Five cases of iatrogenic cerebrospinal fluid (CSF) rhinorrhoea: 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) rhinorrhoea 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 rhinorrhoea 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) rhinorrhoea 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 rhinorrhoea is mainly located either in the cribriform plate, fovea ethmoidalis, and anterior ethmoid sinuses. We present five cases of iatrogenic CSF rhinorrhoea which were identified intraoperatively and postoperatively; and its early management. In our centre, early management is considered for CSF rhinorrhoea 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 I). Intravenous antibiotics were administered; and a lumbar drain was inserted for four days. He remained symptom-free at 6 months follow up.

Case 2

A 40-year-old male had iatrogenic CSF leak and was referred for further management. Intra-operatively, the defect was seen in the posterior cribriform plate, measuring 1.0 x 1.6 cm and it was confirmed by positive intra-thecal fluorescence test. The defect was repaired in layers (Table 1). He was asymptomatic at follow-up at 12 months.

Case 3

A 37-year-old male was referred for iatrogenic CSF leak. Intra-operatively, the defect was detected using intra-thecal fluorescence; 0.2 x 0.2 cm dural tear was seen at the right posterior ethmoid sinus. The leak was repaired immediately. The lumbar drain was kept for 48 hours post-surgery. The patient was asymptomatic up-to-date.

Case 4

A 55-year-old female was referred for intracranial complication post ESS. Intra-operatively, the leak was detected at the junction of lateral lamella of the cribriform plate. Intra-thecal fluorescence was used to locate the defect site and it was sealed in layers (Table I). A lumbar drain was kept or 48 hours. She recovered well and no more experience of CSF rhinorrhoea post-endoscopic repair.

Case 5

A 28-year-old male was referred for CSF leak following ESS. Intra-operatively, the leak was identified at the junction of right posterior ethmoid and sphenoid sinuses using intra-thecal fluorescence, measuring 0.8 x 1.0 cm. It was repaired in layers (Table I). He developed intermittent clear watery nasal discharge a month post-surgery. Thus, a second repair with middle turbinate mucosa flap was carried out. He had no more experience of CSF leak since then.

DISCUSSION

Identifying and localizing the site of the iatrogenic CSF leak are crucial and challenging in managing the CSF rhinorrhoea. These include neuroimaging methods such as high-resolution CT scan, magnetic resonance imaging (MRI) and intrathecal fluorescein technique.[3]

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Table I: This table shows sites of CSF leakage and their managements of five presented cases.

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

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.

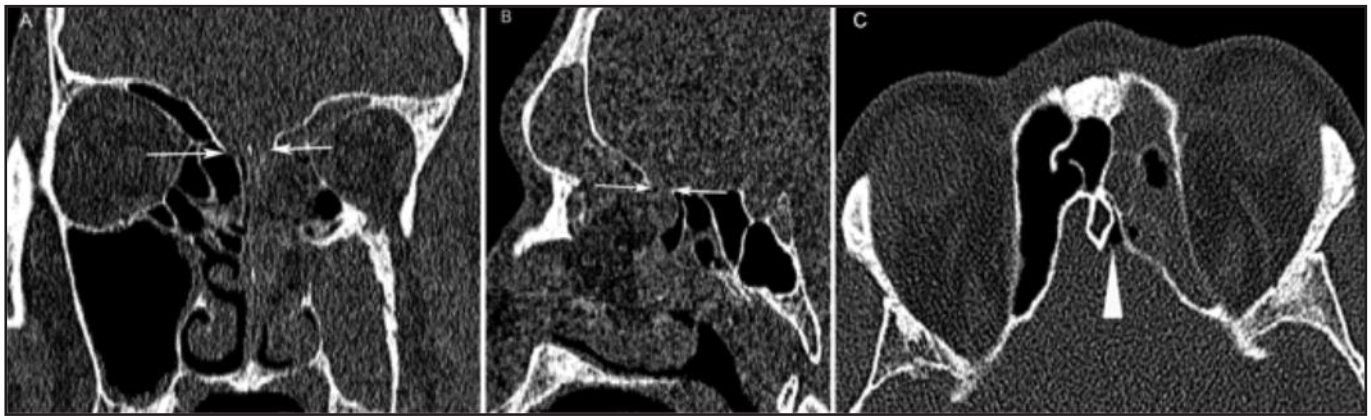

Fig. 1: CT base of skull of Case one demonstrating a left cribriform plate defect, near the fovea ethmoidalis (white arrows) with fluid opacification of the left sided paranasal sinuses. There is air in the anterior cranial fossa representing pneumocranium (arrowhead in c) which indicates communication between the air-filled paranasal sinuses and intracranial cavity.

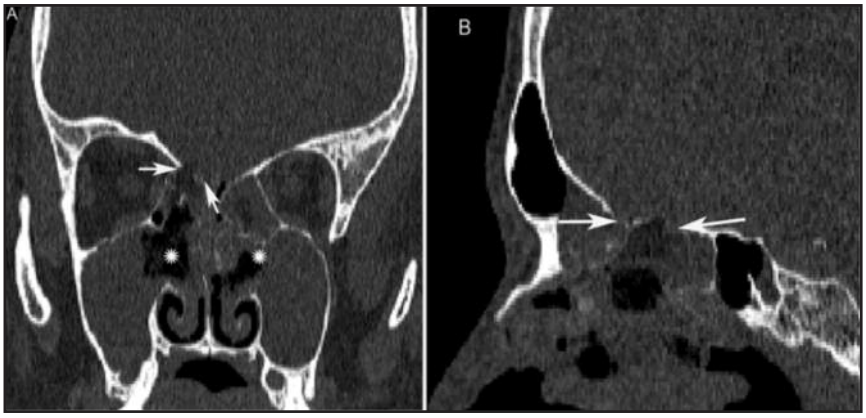

Fig. 2: CT base of skull of Case three in coronal (a) and sagittal (b) who underwent bilateral fundoscopic endoscopic sinus surgery (FESS) recently (white stars) demonstrates a large defect at right anterior cranial fossa (white arrows) with bilateral fluid opacification of the visualised paranasal sinuses.

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 a 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.[4,5] 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.[3,5]

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.

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