Introduction

CSF rhinorrhoea is defined as leakage of CSF from the subarachnoid space into the nasal cavity due to defect/s in the dura, bone (skull base) and mucosa. Common causes include trauma (both iatrogenic & accidental), congenital (meningo or meningoencephalocele, hydrocephalus, skull base defects), inflammatory (erosive lesions, mucocoeles, polypoid disease, cystic fibrosis, fungal sinusitis, osteomyelitis), neoplasms, idiopathic or spontaneous. Diagnosis may be arrived at by a detailed history & clinical examination and confirmed by laboratory investigations (including immunofixation of beta - 2 transferrin), imaging (T weighted MRI/HRCT), intrathecal fluorescin administration & endoscopic examination. Management includes prophylactic antibiotics (role is debated) and surgery for repair of the defect. Various approaches are used based on the site and size of the defect viz. intracranial, extracranial or endoscopic. Various materials for closure of the defect are used e.g. dural flaps, pedicled periosteal flaps, fascial flaps, nasal mucosal grafts etc.

Material & Methods

A prospective randomized study of 08 patients with CSF rhinorrhoea was conducted at Command Hospital (EC), Kolkata-27. Pre - operative assessment for confirmation of diagnosis was done by immunofixation of beta-2 transferrin and identification of the site of defect with MRI brain and/or PNS. Repair was done with following approaches viz. endoscopic and combined (Multiple port frontal sinusotomies with endoscopic repair). Post - operative evaluation was done with endoscopic examination and PNS at 04 weeks post surgery. Patients operated by intracranial approach were excluded.

Operative technique in multiple port frontal sinusotomies combined with endoscopic repair

Left eyebrow incision made and limited osteoplastic frontal flap raised, limited medially till the midline, laterally till the lateral canthus and superiorly till the hairline. 02 frontal sinusotomies (0.5 cm diameter) just medial to midline and at the midpoint of supratrochlear ridge, both 1 cms above the ridge were made. 0° endoscope introduced through the sinusotomies and frontal sinus examined where in one case two defects were seen in the superior wall (smaller) and at the junction between the superior and posterior walls of the frontal sinus. Dural bulges corresponding to the defects with polypoidal mucosa in the sinus were seen. Both dural bulges were cauterized and removed to have free CSF leak from the defects. Polypoidal mucosa was stripped till the sinus ostium and pushed into the ostium. Connective tissue grafts harvested from the left tragal cartilage, temporalis fascia and ear lobule (fat). Smaller defect in the roof closed using ear lobule fat by Bath Plug technique and the larger defect was plugged with tragal cartilage and covered with temporalis fascia and secured with tissue glue (n - butyl cyanoacrylate 0.5 ml). Frontal sinus packed with Gel Foam (absorbable gelatin sponge) soaked in Betadine (Povidone iodine). Frontal sinusotomies were

Abstract

Surgical management of CSF rhinorrhoea usually includes neurosurgical craniotomies or endonasal endoscopic procedures. Choice of surgical venture depends on the site of defect or expertise of available surgical skill. This study attempts to highlight the use of nasal endoscopes by multiple port frontal sinusotomies in select situations. Eight patients with spontaneous CSF rhinorrhoea underwent surgical management using nasal endoscopes between Mar 2011 to Mar 2012 in Dept of ENT and Head & Neck surgery, Command Hospital, Kolkata. Identification of site of defect was done with MRI or CT scans. Six cases of defects in ethmoidal roof and skull base were approached endonasally. In two cases where defect lied in the posterior table of frontal bone, endoscopes were used through multiple frontal sinusotomies. Monthly postoperative reviews were done for six months. The repairs were successful in all cases irrespective of the approach used. In select situations, major neurosurgical operations can be avoided and frontal bone defect can be successfully repaired using minimally invasive endoscopic repair through multiple frontal sinusotomies.
Discussion

