Clinical profile, management and outcome of patients with head injury associated CSF rhinorrhea at a tertiary care centre

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Abstract

Background: There is need for early diagnosis and prompt treatment of CSF rhinorrhea to prevent complications like brain abscess and meningitis, to restore the patients and to improve quality of life. Hence, more and more data related to etiology, clinical presentation, management and outcome of CSF rhinorrhea is required.

Objective: To study clinical profile, management and outcome of patients with head injury associated with CSF rhinorrhea

Methods: Hospital based prospective study was carried out among 35 patients who were admitted with head injury associated with CSF rhinorrhea. Detailed history, thorough clinical examination was carried out. CT scan; MRI was done to confirm diagnosis, to locate site of leakage. Depending upon etiology, location, patients were managed either conservatively or using the surgical approach. All patients were followed for one year.

Results: Incidence of the head injury associated with CSF rhinorrhea in the present settings was 2.1%. 26-35 years (42.9%) and males were more affected (77.1%). Road traffic accidents (71.4%) were common cause. Salty taste (45.7%) was common clinical presentation. 85.7% cases presented within 48 hours. Ethmoid fracture (62.9%) and pneumocephalus (34.3%) were common CT and MRI findings respectively. Fovea ethmoidalis (48.6%) was common site of leakage.12 cases were managed conservatively; 10 cases required conservation with lumbar drain; 13 cases required surgical intervention. During follow up no case had complications.

Conclusion: Most active age group and males are commonly affected by CSF rhinorrhea. It commonly presents with salty taste and majority present within 48 hours. Management either conservative or surgical is successful and complication rate is negligible.

Key words: clinical profile, management, outcome, CSF rhinorrhea, head injury

Introduction:

Leakage of cerebrospinal fluid (CSF) from nose is CSF rhinorrhea. It is due to formation of a fistulous tract between nasal cavities and the intracranial cavities. Trauma at craniofacial region, injury of iatrogenic nature and malignancy are the most common causes of the CSF rhinorrhea. It is not easy to form a diagnosis of CSF rhinorrhea only based on the physical examination. It must be supported by presently available latest imaging techniques as well as biomarker studies which improves the diagnosis to a great extent. If the early diagnosis and prompt treatment is not made, the patients may land into complications; most common being meningitis. Whether the patient should be treated with surgical approach or there is a need to take a conservative approach depends upon the cause, time at which the patient presents to the hospital and the leakage severity.[1]

CSF is a plasma ultrafiltrate. It contains mainly the proteins, electrolytes and glucose. It supports the brain as buffer from shock. It is formed by choroid plexus. The rate of formation is 0.35 ml/min. Daily overall formation of CSF amounts to about 350-500 ml. An adult may have about 140 ml of CSF.[2]

Craniofacial trauma is the most common cause of leakage of CSF in about 80% of the cases. Of all the fractures associated with the skull base, it has

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been estimated that in around 12-39% of the cases, leakage of CSF takes place. More than half of such cases present to the hospital within first two days; this proportion increases to 70% withing a week and goes to 100% withing a period of three months. Thus, CSF leakage can take place from 48 hours to three months. The various reasons for delayed reporting can be attributed to tissue necrosis, rise in the intracranial pressure, contraction of the wound, and resolution of edema. Around 30% of the leakage occurs in frontal sinus and sphenoid sinus while cribriform plate/fovea ethmoidalis is found to be involved in 23% of the cases[3]. CSF leakages can be due to iatrogenic reasons in around 16% of the cases. In 80% of the cases the leak is due to injury to cribriform place/fovea ethmoidalis which most commonly is seen during endoscopic sinus surgery. While performing neurosurgical procedures, there is a risk of damage to the sphenoid sinus which can lead to CSF leakage in 67% of the cases.[4] Thus 96% of the etiology of the CSF leak is attributed to trauma and iatrogenic injury while 4% to other causes like CSF outflow obstruction which is due to tumors. Benign intracranial hypertension is also one of the causes.[5]

Based on causes, defect size and location, CSF rhinorrhea can be classified. Most commonly classified as traumatic and non-traumatic. Traumatic sub-classification can again be divided as iatrogenic or craniofacial. The craniofacial trauma can be classified as acute or delayed. Acute group again classified as due to penetrating or closed injury. Iatrogenic etiology can be due to intracranial or extracranial procedures[6].

