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Original Article

To study the trans-nasal endoscopic repair of cerebrospinal fluid rhinorrhoea

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ABSTRACT:

Aim: To determine the trans-nasal endoscopic repair of cerebrospinal fluid rhinorrhoea. **Materials:** A retrospective study was carried out in the Department of ENT. 23 patients (15 males and 8 females) who had CSF rhinorrhoea and underwent trans-nasal endoscopic repair in Department of ENT. Patients were assessed for demographic profile, etiology of CSF leak and its duration, endoscopic findings, radiographic findings, location of leak, surgical repair and post-operative outcome. Inclusion criteria were cases with defect size less than 1.5 cms; cases involving cribriform, ethmoid, sphenoid or frontal recess region of skull base. **Results:** Etiological factor for CSF leak was found to be accidental trauma in 60.87% cases. In 3 patient cause was iatrogenic resulting from polypectomy. Spontaneous rhinorrhoea was observed in 26.08% subjects. Majority of patients (78.26%) presented with intermittent leaks whereas 21.74% were suffering from continuous type of leakage. 34.78percent of cases had 1-2 episodes of meningitis. **Conclusion:** Endo-nasal endoscopic closure is a safe and effective technique for repair of CSF rhinorrhoea. There is minimal intranasal trauma. An overall rate of successful repair was 100%. No surgical complications were encountered in present series. Etiology of leak and size of defect did not have any adverse effect on surgical outcome.

Keywords: Cerebrospinal fluid rhinorrhoea, Trans-nasal endoscopic approach, Multilayer repair

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INTRODUCTION

Cerebrospinal fluid (CSF) rhinorrhea is a leakage of CSF fluid from the subarachnoid space through the frontal, sphenoidal or ethmoidal sinuses to the nose[1], which can occur either directly from the anterior cranial fossa and the nasal cavity, or indirectly from the middle and posterior cranial fossa through the Eustachian tube.[2] Cerebrospinal fluid leaks of anterior skull base present one of the more difficult challenges in endonasal endoscopic surgery, concerning an area, i.e., anatomically complicated and technically demanding to access. The challenge recreated a barrier between cranial vault and the nasal cavity to prevent and eliminate CSF leaks and protect the brain from exposure to secondary infection. Etiology varies from trauma, iatrogenic injuries, congenital malformations, tumor, or idiopathic. Etiology affects the risk of recurrence and thus the method of repair by having an impact on the defect size, location, degree of dural involvement, the likelihood of elevated intracranial pressure (ICP), and the possibility of meningoencepha- locele protrusion.[1] Risk of meningitis from untreated CSF rhinorrhea ranges from 10% annually up to 40% in long-term follow-up. The approach can vary from intra- cranial approaches that were first described by Dandy.[2] The morbidity of intracranial approaches may include hemorrhage, cerebral edema, anosmia, memory deficit, and osteomyelitis of bone flap. Wigand[3] reported the first endoscopic repair of CSF fistula. This study determines various causes and outcome of endoscopic repair of CSF leak. A meta-analysis showed a success rate of 90% in the first attempt and 97% overall with the endoscopic technique.[4] Since these patients stand at high risk of complications such as brain abscess, meningitis or pneumo-encephalitis, therefore all persisting CSF leak cases should be repaired.[5,6] Purpose of the present study is to review the management and outcomes of various cases of CSF rhinorrhoea in a tertiary care hospital.

METHODS AND MATERIALS

A retrospective study was carried out in the Department of ENT, after taking the approval of the protocol review committee and institutional ethics committee. 23 patients (15 males and 8 females) who had CSF rhinorrhoea and underwent trans-nasal endoscopic repair in Department of ENT. Patients were assessed for demographic profile, etiology of CSF leak and its duration, endoscopic findings, radiographic findings, location of leak, surgical repair and post-operative outcome. Retrieved data was represented in frequency and proportion in tabulated form for evaluation of results. Inclusion criteria were cases with defect size less than 1.5 cms; cases involving cribriform, ethmoid, sphenoid or frontal recess region of skull base. Exclusion criteria were CSF leaks with duration less than two weeks; defect size more than 1.5 cms; cases involving posterior table of frontal sinus; leaks associated with multiple skull base fractures; leaks associated with tumour.

METHODOLOGY

All surgical procedures were done under general anesthesia, with patient lying supine and head end elevated 30 degrees. Left thigh was prepared to harvest fat and fascia graft when required. Nasal decongestion was achieved with 4% xylocaine with adrenaline 1:30000 packs. Middle turbinate was lateralized or resected to gain access to the cribriform area in case of leaks from the cribriform area. In case of defect in the fovea ethmoidalis, complete ethmoidectomy was done. Site of leak was visualized and confirmed by Valsalva manouvere. Nasal mucosa around the site of leak was partially removed. Meningocele/meningoencephalocele was cauterized at the stump and removed. Fat plug was placed in all cases by bath plug method and placed in underlay manner. Further, layered reconstruction was done with a combination of cartilage, fibrin glue, septal bone, middle turbinate mucosa, septal mucosa or fibrin glue. Bilateral nasal packs were placed which were removed on 3rd postoperative day. Lumbar drain was placed in cases with larger defects and/or increased intracranial pressure. Patients were put on acetazolamide 250 mg 8 hourly for 1 week postoperatively.

RESULTS

In present study 23 patients (15males and 8 females) were assessed. Mean age of patients was 28.78 years with range of 13-60 years (Table 1). Etiological factor for CSF leak was found to be accidental trauma in 60.87% cases. In 3 patient cause was iatrogenic resulting from polypectomy. Spontaneous rhinorrhoea was observed in 26.08% subjects. Majority of patients (78.26%) presented with intermittent leaks whereas 21.74% were suffering from continuous type of leakage. 34.78percent of cases had 1-2 episodes of meningitis (Table 2).

