

# Endonasal Endoscopic Repair of Cerebrospinal Fluid Leaks

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## ABSTRACT

**Objective:** To assess the outcome of Endonasal Endoscopic Repair of Cerebrospinal Fluid Leaks.

**Methods and Materials:** This study was conducted from July 2013 to October 2014 at the department of Neurosurgery, PGMI, Lahore General Hospital, Lahore. A total of 20 patients were included in this study of both gender (male and female) and in the age range of 15 – 65 years. All the patients undergone Endonasal Endoscopic with the use of a Karl Storz rigid endoscope of 0° and 30° with a 4mm diameter. All of them were followed up for recurrence of CSF leak and any postoperative complication.

**Results:** Out of 20 patients, there were 08 (40%) males and 12 (60%) female patients. Their age ranged from 15 – 65 years. The maximum numbers of patients were in their third and fourth decade of life. The cause of CSF leak was spontaneous in 11(55%), iatrogenic in 5 (25%) and traumatic in 4 (20%) of cases. In 13 (65%) patients, CSF rhinorrhea was from right nostril and in 7 (35%) patients left side was affected. Endonasal Endoscopic CSF repair was done in all patients and was successful in 18 (90%) of patients. Two patients (10%) presented with recurrence of CSF leak in which one was successfully re-operated endoscopically and other undergone transcranial approach. Overall the success rate was 95% in our study. Only one patient complicates with meningitis postoperatively which was resolved with antibiotics.

**Conclusion:** The repair of the CSF rhinorrhea by Endonasal Endoscopic surgery is minimal invasive, safe, effective and is a valid alternative to the cranial approach.

**Keywords:** Endonasal Endoscopic repair, Cerebrospinal Fluid Leaks.

**Abbreviations:** CSF: Cerebrospinal Fluid. MRI: Magnetic Resonance Imaging.

## 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.<sup>1</sup>

Cerebrospinal fluid (CSF) leak originated from the anterior fossa and sphenoid bone carries significant morbidity when inadequately treated, expresses as meningitis, subdural empyema and brain abscess.<sup>2,3</sup> CSF fistulas can be divided in traumatic and non-traumatic: the traumatic group can be divided in accidental and iatrogenic.<sup>4</sup> The non-traumatic group is associated to brain tumors, skull base congenital defects and

meningoceles or meningoencephalocles.

Detection of CSF leaks is not always simple. 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. Detailed history and clinical examination can be augmented by laboratory tests of rhinorrhea samples for Beta – 2 transferrin detection or B-trace protein which is a highly sensitive technique.<sup>5</sup> HRCT, MRI, radioisotope cisternography, metrizamide CT cisternography, and MR cisternography are all useful for preoperative localization of the defect. HRCT and MRI are the most widely used investigation in CSF leak patients.<sup>6</sup>

Majority of cases respond to conservative treat-

ment measures. Conservative treatment is based on medical treatment, bed rest with slight reverse-Trendelenburg position, lumbar punctures and/or permanent spinal fluid lumbar drainage. Surgical repair is required in the cases refractory to such conservative therapy.<sup>7</sup> Aim of surgery is to provide a water – tight Dural seal, barrier between contaminated Sino nasal space in the sterile subdural compartment, prevention of airflow into the intracranial space and maintenance of a functional Sino nasal system. Surgical repair consists of craniotomy or nasal approaches (external and Endonasal Ethmoidectomy) with the use of an endoscope.<sup>8,9</sup> The failure rate of the transcranial access can be as high as 40% with associated morbidity and especially the postoperative anosmia stimulated the surge of alternative methods of treatment.<sup>10</sup> Dohlman described in 1948 the first extra-cranial access consisting of a naso-frontal incision with External Ethmoidectomy in order to correct the CSF fistula.<sup>11</sup> The first purely endoscopic repair of CSF leak was described in 1981.<sup>12</sup> The advantages associated with the use of an endoscope better lightning, magnification of the image and best angle visualization gives the surgeon a more precise diagnosis and a less invasive method of nasal CSF fistula treatment, giving the endoscopic surgery a status of the method of treatment choice.<sup>13-15</sup> The evolution of Endonasal Endoscopic technique was initially reserved for sellar lesions through the sphenoid sinus cavity, but now over the past decade it has been successfully used for CSF leaks with documented success rates of up to 95%.<sup>16,17</sup>

Complications related to surgery include persistent leak, pneumocephalus, chronic headache, meningitis, anosmia, frontal lobe abscess and intracranial hemorrhage or hematoma.

**MATERIALS AND METHODS**

This study was conducted from July 2013 to October 2014 at the department of Neurosurgery, PGMI, Lahore General Hospital, Lahore. A total of 20 patients were included in this study of both gender (male and female) and in the age range of 15 – 65 years. CSF leak was confirmed by history, examination, laboratory test (beta 2 transferrin levels), HRCT and MRI with FESS protocol. All the patients then undergone Endonasal Endoscopic Repair with the use of a Karl Storz rigid endoscope of 0° and 30° with a 4mm diameter. All of them were followed up for recurrence of CSF leak and any postoperative complication.