CSF rhinorrhea most commonly presents as clear watery discharge from one side of the nose which is intermittent. The discharge varies as the position of the patient changes. It classically characterized by reservoir sign. Reservoir sign is exacerbation of the CSF rhinorrhea due to dependent head positioning. Patients complain of salty taste due to CSF leakage into the nasopharynx. Leaks after trauma are accompanied with other signs like lack of smell, epistaxis, deficits of the cranial nerves, ecchymosis etc. CSF rhinorrhea is also characterized by halo sign. It is demonstrated by collecting the discharge which contains blood on a filter paper and a halo will be created around blood stain on the filter paper which means presence of CSF. Chronic cases may be resistant to diagnosis as associated signs and symptoms are often absent and they are mistaken for other conditions of the Sino nasal disorders. This can lead to abscess in the brain or meningitis if early diagnosis and prompt treatment is not initiated.[7]

Laboratory diagnosis of the CSF rhinorrhea can be done by tests like Glucose oxidase[4], β2 Transferrin[8], β Trace protein (β-TP).[9] For confirming anatomic localization of the CSF rhinorrhea, Nasal endoscopy, High-resolution computed tomography (HRCT) scan, CT cisternography, Magnetic resonance imaging (MRI), Magnetic resonance cisternogram, Radionucleotide cisternogram, or Intrathecal fluorescein can be used.

Thus, it is clear that there is a need for early diagnosis and prompt treatment of cases of CSF rhinorrhea to prevent complications, to restore the patients and to improve the quality of life of patients. For this, there is need of more and more data related to etiology, clinical presentation, management and outcome of CSF rhinorrhea.

Hence present study has been carried out to study the clinical profile, management and outcome of patients with head injury associated with CSF rhinorrhea.

Methods:

Study design: Hospital based prospective study

Place of the study: Present study was carried out at Department of Neurosurgery, Vydehi Institute of Medical Sciences and Research Centre, Bangalore

Study period: From October 2016 to December 2018

Follow up period and follow up frequency: All patients were followed for one year after management of head injury associated with cerebrospinal fluid (CSF) rhinorrhea. The patients were asked to report at the end of first month, third month, sixth month and one year.

Sample size: During the study period, it was possible to include 35 cases of head injury associated with CSF rhinorrhea as per the inclusion and exclusion criteria

Inclusion criteria:

1. Patients with head injury associated with CSF rhinorrhea
2. Willing to participate in the present study

Exclusion criteria:

1. Head injury without CSF rhinorrhea
2. Patients not willing to be part of the present study

Ethical considerations: Institution Ethics Committee permission was taken. Nature of the study was explained to the eligible participants or their attenders and written informed consent was taken. In case of children less than 18 years of age, informed consent was obtained in the child assent form. All patients were managed and given appropriate treatment. They were followed as per the schedule of follow up in the present study

Methodology:

35 consecutive patients admitted with head injury associated with CSF rhinorrhea during the study period were included in the present study after obtaining informed consent from the attender of the patients. All patient related information was recorded in the pre designed, pre tested, and semi structured study questionnaire. History was obtained on characteristics like age, sex, mode of injury, symptoms, time of CSF rhinorrhea and recorded.

Thorough clinical examination was carried out. All patients underwent computed tomography (CT) scan and magnetic resonance imaging (MRI). CT scan was done using GE Bright Speed 16 slice. MRI was done using GE HDX Signa 1.5 Tesla. Site of leakage was determined from imaging studies. All patients were treated with appropriate modalities like Non-surgical therapy without lumbar drain, Conservation with lumbar drain, Craniotomy and extradural repair, Craniotomy with extradural and intradural repair and ventriculoperitoneal (VP) Shunt.

All patients were asked to come for follow up for one year after discharge at the end of one month, three months, six months and one year. During follow up detailed history and thorough clinical examination was carried out.

Statistical analysis: The data was entered in the Microsoft Excel worksheet and analysed using proportions.

Results:

During the study period, a total of 1683 cases of head injury reported to the hospital. Out of which 35 cases had head injury associated with CSF rhinorrhea. All 35 cases agreed to participate in the study and no one was lost to follow up. Thus, the incidence of the head injury associated with CSF rhinorrhea in the present settings was 2.1%.

Table 1: Distribution of study subjects as per baseline characteristics

Baseline characteristics		Number	%
Age (years)	5-15	4	11.3
	16-25	1	2.9
	26-35	15	42.9
	36-45	10	28.6
	46-55	5	14.3
Sex	Male	27	77.1
	Female	8	22.9
Mode of injury	Road traffic accidents	25	71.4
	Fall from height	7	20
	Assault	3	8.6

Table 1 shows distribution of study subjects as per baseline characteristics. The most commonly affected age group was 26-35 years (42.9%) followed by 36-45 years (28.6%). Males were more affected (77.1%) than females (22.9%). Most common cause of CSF rhinorrhea was road traffic accidents in 71.4% of the cases.

