DOI: https://doi.org/10.53350/pjmhs2023175333

ORIGINAL ARTICLE

To Evaluate the Frequencies of Post- Traumatic Cerebrospinal Fluid Leak in Patients Presenting with Traumatic Brain Injury

HAMEEDULLAH[1], HASHIM KHAN[2], SAHAR MALIK[3], HAMZA KHAN[4]
[1]*FCPS Neurosurgery Senior Registrar MTH*
[2]*Trainee Medical officer AFBMT CMH Rawalpindi.*
[3]*Assistant Anesthesia KTH,*
[4]*Medical Office MTI LRH*
Corresponding author: Hashim Khan, Email: Hashimkhan5725@gmail.com

ABSTRACT

Introduction: Traumatic brain injury is the fourth largest cause of fatal trauma worldwide. The social and economic implications of traumatic brain injuries are immense whilst the physical and mental bearing upon the patient is devastating.

Objective: Objective of this study is to evaluate the frequencies of post- traumatic cerebrospinal fluid leak in patients presenting with traumatic brain injury.

Methodology of the study: This study was conducted at Neuro Surgery Department of Lady Reading Hospital, Peshawar during 20/7/2020 to 20/1/2021.In the current study a total of 303 patients presenting with initial head trauma presenting within 24 hours with Glasgow coma score ≤15, patients in age between 18 to 65 years and both gender (male/female) were included in the study. All the patients were subjected for detailed history, clinical examination and radiological examination i.e. CT and MRI was done for the confirmation of brain injury. All the patients were followed till 7th post operative day for the diagnosis of Cerebrospinal fluid leak. It is clear water cerebrospinal fluid discharge diagnosed on clinical examination till 7th post-trauma day and was determined in terms of rhinorrhea or otorrhea.

Results: Our study shows that among 303 patients was analyzed as 215(71%) patients were in age range 18-40 years, 88(29%) patients were in age range 41-65 years. 239(79%) patients were male and 64(21%) patients were female. More over 18(6%) patients had CSF leak while 285(94%) patients didn't had CSF leak.

Practical Implication: This study will be useful for finding the post-traumatic cerebrospinal fluid leak.

Conclusion: Our study concludes that the frequencies of post-traumatic cerebrospinal fluid leak was 6% in patients presenting with traumatic brain injury.

Keywords: Post-traumatic cerebrospinal fluid leak, traumatic brain injury.

INTRODUCTION

Traumatic brain injury is the fourth largest cause of fatal trauma worldwide. The social and economic implications of traumatic brain injuries are immense whilst the physical and mental bearing upon the patient are devastating. Injury to the head results in a wide spectrum of anatomic and physiologic disruptions which frequently needs expert neurosurgical care.[1] Cerebrospinal fluid (CSF) is a physiologic fluid for protecting brain and maintaining intracranial pressure (ICP). 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.[2] The risk of meningitis from the traumatic CSF leak can present with high morbidity and even mortality depending on the cause and site of CSF leak. Except the cases with spontaneous diseases, traumatic CSF leak can be potentially detrimental with various complications such as bacterial meningitis if not self- resolved.[3] The traditional treatment involves intravenous antibiotics treatment as well as primary repair of dural defect if the definite injury is suspected. Thus, early detection of CSF leaks is important as it determines the outcome of the patient. The decision of whether to observe or to surgically intervene is most likely to be dependent on the cause, site of leak, and timing of the leak.[4]

