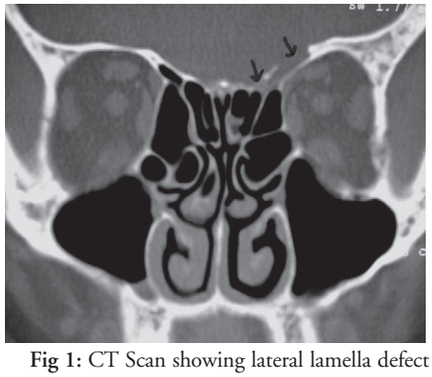

Fig 1: CT Scan showing lateral lamella defect

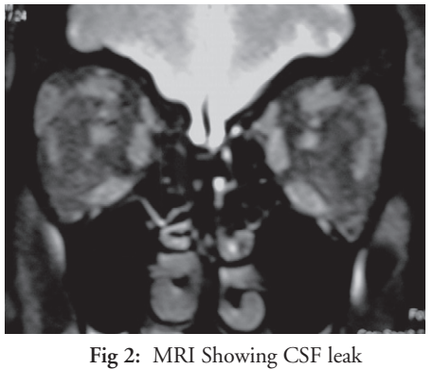

Fig 2: MRI Showing CSF leak

Instruments : Rigid nasal endoscopes (0, 30 and 45 degree) and various endoscopic nasal instruments are used (Fig 3). If IT fluoroscein is to be used, then a yellow light filter for the endoscope and a blue filter for the light source may aid in identifying the defect.

Important perioperative issues include the use of lumbar drain, anesthetic plan, and preoperative antibiotics. The lumbar drain is useful in regulating ICP, administering intrathecal fluoroscein, and in helping reduce encephaloceles. Some studies shows it should not be used[5]. If used it is usually not removed until 24-72 hours post operatively. In addition to lumbar drains, it is important to reduce positive pressure ventilation to avoid pneumocephalus and changes in ICP.

APPROACHES

The direct paraseptal approach may be used to reach defects of the cribiform, or ethmoid roof. A complete ethmoidectomy & maxillary sinusotomy are usually needed for adequate exposure. In addition, frontal sinusotomies, sphenoidotomies, and middle-superior turbinectomies may also be necessary for additional exposure.

Once the defect is visualized, the mucosa is completely stripped away and a bed is prepared for the graft (Fig 4).

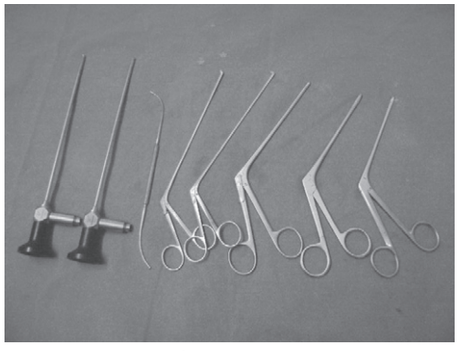

Fig 3: Endoscopic Instruments

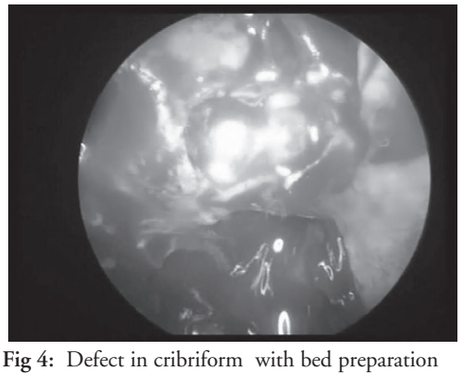

Fig 4: Defect in cribriform with bed preparation

After the site is prepared, the encephaloceles need to be reduced. This may be done by using bipolar electrocautery at the stalk. It is important to ablate the encephalocele at the stalk so that it can not retract into the skull and hemorrhage. The graft material is then placed to cover the defect.

Graft material includes cartilage, bone, mucoperichondrium, septal mucosa, turbinate, fascia, abdominal fat, conchal cartilage, free tissue or pedicled tissue, and composite grafts. Closure techniques include overlay, underlay, combined and obliteration. In overlay technique, the graft is placed extracranially (Fig 5). In underlay technique, the graft is placed between dura and bone (Fig 6). In combined techniques, a graft is placed deep to the dura, between dura and bone, and then an extracranial overlay is used. Obliteration requires complete mucosal stripping, and placement of abdominal fat. Fibrin glue can be used to aid in wound healing by increasing contact of graft to recipient site.

POSTOPERATIVE PERIOD

Patients are placed on bed rest with head elevation and broad spectrum antibiotics for 14-21 days. The patient

Fig 5: Overlay technique (fascia lata being placed in defect of roof of sphenoid)

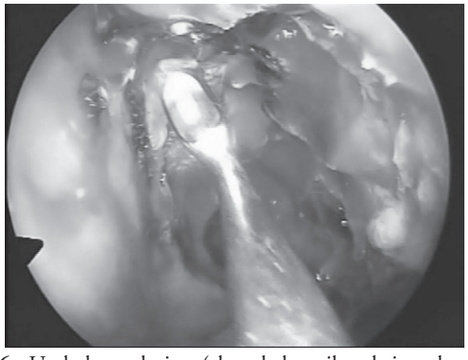

Fig 6: Underlay technique(chonchal cartilage being placed in medial lamella defect)

is asked to avoid nose blowing, sneezing and Valsalva maneuvers, and are placed on stool softeners. If lumbar drains were placed, meticulous care must be taken to maintain CSF homeostasis. These drains are removed after 3-5 days.

COMPLICATIONS

Persistent leak requiring a second operation occurs with 5-10% of endoscopic repairs. Most of these are definitively closed with a second endoscopic operation, bringing endoscopic success rates to 97%. Other complications include:

- Persistent leak (5-10%)
- Pneumocephalus
- Intracranial haemorrhage or hematoma (0.3%)
- Frontal lobe abscess (0.9%)
- Anosmia (0.6%)
- Chronic headache (0.3%)
- Meningitis (0.3%)

CONCLUSION

High resolution CT scans and MRI are essential for preoperative planning and for locating sites of defects. For defects less than 1.5cm in size of the cribiform, ethmoid, and sphenoid sinuses, endoscopic repair is the best option for a lasting repair. Compared to open approaches, endoscopic repair has a less morbidity, lower complication rate and better overall success rate. However, in defects less than 1.5cm in size, and in unfavourable areas, (posterior wall of frontal sinus etc) an open approach may still be required.

REFERENCES

1. Wax MK, Ramadan HH, Ortiz O, Wetmore SJ. Contemporarymanagement of cerebrospinal fluid rhinorrhea. *Otolaryngology-Head and Neck Surgery* 1997; 116: 442-9.
2. Castelnuovo P, Mauri S, Locatelli D, Emanuelli E, Delu G, Giulio GD. Endoscopic repair of cerebrospinal fluid rhinorrhea: learning from our failures. *Am J Rhinol* 2001;15:333-42.
3. Lanza DC, O'Brien DA, Kennedy DW. Endoscopic repair of cerebrospinal fluid fistulae and encephaloceles. *Laryngoscope* 1996;106:1119-25.
4. Lloyd MNH, Kimber PM, Burrows EH. Post-traumatic cerebrospinal fluid rhinorrhea: modern high-definition computed tomography is all that is required for the effective demonstration of the site of leakage. *Clin Radiol* 1994;49:100-103.
5. Cassiano RR, Jassir D. Endoscopic cerebrospinal fluid rhinorrhea repair: is a lumbar drain necessary? *Otolaryngol Head Neck Surg* 1999;121:745-50.