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Post traumatic CSF fistulas – A solved problem?

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ABSTRACT… Objective: To find the frequency of post-traumatic fistulas in acquire data in neurosurgery department of District Hospital Rawalpindi. **Study Design:** Descriptive Retrospective Study. **Setting:** Department of Neurosurgery in District Hospital Rawalpindi. **Period:** July 2017 to 2019. **Material & Methods:** Total 70 Patients presented with CSF leaks from either ear or nose or scalp wound following head trauma. All these patients underwent treatment in the emergency room because the study of patients included only those to who presented to emergency with head trauma, including some who underwent some surgical procedure as well, apart from the standard conservative management for all patients. Mean and standard deviation of quantitative data (age), was recorded. Categorical data like gender, early and late onset of disease, surgical treatment were expressed in frequencies & percentage. **Results:** 70 patients including 52(74.2%) male and 18(25.7%) female. The mean ages was 38.34+13.21 year. CSF leakage was from nose 33(47%) and ear was 37(53%). At the postoperative period, 8(11%) patients had meningitis and 62(89%) patients had no meningitis. Those patients who treated non surgically as 56(80%) as compared to those who underwent some surgical procedures 14(20%). Majority of the patients 59(84%) had early onset < 48 hours of presentation, while 11(16%) had delayed > 48 hours of CSF leakage. **Conclusion:** CSF fistulas remain a problem after head trauma, with a significant risk of complications and rarely death, hence requiring prompt diagnosis and careful management. Failure of CSF fistula to heal within an average time of 2 weeks of conservative treatment, usually requires surgical treatment.

Key words: Cerebrospinal Fluid, Leakage, Trauma, Skull Fracture.

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INTRODUCTION

Traumatic cerebrospinal fluid (CSF) fistulas result from a tear in the dura and arachnoid and are often found with a fracture of the skull base that is in communication with the nasal cavity, paranasal sinuses, or middle ear. The commonest cause of CSF fistulae is trauma to the skull base. Head trauma accounts for 50-80% of all cases of CSF leak, and up to 16% are iatrogenic. CSF otorrhoea complicates 6% - 30% of basilar skull fractures.[1,2]

Cerebral spinal fluid (CSF) leak is a well-known complication of traumatic head injury, and most CSFs occur immediately after the injury or within subsequent days or weeks. It is a physiologic fluid for protecting brain and maintaining intracranial pressure (ICP).[3] It is produced at choroid plexus and a total volume of 140 mL are actively circulating and turned over daily. After severe craniomaxillofacial trauma, the destruction of the meningeal structure may lead to the CSF leak from the subarachnoid space. Post-traumatic CSF leaks are seen 1% to 3% of all closed traumatic brain injuries (TBI) in adults and 80% to 90% of all the causes of CSF leaks in adult patients are due to head injuries.[4,5]

Leakage of traumatic CSF is reported to be almost 10% to 30% of the skull base fractures in adults. More than half of these CSF leak is presented within 48 hours of the trauma while almost all CSF leaks occur within 3 months in delayed manner. The most common fracture sites leading to CSF leaks following TBI are the frontal sinus (30.8%), sphenoid sinus (11.4–30.8%), ethmoid (15.4–19.1%), cribriform plate (7.7%), frontoethmoid

(7.7%) and sphenoethmoid (7.7%).[6,7]

The significance of a persistent CSF fistula is not the leak itself but its sequelae: posture-related headache, pneumocephalus, and most significantly, bacterial meningitis. Overall, between 7% and 30% of all patients with posttraumatic CSF leakage will develop meningitis, and this rate increases as the duration of CSF leakage increases.[5,8,9] The role of antibiotic prophylaxis in patients with CSF leaks has been studied extensively yet remains controversial.[10] However, because patients with persistent leaks are at higher risk of meningitis, the efficacy of antibiotic prophylaxis may be higher in this subgroup.

The study was carried out to find the frequency of CSF fistulas is our acquire data in Neurosurgery department of District Hospital Rawalpindi.

MATERIAL & METHODS

This descriptive cross sectional study was conducted from July 2017 to May 2019 in the Neurosurgery Department in District Hospital Rawalpindi Pakistan. It was after obtaining permission from the Institutional Board of the hospital. Informed written consent was obtained from patients. 70 sample size was calculated with 80% power of test and 5% level of significance by taking expecting frequency of 60% CSF fistula leakage.