Current guideline advises conservative treatment of posttraumatic CSF leaks for 10 to 14 days. If the leak does not respond to conservative measures in two weeks, then it is imperative to intervene invasively. [5,6,7] The common investigations performed to detect skull fracture and hence the suspected dural tear area is the high resolution CT scan with coronal and sagital cuts. MRI with T2 weighted images in prone position is also highly favored. Radionuclide cisternography, metrizamide contrast test and intrathecal fluorescein dye test are other tests to confirm CSF leaks. Beta transferrin of the leaking fluid and its glucose levels are also helpful in guiding to differentiate between CSF rhinorrhoea from other causes. [7,8,9] Complications of posttraumatic CSF leaks include acute fulminant meningitis with a considerably higher mortality rate, repeated pneumocephalus with the possibility of tension pneumocephalus. [9,10,11,12] Bell et al[13] has conducted a review of post traumatic CSF leaks and its management and has reported that these leaks are present in 4.6% of head trauma patients. In another study conducted by Junaid M et al[14] had reported that CSF leak was observed in 5.2% of patients. Looking at the type of outlet of CSF leak, we observed that 2.1% of patients had Otorrhea, while 3.1% patients had Rhinorrhea.

Objectives: Aim of this study is to determine the frequency of post traumatic CSF leaks in patients presenting with traumatic brain injury. Although few study has been conducted in other population.

MATERIAL AND METHODS

This study was conducted at Neuro Surgery Department of Lady Reading Hospital, Peshawar during 20/7/2020 to 20/1/2021.

Study design: Descriptive case series

Sample size: Sample size was 303 which was calculated on WHO formula for sample size calculation by taking 5.2%[14] prevalence of post-operative cerebrospinal fluid leaks in patients presenting with traumatic brain injury, confidence level 95% and margin of error 2.5%. Data was collected through non-probability (consecutive) sampling.

Inclusion criteria: All the patients with initial head trauma presenting within 24 hours with Glasgow coma score ≤15, patients in age between 18 to 65 years and both gender (male/female) were included in the study.

Exclusion criteria: All the presents presenting with patients with nasal fractures, Patients with fever and neck stiffness, patients with penetrating head injuries, with spontaneous cerebrospinal fluid rhinorrhoea or otorrhoea or those who develop inflammatory type of Cerebrospinal fluid discharge were excluded from the study as they had act as confounders and had introduce bias in the study results if included.[19,20]

Data collection procedure: The current study was carried out after taking permission from hospital ethical committee. All patients fulfilling the inclusion criteria i.e. All the patients with initial head trauma presenting within 24 hours with Glasgow coma score ≤8

was enrolled in the study through emergency department and Neuro Surgery Department of Lady Reading Hospital, Peshawar. The purpose and benefits of the study was explained to the guardian/relative and an informed consent was obtained. All the patients were subjected for detailed history, clinical examination and radiological examination i.e. CT and MRI was done for the confirmation of brain injury. All the patients were followed till 7th post operative day for the diagnosis of Cerebrospinal fluid leak. It is clear water cerebrospinal fluid discharge diagnosed on clinical examination till 7th post-trauma day and was determined in terms of rhinorrhea or otorrhea. All the data i.e. age, gender, initial GCS, type of trauma, location of trauma, severity of trauma were recorded in proforma (attached). Exclusion criteria had sticky followed to control confounders and bias in the study results.

Data Analysis: The data were analyzed using the statistical program SPSS version 22. Mean ± standard deviation was calculated for quantitative variables like age, initial GCS. Frequency and percentage were calculated for categorical variables like gender, type of trauma, location of trauma, severity of trauma and CSF leaks. Cerebrospinal fluid leak were stratified among age, gender, type of trauma, location of trauma, severity of trauma to see effect modifiers. Post- stratification chi square test was applied in which P value ≤ 0.05 was considered significant. All results were presented in the form of charts and graphs.

RESULTS

Our study shows that among 303 patients was analyzed as 215(71%) patients were in age range 18-40 years, 88(29%) patients were in age range 41-65 years. Mean age was 34 years with SD ± 13.15. 239(79%) patients were male and 64(21%) patients were female. 55(18%) patients had fall, 221(73%) patients had RTA and 27(9%) patients had assault. 233(77%) patients had trauma at temporal site, 46(15%) patients had trauma at frontal site while 24(8%) patients had trauma at parietal site.

