Five cases of iatrogenic cerebrospinal fluid (CSF) rhinorrhea: Early management is crucial

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SUMMARY
Endoscopic sinus surgery (ESS) is a standard treatment for rhinosinusitis, which failed optimum medical therapy. Iatrogenic cerebrospinal fluid (CSF) rhinorrhea can occur during ESS warrants early repair of the leakage. The common sites for CSF leakage are cribriform plate, fovea ethmoidalis, and anterior ethmoid sinuses. We present five cases of iatrogenic CSF rhinorrhea due to ESS and its management.

INTRODUCTION
Endoscopic sinus surgery (ESS) has evolved tremendously since the advent of computed tomography (CT) scan and it becomes a standard surgical treatment for chronic rhinosinusitis, which failed optimum medical therapy. The risk and complications from ESS are related to anatomical complexities of the structures surrounding the sinuses namely orbit, skull base, cavernous sinus and internal carotid artery; and operative fields formed by narrow slits with walls that bleed abundantly.¹

A cerebrospinal fluid (CSF) rhinorrhea is a known complication of ESS. Thus, the preoperative assessment is important to identify the complex anatomical variability of the paranasal sinuses and the skull base. Although direct examination with endoscope provides great detail of the anatomy, the advantage of thin-cut CT imaging allows the surgeon to gather further information prior the surgery and as an intra-operative guidance. Iatrogenic CSF rhinorrhea is mainly located either in the cribriform plate, fovea ethmoidalis, and anterior ethmoid sinuses. We present five cases of iatrogenic CSF rhinorrhea which were identified intraoperatively and postoperatively; and its early management. In our centre, early management is considered for CSF rhinorrhea which is presented within one week post ESS.

CASE REPORTS
Case 1
A 35-year-old male was referred for management of iatrogenic CSF leak. Intra-operatively, the skull base at the junction between anterior and posterior ethmoid sinuses was breached. Immediate repair of the leak was carried out. CT scan of the paranasal sinuses showed a left cribriform plate defect (Figure 1). The defect was repaired in layers (Table 1).

CASE REPORT
This article was accepted: 26 February 2018
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Table I: This table shows sites of CSF leakage and their managements of five presented cases.

<table>
<thead>
<tr>
<th>Occurrence of CSF leakage and time of repair</th>
<th>Neuroimaging findings</th>
<th>Graft material</th>
<th>Management</th>
<th>Conservative measures.</th>
<th>Outcome/ follow-up</th>
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</thead>
<tbody>
<tr>
<td>Case 1 ESS for pansinusitis complicated with intraorbital complication. CSF leak developed intra-operatively. Immediate repair was done.</td>
<td>Small defect at the adjacent fovea ethmoidalis (between crista galli and the left fovea ethmoidalis), pneumocranium in the ACF.</td>
<td>Fat lobule (underlay) and nasoseptal mucosal flap (overlay).</td>
<td>1st CSF repair; Graft used were fat and fascia lata. Stabilizer material: absorbable hemostat (Surgicel®), fibrin sealant (Tisseel®) and bioresorbable nasal dressing (NasoPore®).</td>
<td>4th ceftriaxone and metronidazole for a week; and a LD was kept for 4 days. CRIB and others*.</td>
<td>Remained asymptomatic at 6 months follow-up.</td>
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<td>Case 2 ESS for CRS. CSF leak started at day 3 after ESS. Repair was done 21 months later.</td>
<td>Defect at the posterior aspect of left cribriform plate, with presence of meningocele.</td>
<td>Collagen matrix (DuraGen®) (underlay) and nasoseptal flap (overlay).</td>
<td>1st CSF repair; Graft used were fat and fascia lata. Stabilizer material: absorbable hemostat (Surgicel®), surgical adhesive (BioGlue®) and bioresorbable nasal dressing (NasoPore®).</td>
<td>IV ceftriaxone for a week. CRIB and others*.</td>
<td>Remained asymptomatic at 12 months follow-up.</td>
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<tr>
<td>Case 3 ESS done for pansinusitis. CSF leak started at day 1 after ESS. Repair was done on day 4 after ESS.</td>
<td>Large defect at the right ACF, at the level of fovea ethmoidalis, with presence of meningocele.</td>
<td>Collagen matrix (DuraGen®) (underlay) and free flap from middle turbinate (overlay).</td>
<td>1st CSF repair; Graft used were fat and fascia lata. Stabilizer material: absorbable hemostat (Surgicel®), surgical adhesive (BioGlue®) and bioresorbable nasal dressing (NasoPore®).</td>
<td>IV ceftriaxone; and a LD was kept for 48 hours. CRIB and others*.</td>
<td>Remained asymptomatic at 4 years follow-up.</td>
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<td>Case 4 First ESS in 2004. CSF leak started few weeks later. 1st CSF leak repair in 2006. Symptoms recurred and 2nd CSF leak repair in 2012.</td>
<td>Small defect at the left cribriform plate.</td>
<td>1st CSF repair; Graft used were fat and fascia lata. Stabilizer material: absorbable hemostat (Surgicel®), fibrin sealant (Tisseel®) and nasal tampon (Meroxel®).</td>
<td>1st CSF repair; Graft used was free flap from middle turbinate. Stabilizer material: absorbable hemostat (Surgicel®) and bioresorbable nasal dressing (NasoPore®).</td>
<td>IV ceftriaxone; and a LD was kept for 48 hours. CRIB and others*.</td>
<td>Remained asymptomatic at 2 years follow-up.</td>
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<td>Case 5 ESS for CRS with NP in 2010. Then, complicated with meningitis due to CSF leak; and 1st CSF repair was done. CSF leak recurred 3 years later; and 2nd CSF repair was done.</td>
<td>Defect at the posterior aspect of right cribriform plate, 8mm.</td>
<td>1st CSF repair; Graft was used was nasoseptal mucosal flap. Stabilizer material: absorbable hemostat (Surgicel®), fibrin sealant (Tisseel®) and bioresorbable nasal dressing (NasoPore®).</td>
<td>1st CSF repair; Graft used was middle turbinate mucosa flap. Stabilizer material: absorbable hemostat (Surgicel®), fibrin sealant (Tisseel®) and bioresorbable nasal dressing (NasoPore®).</td>
<td>IV ceftriaxone. CRIB and others*.</td>
<td>Remained asymptomatic at 2 years follow-up.</td>
</tr>
</tbody>
</table>

