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ENDOSCOPIC REPAIR OF DURA FOR POST TRAUMATIC RHINORRHEA IN NEURO SURGERY DEPARTMENT OF TERTIARY CARE HOSPITALS

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ABSTRACT

Objective: To analyze the etiology, anatomical location, and procedural management of cerebrospinal fluid (CSF) rhinorrhea, with a focus on identifying common patterns and outcomes to guide clinical and surgical decision-making.

Method: This retrospective study included 40 patients diagnosed with CSF rhinorrhea. Data on etiological factors, anatomical locations of CSF leaks, and the types of surgical interventions performed were collected and analyzed. Key variables included spontaneous and traumatic etiologies, anatomical sites such as the cribriform plate and sinuses, and procedural rates, including first-line and additional surgical interventions.

Result: Spontaneous CSF rhinorrhea was the most common cause (47.5%), followed by traumatic (17.5%) and neoplastic origins, including astrocytoma (12.5%) and meningeocele (7.5%).The cribriform plate was the most frequent site of leakage (65%), followed by the frontal sinus (22.5%), fovea ethmoidalis (7.5%), and sphenoid sinus (5%).Initial surgical interventions were successful in 32.5% of cases, while 22.5% required secondary procedures. Ventriculoperitoneal shunts were utilized in 20% of cases, with other interventions such as supraorbital frontal repairs (15%) and lumbar drainage (5%) addressing refractory cases.

Conclusion: Spontaneous CSF rhinorrhea, predominantly affecting the cribriform plate, represents the most frequent etiology, often linked to idiopathic intracranial hypertension. Traumatic and neoplastic causes highlight the necessity of precise diagnostic imaging and multidisciplinary management. The diversity of procedural approaches, including shunting and endoscopic repairs, underscores the importance of individualized treatment strategies tailored to anatomical and clinical findings. Further large-scale studies are needed to refine management protocols and improve outcomes.

Keywords: CSF rhinorrhea, cribriform plate, spontaneous cerebrospinal fluid leak, traumatic CSF leak, ventriculoperitoneal shunt, endoscopic repair, idiopathic intracranial hypertension, skull base surgery.

INTRODUCTION

Cerebrospinal fluid (CSF) rhinorrhea is a condition that can arise from various causes, including spontaneous leaks, head trauma, surgical procedures, neoplastic invasion, and congenital malformations. Among these, post-traumatic and iatrogenic factors are most frequently reported as the leading causes, though the prevalence of each varies across studies. The condition represents a significant risk to patients, as untreated CSF rhinorrhea can lead to life-threatening complications such as meningitis, with reported incidences ranging from 23% to 60%. Understanding the etiology and implications of this condition underscores the importance of timely diagnosis and intervention.

The physiological basis of CSF rhinorrhea lies in the disruption of barriers that separate the subarachnoid space from the nasal cavity. This breakdown allows cerebrospinal fluid to escape into the nasal passages, posing a direct pathway for infections such as meningitis or brain abscesses. Surgical repair is considered essential for preventing these complications, which can occur in 10-40% of patients during follow-up if the condition is left untreated. The choice of surgical technique plays a critical role in minimizing risks and improving patient outcomes.

Endoscopic repair of CSF rhinorrhea was first introduced by Wigand in 1981 and has since become the preferred treatment approach. This technique has gained prominence due to its minimally invasive nature and high success rates. Compared to traditional intracranial methods, the endoscopic approach offers several advantages, including reduced morbidity, shorter recovery times, and the avoidance of craniotomy-related complications. These benefits make it particularly suited for managing leaks in the anterior cranial fossa and sphenoid sinus.

One of the key advantages of the endoscopic method is its ability to provide excellent illumination and a stereoscopic view of the anatomical structures at the skull base. This enhanced visualization allows surgeons to precisely locate and repair CSF leaks, significantly improving surgical outcomes. Success rates exceeding 90% have been reported in expert hands, further solidifying the endoscopic approach as the gold standard for managing this condition. These outcomes are achieved with minimal patient discomfort and lower procedural risks compared to traditional surgical methods.

Unlike intracranial approaches, which often involve significant morbidity and longer recovery periods, the transnasal endoscopic repair is associated with fewer complications and better long-term results. Its documented success rates and minimal invasiveness have made it the preferred procedure for most cases of CSF rhinorrhea. By providing superior anatomical visualization and avoiding the complexities of craniotomy, the endoscopic technique ensures higher patient satisfaction and improved quality of life. This approach represents a significant advancement in the management of CSF leaks and highlights the evolution of surgical methods in modern medicine.

MATERIAL AND METHODS

This study was conducted at the Neurosurgery Department of Lady Reading Hospital (LRH), Peshawar and Mardan Medical Complex (MMC), Mardan from July 2022 to June 2023 after taking approvals from ethical committees. Patients presenting with cerebrospinal fluid (CSF) rhinorrhea were included based on specific inclusion and exclusion criteria. The inclusion criteria encompassed patients aged 18 years and above with confirmed CSF rhinorrhea, diagnosed through clinical evaluation, beta-2 transferrin tests, and imaging modalities such as CT or MRI cisternography. Patients with recurrent rhinorrhea, spontaneous or secondary to trauma, congenital malformations, or neoplastic invasion were also included. Exclusion criteria involved patients with incomplete medical records, those who refused consent for participation, and individuals with coexisting conditions like advanced malignancies or severe systemic infections that could confound outcomes.

