ORIGINAL ARTICLE

EFFICACY OF CONSERVATIVE MANAGEMENT OF EARLY POST-TRAUMATIC CEREBROSPINAL FLUID RHINORRHOEA

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Background: The incidence of Post-traumatic Cerebrospinal Fluid Rhinorrhoea (PCSFR) has been decreased due to advanced therapeutic measures. The current investigative study has been arranged to assess the efficacy of conservative management of early PCSFR. **Methods:** This cross-sectional study was conducted at departmental of Neurosurgery, Ayub Medical Institute, Abbottabad. Patients with traumatic brain injury having Cerebrospinal fluid rhinorrhoea with either gender having age 5–50 year and presenting within seven days of traumatic brain injury were included. Moreover, those with nasal fractures, penetrating head injuries having fever and neck stiffness were also included in the study. **Results:** A total number of 120 patients having male dominancy, i.e., 86 (72%) were included in the study with the mean age of 27 years ± 8.741 in which 77 (92%) patients were in the age range of 2nd to 4th decades. The commonest cause was trauma due to Road Traffic Accidents (RTA) having 65 (54%) patients. Conservative treatment was effective in 62 (52%) patients predominantly in the patients of 3rd decade, i.e., 31 (50%), in which the effectiveness in male gender was revealed to be 52.32% (45) and effectiveness in RTA patients was recorded to be 54.83%. Similarly, the Chi-Square value was calculated for the PCSFR patients for four groups of patients (5–20, 21–30, 31–40, 41–50) to be 48.27 having critical value of 7.81 with the *p*-value of 1.87e^{-10}, which completely rejects the Null-hypothesis for the patients of various ages. **Conclusion:** Based on the current investigative study, it may be concluded that PCSFR is common in middle age population with slight male dominancy. It may also be inferred that RTA is the leading cause of PCSFR in our set up and majority of the patients shows improvement after conservative management. Moreover, the effectiveness of conservative management of PCSFR could be predominantly observed in the patients of 3rd decade.

Keywords: Conservative Management; Post-traumatic Cerebrospinal Fluid Rhinorrhoea; Road Traffic Accidents; CSF

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INTRODUCTION

Cerebrospinal fluid (CSF) rhinorrhoea is an abnormal communication between the sino-nasal cavity and subarachnoid space. The posttraumatic cerebrospinal fluid rhinorrhoea (PCSFR) can occur following skull-base trauma, endoscopic sinus surgery (ESS) or neurosurgical procedures. Cerebrospinal fluid rhinorrhoea (CSFR) is an abnormal communication between the skull base and the dura and leakage of CSF from the nose. The aetiology shows the collapse of all barriers which separates the sterile subarachnoid space from upper aero-digestive tract. These barriers are comprised up of paranasal sinus or the mucosa of nasal cavity, skull base, i.e., bone, arachnoid membrane and dura matter.[1,2]

Generally, the CSF rhinorrhoea has been classified as traumatic or non-traumatic. The traumatic aetiology is subdivided into iatrogenic and accidental, while the non-traumatic CSF leak may be spontaneous, for instance, the skull base anomalies or bone erosion due to tumours or hydrocephalus.[3,4] In traumatic, both the non-iatrogenic and iatrogenic, contributes to 80–90% of cerebrospinal fistulas. Cerebrospinal fluid rhinorrhoea resulting from non-iatrogenic trauma has been reported in upto 2% of all head traumas, 12–30% of fractures of skull base and 25% of facial fractures.[5] The lateral sides of the cribriform plate above the superior turbinate, which shows thinner nature than the more lateral sides of the ethmoid roof, has been reported to be the most susceptible to damage. The posterior ethmoid skull base has been reported to be another common site for damage because it makes a slope inferiorly with the sphenoid rostrum.[3,6]

Rhinorrhoea associated with fistula can be provoked and aggravated by positioning the patient's face downward and observing the leakage for several minutes.[7] MRI and CT in prone position are also employed to investigate CSFR.[8] The gold standard diagnostic measure for cerebrospinal fluid rhinorrhoea is currently considered as Beta-2

transferrin immunofixation.[9] Among different aetiologies, traumatic CSFR is most often controlled with conservative management.[10,11] CSFR is a very critical condition that still faces major challenges in terms of its diagnostic and therapeutic measures. According to a recent report, meningitis develops in about 10–25% of patients with CSFR and approximately 10% of them eventually die. Majority of leakages heal with conservative management over 7–10 days, with the second option being the lumbar drainage if we are unable to stop the leakage. Nonetheless, some surgeons prefer to go through the surgical repair of such patients.[12,13]