ESS: endoscopic sinus surgery. CSF: cerebrospinal fluid. ACF: anterior cranial fossa. IV: intravenous. LD: lumbar drain. CRIB and others*: complete rest in bed with head elevated 30°; and avoidance of straining, nose blowing and forward bending.
Intrathecal fluorescein technique is one of the methods to localize the site of CSF leakage, has been used in case 2, 3, 4 and 5. The potential complications of this procedure include headache, nausea and vomiting, dizziness, nuchal pain, lower limb weakness, numbness, generalised seizure activity, opisthotonus and cranial nerve deficit. All our patients did not have any complications.

All of five cases were repaired by nasoseptal mucosal flap or middle turbinate flap. The choice of the flap was depending on the case, site and size of the defect. Free graft or allogenic material was used with underlay technique; and vascularised flap was used with overlay technique had increased the chance of uptake. Case 1 and 2 showed defects in the cribriform plate and nasoseptal mucosal flap were used. Case 3 showed a large defect in the right anterior cranial fossa with a presence of meningocele; thus, repaired by the middle turbinate mucosal flap. As for case 4 and 5 (defects at cribriform plate), multiple CSF leakage repairs done and middle turbinate mucosal flap in a revision case. Farooq et al., 2011 found that the type of graft material used did not affect the outcome of the result, whether by using autologous fat which was taken from ear or abdomen, a fat graft with the mucosa of the middle turbinate, temporalis fascia; and all these grafts material worked well. The graft becomes incorporated with the dura after one week. The graft was stabilised by fibrin glue with the successful rate of 96.33% in the first repair.

Immediate post-surgery is a critical period of observation to ensure the success of repair procedure. Lumbar drainage diverts the CSF and may prevent intracranial pressure (ICP) which indirectly affects the graft closure. In our centre, lumbar drainage was inserted for at least 48 hours, for the cases with high flow leak, such as in case 1, 3 and 4.

The use of antibiotic following CSF leak repair is the possible reduction of significant endocranial complication from a highly contaminated nasal cavity. All of five our cases were administered intravenous ceftriaxone for at least a week.

Endoscopic sinus surgery is the most common cause of iatrogenic CSF leakage. Early repair of iatrogenic CSF leak is mandatory to avoid life-threatening sequences. Different graft materials can be used for closure of CSF leakage in single or multilayer with equally good results.
REFERENCES