Table 1: Descriptive statistics of patients

Age	Frequency	Percentage
18-40 years	215	71%
41-65 years	88	29%
Gender	Frequency	Percentage
Male	239	79%
Female	64	21%
Type of Trauma	Frequency	Percentage
Fall	55	18%
RTA	221	73%
Assault	27	9%
location	frequency	percentage
Temporal	233	77%
Frontal	46	15%
Parietal	24	8%
Total	303	100%

124(41%) patients had mild trauma (GCS 13-14), 142(47%) patients had moderate trauma (GCS 8-12, 37(12%) patients had severe trauma (GCS ≤8). Mean GCS score was 9 with SD ± 3.772. More over 18(6%) patients had CSF leak while 285(94%) patients didn't had CSF leak. Stratification of CSF leak with respect to age, gender, type of trauma, location of trauma, severity of trauma.

Table 2: Severity of trauma (n=303)

Severity	Frequency	Percentage
Mild trauma (GCS 13-14)	124	41%
Moderate trauma (GCS 8-12)	142	47%
Severe trauma (GCS ≤8)	37	12%
Total	303	100%

Table 3: CSF LEAKS (n=303)

CSF Leaks	Frequency	Percentage
Yes	18	6%
No	285	94%
Total	303	100%

Table 4: Stratification of CSF Leaks with Respect to Type of Trauma

CSF leaks	Fall	RTA	Assault	Total	*P value
Yes	3	13	2	18	
No	52	208	25	285	0.9377
Total	55	221	27	303	

Table 5: Stratification of CSF Leaks with Respect to Location of Trauma

CSF leaks	Temporal	Frontal	Parietal	Total	*P value
Yes	13	3	2	18	0.8487
No	220	43	22	285	
Total	233	46	24	303	

DISCUSSION

Traumatic brain injury is the fourth largest cause of fatal trauma worldwide. The social and economic implications of traumatic brain injuries are immense whilst the physical and mental bearing upon the patient are devastating. Injury to the head results in a wide spectrum of anatomic and physiologic disruptions which frequently needs expert neurosurgical care.[1] Cerebrospinal fluid (CSF) is a physiologic fluid for protecting brain and maintaining intracranial pressure (ICP). It is produced at choroid plexus and a total volume of 140 mL are actively circulating and turned over daily.[15] After severe craniomaxillofacial trauma, the destruction of the meningeal structure may lead to the CSF leak from the subarachnoid space.

Our study shows that among 303 patients was analyzed as 215(71%) patients were in age range 18-40 years, 88(29%) patients were in age range 41-65 years. Mean age was 34 years with SD ± 13.15. 239(79%) patients were male and 64(21%) patients were female. 55(18%) patients had fall, 221(73%) patients had RTA and 27(9%) patients had assault. 233(77%) patients had trauma at temporal site, 46(15%) patients had trauma at frontal site while 24(8%) patients had trauma at parietal site. 124(41%) patients had mild trauma (GCS 13-14), 142(47%) patients had moderate trauma (GCS 8-12, 37(12%) patients had severe trauma (GCS ≤8). Mean GCS score was 9 with SD ± 3.772.[16] More over 18(6%) patients had CSF leak while 285(94%) patients didn't had CSF leak. In another study conducted by Ji-Woong Oh et al[81] had reported that 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.[17] The risk of meningitis from the traumatic CSF leak can present with high morbidity and even mortality depending on the cause and site of CSF leak. Except the cases with spontaneous diseases, traumatic CSF leak can be potentially detrimental with various complications such as bacterial meningitis if not self-resolved.[18]

CONCLUSION

Our study concludes that the frequencies of post-traumatic cerebrospinal fluid leak was 6% in patients presenting with traumatic brain injury.