Conservative management includes head elevation, bed rest, avoidance of straining and in some cases, a lumbar drain to decrease cerebrospinal fluid pressure. The goal of these measures is to decrease or avoid the fluid to flow through the leak, reduce CSF pressure and to allow healing of the injured portion to seal the leak and most importantly to avoid a surgical intervention.[14] Acetazolamide is most often recommended to decreases CSF production.[15]

Based on the literature review and the significance of conservative management of PCSFR, the current study has been designed to evaluate the efficacy of conservative management in PSCFR patients presented at Department of Neurosurgery, Ayub Medical Institute, Abbottabad, Pakistan.

MATERIAL AND METHODS

This cross-sectional study was conducted at Departmental of Neurosurgery, Ayub Medical Institute, Abbottabad with 6 months duration from Feb 01, to August 01, 2017. Patients with traumatic brain injury having Cerebrospinal fluid rhinorrhoea (CSFR) with either gender having age 5–50 year and presenting within seven days of traumatic brain injury were included. Moreover, those with nasal fractures, penetrating head injuries and having fever and neck stiffness were also included in the study. Patients' information like name, age, gender, type of trauma and efficacy of the conservative treatment was recorded on a predesigned proforma. All the data was analyzed by SPSS-20 and represented in the form tables and figures.

After taking consent from hospital ethical research committee, patients were included in the study through OPD/ER department in a consecutive manner. Patients who presented with traumatic brain injury having CSFR were enrolled in the study after taking their informed written consent. All patients were admitted in the Neurosurgery department and neurosurgical ICU of the hospital for further evaluation. After taking detailed history, complete general physical, systemic and neurological examination was done. Patients were subjected to X-rays and CT-scans of skull for evaluation of head injury. CSFR was diagnosed on clinical grounds by assessing the patients in sitting position after 30 minutes of recumbency (reservoir sign). MRI brain with T2-weighted images in prone position was carried out. Patients were managed in propped up position with head end of the bed at 30 degrees. Patients were kept on intravenous antibiotics and intravenous Mannitol in the dose of 0.5–1 g/kg for the first three days and then oral Acetazolamide. Patients were regularly monitored for the leak from the nose during the first seven days. The above-mentioned information including name, age, gender, type of trauma and efficacy of the conservative treatment was recorded on a predesigned proforma. Data was analyzed using SPSS version 20. Results were stratified among age, sex, type of trauma with respect to efficacy of the conservative management to see the affect modification. All the results were presented in the form of Tables and Figures. Post stratification Chi-Square test was used with level of significance <0.05.

RESULTS

The frequency and percent of PCSFR patients at various stages of life, i.e., from 5–50 with Mean age was 27 years with SD±8.761 years. The largest number of patients has been recorded in 3rd decade, which were 60 out of 120 making 50% of the total PCSFR patients (Table-1). Similarly, the smallest number of patients was recorded in 5th decade, i.e., 10 (8% of total patients). Gender distribution among 120 patients was analyzed as 86(72%) patients were male while 34(28%) patients were female. Type of trauma among 120 patients was analyzed as 40 (33%) patients had trauma due to fall, 65(54%) patients had trauma due RTA and 15 (13%) patients had trauma due to assault. Efficacy of conservative treatment among 120 patients was analyzed as conservative treatment was effective in 62 (52%) patients and was not effective in 58 (48%) patients. (Table-2)

Stratification of efficacy with respect to age, gender, type of trauma is given in table 3–5.

Table-1: Age distribution (n=120)

Age	Frequency	Percentage
5-20 years	18	15
21-30 years	60	50
31-40 years	32	27
41-50 years	10	8
Total	120	100

Mean age was 27 years with SD±8.761

Table-2: Efficacy of conservative management of PCSFR (n=120)

Efficacy	Frequency	Percentage
Effective	62	52
Not effective	58	48
Total	120	100

Table-3: Stratification of efficacy W.R.T age distribution (n=120)

Efficacy	5-20 years	21-30 years	31-40 years	41-50 years	Total
Effective	9	31	17	5	62
Not effective	9	29	15	5	58
Total	18	60	32	10	120

Chi square test was applied in which *p*-value was 0.9963

Table-4: Stratification of efficacy W.R.T gender distribution (n=120)

Efficacy	Male	female	Total
Effective	45	17	62
Not effective	41	17	58
Total	86	34	120