The patients presented with acute head trauma and associated CSF fistulas (rhinorrhea, oculorrhea and otorrhea). The study group was selected among 70 patients presented with traumatic CSF fistulas. All of the patients were managed conservatively (closed lumbar drainage or observation alone) before CSF fistula repair except associated lesions, which should be operated urgently, such as depression fractures, epidural hematoma, etc.

The patients were further classified into three groups as mild (GCS score between 14 and 15), moderate (GCS score between 8 and 13) and severe head trauma (GCS score 7 or less). Duration of hospital stay was also recorded. Complication, mode of treatment given to the patient conservative vs surgical and onset of leak whether it was early or delayed in onset. The timing of CSF leak is important that it will affect the long-term prognosis of the patients with other complications such as infection. The early onset group includes the patients with CSF leak within 48 hours from trauma. The delayed onset group is defined as patients with CSF leak presented at least 1 week after trauma. CSF leakage may be delayed even if there is no CSF leakage at first. Usually they can be healed spontaneous or lumbar drainage may be required for further treatment. Less than 15 years and greater than 65 years of patients, and those patient who dead on the spot were excluded from the study.

Data was entered in SPSS 23. Age and duration of stay were presented as mean and standard deviation. Categorical data like gender, early and late onset of disease, surgical treatment were expressed in frequencies & percentage.

RESULTS

In our study, total 70 patients including 52(74.2%) male and 18(25.7%) female. The mean ages was 38.34+13.21 years. There were 6(8.5%) patients in 16-26 years of age, 28(40%) were in between the age of 27-36 years, 15(21.4%)were in between the age of 37-46years. 13(18.5%) were in 47-56 years of age group and only 8(11.4%) patients in above 60 years. Table-I

CSF leakage was from nose 33(47%) and ear was 37(53%). At the postoperative period, 8(11%) patients had meningitis and 62(89%) patients had no meningitis. Complications had managed successfully by conservative measures. Those patients who treated non surgically as 56(80%) as compared to those who underwent some surgical procedures 14(20%). Majority of the patients 59(84%) had early onset < 48 hours of presentation, while 11(16%) had delayed > 48 hours of CSF leakage. Table-II

In our studied patients, different CT scan findings were as follows. The lost common being a skull fracture which was seen in almost all of the patients. 54(77%) patients had other skull fracture, 3(4.0%) patients had skull fracture EDH, subdural

hematoma and epidural hematoma, 2(3.0%) patients had skull fracture EDH + subdural hematoma and sub-acrchanoid hemorrhage. Table-III

All of the patients were followed up for a mean of 15 months. In cases with CSF leakage commonly have more damage to their neurological System. 32(45.7%) had mild with GCS score between (14-15), 16(22.9%) had moderate with GCS score between (8-13) and 22(31.4%) had severe with GCS score between 7 or less respectively.

Gender	**Male**	52(74.2%)
	Female	18(25.7%)
Age	**Mean age**	38.34+13.21
16-26	6(8.5%)	
27-36	28(40%)	
37-46	15(21.4%)	
47-56	13(18.5%)	
57-66	8(11.4%)	

Table-I. Frequency of age and gender distribution

CSF Leakage		Frequency (%)
CSF Leakage	Nose	33(47%)
	Ear	37(53%)
Meningitis	Yes	8(11%)
	No	62(89%)
Surgical Treatment	Surgical Procedure	14(20%)
	Without Surgical Procedure	56(80%)
Onset of Presentation	Early onset (< 48 hours)	59(84%)
	Delayed Onset (> 48 hours)	11(16%)

Table-II. Characteristics of clinical findings

CT Scan Findings	Frequency (%)
Other skull fracture	54(77%)
Skull fracture EDH	3(4%)
Skull fracture EDH+ subdural hematoma	2(3%)
Skull fracture + subdural hematoma	3(4%)
Skull fracture + subacrchanoid hemorrhage	2(3%)
epidural hematoma	3(4%)
Pneumocephalus	2(3%)
Subdural hematoma	1(1%)