REFERENCES

1. Algattas H, Huang JH. Traumatic brain injury pathophysiology and treatments: early, intermediate, and late phases post- injury. Int. J. Mol. Sci. 2014;15:309-41.
2. Gray S.T, Wu A.W. Pathophysiology of iatrogenic and traumatic skull base injury. Adv Otorhinolaryngol. 2013;74:12–23.
3. Schoentgen C, Henaux PL, Godey B. Management of post- traumatic cerebrospinal fluid (CSF) leak of anterior skull base: 10 years experience. Acta Otolaryngol. 2013;133(9):944-50.
4. Kumar BR, Sahu R, Srivastava AK, Nair AP, Mehrotra A. Surgically repaired posttraumatic CSF rhinorrhea: An institutional experience and review of literature. Indian J Neurosurg 2012;1:23-7.
5. Oh JW, Kim SH, Whang K. Traumatic Cerebrospinal Fluid Leak: Diagnosis and Management. Korean J Neurotrauma. 2017;13(2):63–7.
6. Adoga AA, Ozoilo KN, Iduh AA, Mugu JG. Otorhinolaryngological manifestations in head trauma: A prospective study of the epidemiology, clinical presentations, management, and outcomes. Int J Crit Illn Inj Sci. 2017;7(4):231-35
7. Kim SW, Park HW, Jeon SY. Versatility of the pedicled nasoseptal

flap in the complicated basal skull fractures. Auris Nasus Larynx. 2013;40(3):334-7.
8. Luszczyk MJ, Blaisdell GY, Wiater BP. Traumatic dural tears: what do we know and are they a problem? Spine J. 2014;14(1):49-56.
9. Pease M, Marquez Y, Tuchman A. Diagnosis and surgical management of traumatic cerebrospinal fluid oculorrhea: case report and systematic review of the literature. J Neurol Surg Rep. 2013;74(1):57-66.
10. Oakley GM, Alt JA, Schlosser RJ, Harvey RJ, Orlandi RR. Diagnosis of cerebrospinal fluid rhinorrhea: an evidence-based review with recommendations. Int Forum Allergy Rhinol. 2016;6(1):8–16.
11. Yellinek S, Cohen A, Merkin V, Shelef I, Benifla M. Clinical significance of skull base fracture in patients after traumatic brain injury. J Clin Neurosci. 2016;25:111-5
12. Luszczyk MJ, Blaisdell GY, Wiater BP. Traumatic dural tears: what do we know and are they a problem? The Spine J. 2014;14:49-56.
13. Chaudhary N, Awan LM, Niaz A. Success determination of lumber drainage in cranial traumatic CSF fistula. J Spine Neurosurg. 2013;2:5.
14. Junaid M, Nabi A, Khan MA, Umair M. Prevalence of cerebrospinal fluid leak in traumatic head injury at a tertiary care center. J Islamabad Med Dental Coll.2019;8(3):123-6.
15. Stein SC. Minor head injury: 13 is an unlucky number. J Trauma. 2001;50(4):759-60.
16. Matsuyama T, Shimomura T, Okumura Y, et al. Acute subdural hematomas due to rupture of cortical arteries: a study of the points of rupture in 19 cases. Surg Neurol.1997;47(5):423-7.
17. Eisenberg HM, Gary HE Jr, Aldrich EF, et al. Initial CT findings in 753 patients with severe head injury. A report from the NIH Traumatic Coma Data Bank. J Neurosurg.1990;73(5):688-98.
18. Haider AH, Efron DT, Haut ER, DiRusso SM, Sullivan T, Cornwell EE 3rd. Black children experience worse clinical and functional outcomes after traumatic brain injury: an analysis of the National Pediatric Trauma Registry. J Trauma.2007;62(5):1259-3.
19. Farid G, Warraich NF, Iftikhar S. Digital information security management policy in academic libraries: A systematic review (2010–2022). Journal of Information Science. 2023:01655515231160026.
20. Khalid A, Malik GF, Mahmood K. Sustainable development challenges in libraries: A systematic literature review (2000–2020). The Journal of academic librarianship. 2021 May 1;47(3):102347.