Table 1: Demographic profile of patients

Variables	Frequency	Percentage (%)
Age (in years)		
0-20	5	21.74
21-40	13	56.52
41-60	5	21.74
Gender		
Males	15	65.22
Females	8	34.78

Table 2: Clinical characteristics

Variables	Frequency	Percentage (%)
Etiology of leak		
Traumatic		
Accidental	14	60.87
Iaterogenic	3	13.04
Spontaneous	6	26.08
Nature of leak		
Intermittent	18	78.26
Continuous	5	21.74
Pre-operative episodes of meningitis		
Present	8	34.78
Absent	15	65.22

Radiographic examination revealed bony defects in all these cases with concurrent meningocele and meningo- encephalocele in 8.69% and 52.17% cases respectively. Most common location of defect in this cohort was cribriform plate of ethmoid 78.26%) whereas it was fovea ethmoidalis in 21.74% patients. Cysternography was carried out in 30.43% patients to delineate the defect because of doubts in defining the

lesion by HRCT/MRI in these cases (Table 3). All leaks were repaired with an underlay multilayered technique to restore the original anatomy layer by layer. Fat, middle turbinate (MT) mucosa and septal bone were used as graft to fill the defects in 56.52% cases. 8.69% of patients were treated by fat, MT mucosa and inferior turbinate mucosa. Fat, MT mucosa and septal cartilage were used in 8.69% and in 26.09% cases fat, septal mucosa and fibrin glue were used as grafts to seal the dehiscence. Post-operatively, lumbar drain was used in 34.78% cases only. No post-surgical complications were encountered in this study. Hospital stay in most of the cases (78.26%) was less than 2 weeks and in 21.74% of patients it was up to 4 weeks (Table 4). Mean follow up period was 12 months.

Table 3: Investigative procedures and observations

Variables	Frequency	Percentage (%)
HRCT/MRI findings		
Bony defects	23	100
Meningocele	2	8.69
Meningo- encephalocele	12	52.17
Cysternography required	7	30.43
Site of CSF leak		
Cribriform plate	18	78.26
Fovea ethmoidalis	5	21.74
Sphenoid	00	00

Table 4: Surgical repair and post-operative outcomes

Variables	Frequency	Percentage (%)
Graft used for repair		
Fat, MT* mucosa, septal bone	13	56.52
Fat, MT mucosa, Inf turbinate mucosa	2	8.69
Fat, MT mucosa and septal cartilage	2	8.69
Fat, septal mucosa and fibrin glue	6	26.09
Post-operative lumber drain		
Yes	8	34.78
No	15	65.22
Post-operative complications		
No complication	23	100
Successful surgery		
Yes	23	100
No	00	00
Hospital stay (weeks)		
0-2	18	78.26
3-4	5	21.74
Follow up period (months)		
0-6	3	13.04
>6	20	86.96

*MT: Middle turbinate

DISCUSSION

Extracranial approach for CSF leak was initiated by Dohlman in 1948 using naso-frontal incision which offered success rate of 60-80% with considerable reduction in risk of complications.[4,7] It was not until 1981 that Wigand described endoscopic repair of CSF rhinorrhoea which led to success rate of 90%.[4] Since then this technique has gained popularity. It has been suggested that endoscopic repair be limited to gaps less

than 1.5 cms in size but other authors have found no correlation between the success rate and size of the defect.[6] Recent studies have reported success rate of 93% at first and 100% at second surgery.[8] In present study, mean age of patients was found to be 28.78 years which is lower than the results presented by some authors.[3] Lower mean age is related to the fact that majority of patients had traumatic leaks resulting from road traffic accidents and assaults which tend to involve the younger demographic.[8] Preponderance of males over females has been observed in the present series. Traumatic leaks outnumber the non-traumatic leakages similar to the results presented by Safavi et al.[3] An important aspect of success in such cases is identification of the exact site of CSF leak.[5,9] HRCT plays an essential role in identifying even the smallest defect and provides important information about the anatomical variations and guiding the surgeon in planning surgical repairs. MRI scanning was done to detect co-existing meningocele or meningo-

encephalocele in cases where causative factor was trauma. In present study 50% patients had meningo-encephalocele and 13% had meningocele. These figures are higher than those observed by Ismail et al.[6] Cysternography was done only in those cases where there was doubt in defining defect on CT/MRI scan. Commonest site of anatomical defect in majority (78.26%) of cases in our study was cribriform plate of ethmoid bone because of its inherent weakness due to presence of sieve like apertures for passage of olfactory nerve fibers. A variety of graft material was used ranging from fat, fascia lata, MT mucosa, septal cartilage or bone and fibrin glue depending upon the aetiology of leak, location and dimensions of bony dehiscence. Post-operative lumbar drain was used in cases that had larger defects and those with raised intra-cranial pressure. No post-operative complication was observed in any of patients in our study. These results are in concurrence with the earlier reports discussed in literature.[3,4,6,10] Success rate of 100% was recorded in this study similar to the results published by Ismail et al.[6] Hospital stay was less than 2 weeks in majority of cases. Mean follow up period was 12 months with no recurrence in any of these cases.

CONCLUSION

Endo-nasal endoscopic closure is a safe and effective technique for repair of CSF rhinorrhoea. There is minimal intranasal trauma. An overall rate of successful repair was 100%. No surgical complications were encountered in present series. Etiology of leak and size of defect did not have any adverse effect on surgical outcome.

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