**RESULTS**

Out of 20 patients, there were 08 (40%) males and 12 (60%) female patients as shown in figure below. Their age ranged from 15 – 65 years. The maximum numbers of patients were in their third and fourth decade of life. The cause of CSF leak was spontaneous in 11 (55%), iatrogenic in 5 (25%) and traumatic in 4 (20%) of cases as shown in table below. In 13 (65%) patients, CSF rhinorrhea was from right nostril and in 7 (35%) patients left side was affected. Endonasal Endoscopic CSF repair was done in all patients and was successful in 18 (90%) of patients. Two patients (10%) presented with recurrence of CSF leak in which one was successfully re-operated endoscopically and other undergone trans-cranial approach. Overall the success rate was 95% in our study. Only one patient complicates with meningitis postoperatively which was resolved with antibiotics.

Site	No. of Patients	Percentage
Spontaneous CSF leak	11	55%
Iatrogenic CSF leak	05	25%
Traumatic CSF leak	04	20%

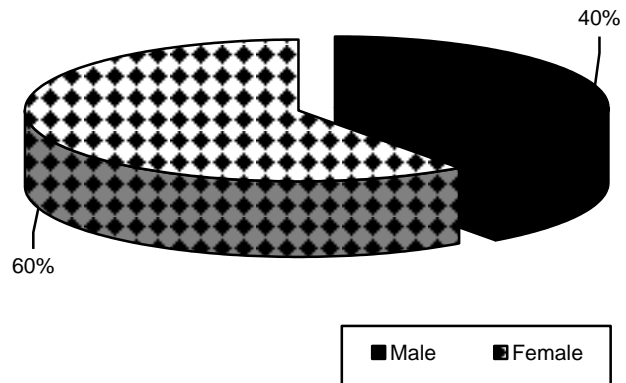


Fig. 1: Patients Age.

**DISCUSSIONS**

Cerebrospinal fluid (CSF) rhinorrhea involves a breakdown of all barriers that separate the subarachnoid space containing CSF from the upper respiratory tract, namely, the mucosa of the nasal cavity or paranasal sinus, skull base (i.e., bone), Dura mater, and arachnoid membrane. The etiology of CSF leaks is diverse. 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 the major cause of CSF fistulae, which are diagnosed in 3% of all patients who have a closed head injury and in up to 30% of patients who have skull base fracture.<sup>18</sup> Conditions that increase the ventricular pressure, such as intracranial space occupying lesion, post-traumatic and post infectious hydrocephalus, although less common, are also an important causes of CSF leak.

Many of the CSF leaks that occur after blunt trauma or skull base surgery resolve with conservative measures, such as strict bed rest, head elevation, avoidance of straining activities such as coughing, sneezing etc., and/or decreasing the CSF pressure with spinal taps or drains. Surgical repair is only indicated in patients who do not respond to these measures.

Endonasal endoscopic approach for the treatment of CSF fistula has received great support since the pioneering article of Wigand.<sup>19</sup> *Papay et al*<sup>20</sup> and *Kenedy et al*,<sup>21</sup> also reported their experience with the use of nasal endoscopy in patients presenting with CSF fistula and nasal encephalocele. In other study *Lanza et al*,<sup>22</sup> reported 94.4% occlusion of the CSF fistula by Endonasal endoscopy.

In our study, a total of 20 patients including 08 (40%) males and 12 (60%) female patients with their age ranged from 15 - 65 years were included in our study group after confirming CSF leak by history, examination, laboratory test (beta 2 transferrin levels), HRCT and MRI with FESS protocol. All of them undergone Endonasal Endoscopic Repair with the use of a Karl Storz rigid endoscope of 0° and 30° with a 4mm diameter. Out of 20 patients in our study, 11 has got spontaneous CSF leak including meningoencephalocles in two patients. 5 patients had defect in Cribriform Plate while 4 patients had defect in Fovea Ethmoidalis. Those patients who have got smaller defect less than 5mm, outlay (on lay) graft was placed followed by spillage of fibrin glue on graft and nasal packing for 72 – 96 hours postoperatively. Those patients who have got defect larger than 5mm were managed by placing both inlay and on lay graft in them. All of them did well and 18 patients got relief from CSF leak postoperatively with a success rate of almost 90% in our study. Two patients (10%) presented with recurrence of CSF leak in which one was successfully re-operated endoscopically on next list and the other undergone trans-cranial approach. Only a single patient

complicates with meningitis postoperatively which was managed with antibiotics.

## CONCLUSION

The repair of the CSF rhinorrhea by Endonasal Endoscopic surgery is a very safe, minimally invasive, effective with less complication rate than cranial approach and is a valid alternative to the cranial approach.

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