Chi square test was applied in which *p*-value was 0.8183

Table-5: Stratification of efficacy W.R.T type of trauma (n=120)

Efficacy	Fall	Read Traffic Accident	Assault	Total
Effective	20	34	8	62
Not effective	20	31	7	58
Total	40	65	15	120

Chi square test was applied in which *p*-value was 0.9647

DISCUSSION

The current investigative study shows an important data regarding the efficacy of conservative management of patients presenting with PCSFR. The data was collected and analyzed with various angles, i.e., firstly gender-wise frequency and efficacy has been figured out, secondly age-wise frequency and efficacy has been recorded, thirdly trauma-based frequency and effectiveness has been calculated and finally the Chi-Square distribution analysis was carried out for the patients of various ages. In nutshell, the mean age of patients under investigation was recorded as 27±8.741 years. Among 120 patients of PCSFR, 72% patients were male while 28% patients were female. The commonest cause was trauma due to Road Traffic Accidents (RTA) having 65 (54%) patients. Conservative treatment was effective in 62 (52%) patients predominantly in the patients of 3rd decade, i.e., 31 (50%), in which the effectiveness in male gender was revealed to be 52.32% (45) and effectiveness in RTA patients was recorded to be 54.83%.

Our study goes parallel with one of the recent reports by Schoentgen, C., *et al*., in which the mean age was recorded to be 30±7.571 years. Similarly, 70% of patients were male while 30% patients were female. The success rate of conservative management of traumatic cerebrospinal fluid rhinorrhoea was figure out to be 27.5%.[16] Similar results were observed in another study conducted by Yeo, N.-K., *et al*., in which mean age was 29±8.136 years. Among the test population, 75% percent patients were male and 25% patients were female. The success rates of conservative management of traumatic cerebrospinal fluid rhinorrhoea were 52%.[13] Likewise Friedman *et al.,* reported 68% success rates of conservative treatment of traumatic cerebrospinal fluid rhinorrhoea.[17] Brodie *et al*., indicated that CSF rhinorrhoea could also result from temporal bone fractures.[18] In 820 temporal bone fractures, they found that 72% of patients with temporal bone fractures and CSF fistulas presented with CSF rhinorrhoea. In this report, fracture of the frontal skull base, sinus walls, and temporal bone was observed. The success rate of conservative treatment of traumatic cerebrospinal fluid rhinorrhoea was 57%.

Schoentgen, C., *et al*., reported that that the overall risk of recurrence was 22.5%. The recurrence was exhibited by the presence of Cerebrospinal Fluid Rhinorrhoea in 12.5% patients while meningitis was recorded in 10% patients. Furthermore, the postoperative anosmia has also been revealed in that report to be 27.5%. Likewise, the wait and see policy has been annulled by observing higher risks of developing meningitis in this policy which showed the p-value of 0.0003.[16]

The results of our study could be compared with the reports of Yadav JS *et al*., in which they observed the conservative management of 12 PCSFR patients. In this report, 7 patients were re-hospitalized due to recurrence of PCSFR or meningitis. The male to female ratio has been observed to be 4:1. The whole scenario revolves around the fact that conservative management is inevitable for the PCSFR patient at any age irrespective of gender.[10] A very recent study reported from District Hospital Rawalpindi, Pakistan in 2021, shows the critical analysis of 70 patients including 52 male and 18 female. In this report, the Posttraumatic CSF fistula has been observed and eventually the concluding remarks were to treat the Posttraumatic CSF fistula following conservative and surgical management. Only conservative management should not be relied in the case, when the complications exacerbate even after two weeks.[19]

The conservative management could not be compared with the surgical management of PCSFR because the intensity and nature of PCSFR varies from individual to individual. Another report, also signifies and endorse the application of conservative

management and also emphasize the intervention of surgical therapy if the conservative management fail to give good prognosis within two weeks.[20]

CONCLUSION

Based on the current investigative study, it may be concluded that PCSFR is common in middle age population with slight male dominancy. It may also be inferred that RTA is the leading cause of PCSFR in our set up and majority of the patients shows improvement after conservative management. Moreover, the effectiveness of conservative management of PCSFR could be predominantly observed in the patients of 3rd decade.

Ethical considerations: Patients were not directly involved therefore informed written consent was not obtained.

Conflict of interest: All authors declare no competing interests.

AUTHORS' CONTRIBUTION

SAK, BA: Conceptualization of study design, literature search, write-up. MS, MA, AK, AAK: Data collection, data analysis and interpretation, write-up

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