Table-III. Clinical findings on skull base fracture

DISCUSSION

Cerebrospinal fluid (CSF) is a transparent fluid consisting of glucose and protein which is present in the subarachnoid space, ventricles and the spinal cord. The clinical importance of CSF is to cushion the brain which is a delicate organ following any trauma or blow to head. In most of the studies it is highlighted that CSF leak occurs due to craniofacial trauma.[11]

Different studies showed that anterior cranial fossa is the most common site of basal skull fracture resulting in rhinorrhea from CSF fistula and middle cranial fossa ethmoid and sphenoid has thin cranial bones which consists of multiple foramina leading cause of BSF and traumatic leak of cerebrospinal fluid.[12,13]

Cerebrospinal fluid rhinorrhea and otorrhea are managed in the hospital setting mostly its self-limiting. During the hospital stay there are two kinds of treatment given to the patient conservative or non-surgical and surgical. While focusing the conservative management plan. Patients was kept under observation, Intra venous antibiotics triple cover was given with ceftriaxone, vancomycin and flagyl for 14days along with steroids, antiepileptic's, proton pump inhibitors, IV fluids, acetazolamide and analgesics.

Surgical management was open craniotomy for CSF repair. Patients who developed complications like meningitis were shifted to intensive care unit under supervised observation of vital, arterial blood gases and appropriate nursing care along with standard empiric treatment intravenous antibiotics triple cover (ceftriaxone, vancomycin and falgyl), steroids, antiepileptic's followed by culture and sensitivity antibiotics.

We have used retrospective study in which 70 patients in 2 years of time period following traumatic Cerebrospinal fluid leak were recorded. Some patients died at the spot when accident encountered and some patients sustained BSF and pnemocephalus. Glasgow coma scale at the time of presentation and discharge, mode of injury, computerized tomography associated cranial nerves injuries associated complications,

skull fractures and intracranial hemorrhage, management, patients were asked to follow up get assessed. To simplify we have categorized CSF leak into three group's otorrhea 47 %, rhinorrhea 53 % and pnemocephalus.

When CSF leak follows ear canal most commonly temporal bone was fractured and pnemocephalus has been detected after TBI. Moreover, it was observed that road traffic accidents while driving motorbike encountered the TBI however even with the precautionary use of helmet also lead to fracture of anterior frontal facial part as this location is more prone to fracture.[14,15]

In a retrospective study, 28 patients, underwent endoscopic repair of CSF leak of anterior and central skull base. Time duration of surgical treatment was 28 months from 2003 to 2009,[16] As comparison to our study, CSF fistula to heal within an average time of 2 weeks of conservative treatment, usually requires surgical treatment.

In a retrospective case study 51 patients had traumatic CSF rhinorrhea in that 16 % of patients developed meningitis after 6.5 years.[17] As comparison of our study, 8(11%) patients had meningitis of post traumatic CSF fistula.

In one study reported that 50.0% had mild TBI (GCS ≥ 13), 21.8% moderate TBI (GCS 9–12), and 28.2% severe TBI (GCS ≤ 8). As comparison of our study, 32(45.7%) had mild with GCS score between (14-15), 16(22.9%) had moderate with GCS score between (8-13) and 22(31.4%) had severe with GCS score between 7 or less respectively.[18]

In 2015 study, At the postoperative period, meningitis (5 cases), urinary tract infection (1 case), pulmonary infection (1 case), deep venous thrombosis (1 case), and transient diabetes insipidus (3 cases) were seen as complications.[19] As compare to our study, 8(11%) patients had meningitis and 62(89%) patients had no meningitis.

CONCLUSION

CSF leaks that occur months or years after traumatic skull base injury may be more widespread than presently realized. As our case illustrated, accurate and timely diagnosis of this complication often presents significant challenges, with risks such as meningitis and other intracranial complications potentially becoming more frequent over time. In this study, failure of CSF fistula to heal within an average time of 2 weeks of conservative treatment, usually requires surgical treatment.

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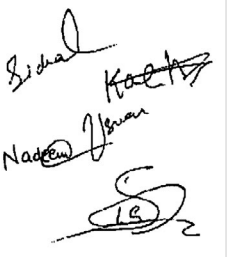
1	Sidra Aftab Satti	1st Author	
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