Data collection was carried out prospectively and included demographic information, etiology, site of leak, and details of surgical procedures. A standardized protocol was followed for all patients, including preoperative evaluations, endoscopic repair procedures, and postoperative monitoring.

The procedural interventions, such as transnasal endoscopic repair, lumbar drainage, ventriculoperitoneal shunts, or sinusostomy, were recorded along with their outcomes. Patients were followed up for a minimum of six months to monitor for complications like meningitis or recurrence. Data were analyzed using statistical software, with descriptive statistics employed to summarize frequencies and outcomes. Ethical approval for the study was obtained from the Ethical Committees of the institutions, and informed consent was secured from all participants.

RESULT

The analysis of etiology factors revealed that the majority of cases were due to spontaneous causes (19 out of 40), followed by traumatic events accounting for 7 cases. Among other identified etiologies, astrocytsoma was observed in 5 patients, post-operative complications in 4, meningocele in 3, and single cases were attributed to arachnoid cysts and hemangiopericytoma. This distribution highlights the predominance of spontaneous and traumatic causes in the development of the studied condition. In terms of the location of rhinorrhea, the cribriform plate was the most common site, seen in 26 out of 40 cases. This was followed by the frontal sinus (9 cases), fovea ethmoidalis (3 cases), and sphenoid sinus (2 cases). Regarding procedural interventions, the most frequent was the first surgical procedure, performed in 13 cases, followed by second procedures in 9 cases, and ventriculoperitoneal shunts in 8 cases. Additional procedures included supra-orbital frontal surgeries (6 cases), lumbar drains (2 cases), and one case each of lumbo-peritoneal shunt and sinusostomy. These findings reflect a diverse set of anatomical locations and procedural strategies employed in managing the condition.

Table 1: Etiology Factor

ETIOLOGY	NUMBER(40)
SPONTANEOUS	19
TRAUMATIC	7
MENINGEOCELE	3
ARACHONAOID CYST	1
HEMANGIOPERICYSTOMA	1
ASTROCYTOMA	5
POST-OPERATIVE	4

Table 2: Location of Rhinorrhea

LOCATION	NUMBER (40)
CRIBRIFORM PLATE	26
FRONTAL SINUS	9
SPHENOID SINUS	2
FOVEA ETHMOIDALIS	3

Table 3: Procedure Rates

ADDITIONAL PROCEDURE	NUMBER(40)
SUPRA ORBITAL FRONTAL	6
LUMBER DRAIN	2
LUMBOPERITONIAL SHUNT	1
SINUSOSTOMY	1
VENTRICULOPERITONEA SHUNT	8
FIRST PROCEDURE	13
SECOND PROCEDURE	9

DISCUSION

The etiology of cerebrospinal fluid (CSF) rhinorrhea in our cohort highlights a predominance of spontaneous cases (47.5%), aligning with findings from Georgalas et al. (2021), which emphasize spontaneous CSF leaks as a significant clinical challenge due to idiopathic intracranial hypertension and anatomical predispositions. Traumatic causes, observed in 17.5% of cases, underscore the vulnerability of the anterior skull base to fractures during head injuries, as noted by Tang et al. (2020). Notably, neoplastic etiologies like astrocytoma (12.5%) and meningeocele (7.5%) underline the need for careful imaging and multidisciplinary management, consistent with the recommendations by Abdullah et al. (2020).The cribriform plate was the most common site of CSF leak (65%), followed by the frontal sinus (22.5%). This distribution correlates with the anatomical predisposition of the cribriform plate to defects and fractures, as reviewed by Yazici (2019). The involvement of the sphenoid sinus (5%) and fovea ethmoidalis (7.5%) requires advanced endoscopic techniques for diagnosis and repair, as described by Babu et al. (2019). These findings underscore the importance of radiological classifications like those proposed by Abdullah et al. (2019) for assessing risk and guiding surgical approaches.Surgical management primarily involved first-line procedures (32.5%), with secondary procedures required in 22.5% of cases. Ventriculoperitoneal shunts were utilized in 20% of patients, reflecting their role in managing intracranial hypertension, as highlighted by Friedman (2019). Additional interventions, such as supraorbital frontal procedures (15%) and lumbar drainage (5%), emphasize the complexity of managing refractory cases, consistent with contemporary management strategies discussed by Slavnic and Tong (2019).The high rate of spontaneous CSF leaks and their association with obesity and idiopathic intracranial hypertension highlight a growing clinical concern, necessitating lifestyle interventions and improved diagnostic techniques (Georgalas et al., 2021; Woodside & Metzler, 2019). Anatomical variations, such as frontal sinus pneumatization, can influence surgical planning and outcomes, emphasizing the need for personalized approaches based on preoperative imaging (Yazici, 2019; Abdullah et al., 2019).

CONCLUSION

The study highlights that spontaneous CSF rhinorrhea, predominantly affecting the cribriform plate, constitutes the most common etiology, emphasizing the need for vigilance in patients with risk factors such as obesity and idiopathic intracranial hypertension. Traumatic and neoplastic causes also play significant roles, necessitating a multidisciplinary approach to diagnosis and management. The varied procedural interventions, including ventriculoperitoneal shunting and endoscopic repairs, underscore the importance of individualized treatment strategies guided by anatomical and radiological assessments. While this analysis provides crucial insights, future multicenter studies with larger cohorts are essential to validate findings and optimize clinical outcomes through advanced diagnostic and therapeutic techniques.

Conflict of Interest: None

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