Cerebrospinal fluid rhinorrhoea may be classified broadly into traumatic and non traumatic. Out of 08 cases of CSF rhinorrhoea operated at our centre, 02 (25%) cases were due to trauma, 02 (25%) cases had congenital skull base defects and 04 (50%) cases were cases of spontaneous CSF rhinorrhea. Presence of spontaneous CSF rhinorrhoea is variable in the literature, ranging from 4 to 39%. In Wax et al. the incidence of spontaneous leakages was 29.5%. The most affected site with CSF leak was the lateral lamella of the cribriform plate where bone is thinner and dura's adherence to the bone is stronger. This was especially observed in postoperative fistulas after endoscopic surgery. As endoscopic approaches are used to repair CSF fistulae, endoscopy can also be the cause of CSF rhinorrhoea as a complication of sinus surgery. This is an accepted and known complication. One-third of Lanza's patient population were CSF fistulae after endoscopic sinus surgery compared to 15% of our cases. Diagnosis of a CSF fistula is made after diagnostic nasal endoscopy, imaging and performance of laboratory tests of the fluid. In some cases, there is contamination of the material with blood or other secretions, so the test with beta-2 transferrin becomes mandatory. Sensitivity of the test is as high as 97.7% in a study including 88 patients. In our study the presence of a CSF fistula was revealed based on clinical history, examination and imaging studies. Laboratory confirmation of the CSF rhinorrhoea was done with beta-2 transferrin test. During preoperative evaluation and in order to locate the lesions sites, all patients were submitted to computed tomograph, with axial and coronal sections of paranasal sinuses. (MRI) was requested for all cases, coinciding with Nachtigal and Schick studies, which proposed MRI for all cases.

Endonasal endoscopic approach for the treatment of CSF rhinorrhoea has received great support since the pioneering article of Wigand. Papay et al. described the use of a rigid endoscope for the treatment of 04 patients with nasal CSF fistula of the sphenoid and ethmoid bone, occluded with fat, muscle and fascia lata graft. Mattox and Kennedy reported their experience with the use of nasal endoscopy in 05 patients presenting with CSF fistula and in 02 patients presenting with nasal encephalocele successively treated. Stankiewicz reports the treatment of 06 cases of CSF fistulas in a series of 800 ethmoidectomies; all cases were effectively treated with endoscopy. Lanza et al. reported a study with 36 patients submitted to nasal endoscopy; where, in 34 patients (94.4%), the occlusion of the CSF fistula was effectively performed in only one procedure. Burns et al. treated 42 patients with CSF fistula, obtaining resolution of the leak in 35 patients (85.3%) after one procedure, only 03 patients requiring a second surgical approach. In our study endonasal procedure was performed in 06 cases with occlusion of the CSF fistula in all cases. 02 patients were operated with a combined approach with the use of nasal endoscopes after multiple frontal sinusotomies. Autologous and heterologous grafts have been used to repair CSF fistulas. The grafts, in our series, consisted of mucoperichondrium, temporalis fascia, tragal cartilage and ear lobule fat with tissue glue in some cases. The graft can be positioned underlay or in an onlay form. In our series, we performed the onlay technique in all cases. Some studies report that the form of graft positioning is not a critical factor in predicting success of the procedure. Perioperative antibiotics were given in all cases. Some authors still recommend the routine use of a lumbar drain, although recent studies suggest it should not be routinely performed. In our sample, as well as in the literature mentioned, we have not observed surgical failures associated with a specific type of graft used. According to Schick and Hao, incomplete exposure and large bone defect were prevalent factors in therapeutic failures. In our series, success rate of first intervention was 100%, which is similar to results reported by Schick et al. (2001), Burns et al. (1996), and Hao et al. (1996). Failures in these studies were due to large defects, such as hernia of meningoencephalic sac at the cribriform area or in the sphenoid sinus, or to extensive frontobasal fractures. Non-recognition of dural defect adjacent to primary defect was the cause of failure in the series of Ryet et al. In these cases, due to multiple fistulas, there was impairment in graft placement and insufficient adherence. A critical aspect of the procedure is adequate resection of the mucosa around the bone defect in order to permit complete graft attachment. Meningitis is the most dreaded complication in patients with CSF fistulas. Studies demonstrate incidence in up to 40% of patients. We did...
not have any case of meningitis, which corroborates with the minimal morbidity of endoscopic techniques. Use of prophylactic antibiotics is controversial. We did not use antibiotics in any patient. Nachtigal, who had not adopted a prophylactic approach, had no cases of meningitis in his 12-patient series17. Among 115 patients with accidental CSF leakage, Choi observed a higher incidence of meningitis in patients who underwent antibiotic prophylaxis17. Regarding anosmia or hyposmia, there was no loss of smell sense in any of the operated patients.

**Conclusion**

The transnasal and combined endoscopic techniques provide magnificent visualization, facilitate precise graft placement and are associated with less post operative morbidity. In select situations, major neuro-surgical operations can be avoided and frontal bone defect/s can be successfully repaired using minimally invasive endoscopic repair through multiple frontal sinusotomies.

**References**