Table 2: Distribution of study subjects as per clinical features and time of CSF rhinorrhea

Variables		Number	%
Clinical features	Salty taste	16	45.7
	Headache	8	22.9
	Anosmia	7	20
	Reservoir sign	2	5.7
	Fever/neck pain	1	2.9
	Target sign	1	2.9
	Visual disturbances	0	0
Time of CSF rhinorrhea	Early (< 48 hours)	30	85.7
	Late (48 hours to 3 months)	5	14.3
	Delayed (> 3 months)	0	0

Table 2 shows distribution of study subjects as per clinical features and time of CSF rhinorrhea. Most common clinical presentation was salty taste in 45.7% of the cases followed by headache in 22.9% of the cases while reservoir sign was seen in only 5.7% of the cases. 85.7% of the cases of CSF rhinorrhea presented withing 48 hours of head injury while 14.3% presented withing 48 hours to three months.

Table 3: Distribution of study subjects as per CT scan and MRI findings

Imaging method		Number	%
CT scan findings	Ethmoid fracture	22	62.9
	Pneumocephalus	12	34.3
	Frontal sinus fracture	9	25.7
	Paranasal sinus opacity	9	25.7
	Sphenoid fracture	4	11.4
	Hydrocephalus	2	5.7
MRI scan findings	Pneumocephalus	12	34.3
	CSF in paranasal sinuses	10	28.6
	Encephalocele	5	14.3
	Hydrocephalus	2	5.7

Table 3 shows distribution of study subjects as per CT scan and MRI findings. Most common CT scan finding was ethmoid fracture in 62.9% of the cases while most common MRI finding was pneumocephalus in 34.3% of the cases.

Table 4: Distribution of study subjects as per site of leakage

Site of leakage	Number	%
Fovea ethmoidalis	17	48.6
Frontal sinus	10	28.6
Cribriform plate	7	20
Sphenoid sinus	2	5.7

Table 4 shows distribution of study subjects as per site of leakage. Most common site of leakage was found to be fovea ethmoidalis in 48.6% of the cases followed by frontal sinus in 28.6% of the cases.

Table 5: Distribution of study subjects as per management and outcome of head injury associated with CSF rhinorrhea

Management and outcome		Number	%
Type of management	Non-surgical therapy without lumbar drain	12	34.3
	Conservation with lumbar drain	10	28.6
	Craniotomy and extradural repair	6	17.1
	Craniotomy with extradural and intradural repair	6	17.1
	ventriculoperitoneal (VP) shunt	1	2.9
Outcome	Recurrence of CSF rhinorrhea and meningitis at 1 month	0	0
	Recurrence of CSF rhinorrhea and meningitis at 3 months	0	0
	Recurrence of CSF rhinorrhea and meningitis at 6 months	0	0
	Recurrence of CSF rhinorrhea and meningitis at 1 year	0	0

Table 5 shows distribution of study subjects as per management and outcome of head injury associated with CSF rhinorrhea. 12 cases could be managed conservatively while 10 cases required conservation with lumbar drain. 13 cases required surgical intervention; out of which six cases underwent craniotomy and extradural repair. In other 6 cases, Craniotomy with extradural and intradural repair was performed. One case required VP shunt. During follow up no case had any complications.

Discussion:

In the present study, incidence of the head injury associated with CSF rhinorrhea was 2.1%. 26-35 years (42.9%) and males were more affected (77.1%). This can be attributed to the most active and more outdoor activities among males compared to females which predispose males and this age group to trauma and injuries. Road traffic accidents (71.4%) were common cause of CSF rhinorrhea. Salty taste (45.7%) was common clinical presentation. 85.7% cases presented within 48 hours. Ethmoid fracture (62.9%) and pneumocephalus (34.3%) were common CT and MRI findings respectively. Fovea ethmoidalis (48.6%) was common site of leakage. 12 cases were managed conservatively; 10 cases required conservation with lumbar drain; 13 cases required surgical intervention. During follow up no case landed into the complications.

Adoga AA et al[10] noted that incidence of otorhinolaryngological presentations was 1.3% among head injury cases which is similar to our findings of 2.1% incidence of CSF rhinorrhea. Males were mostly affected and the mean age was 34 years; these findings are consistent with our findings. 50.5% of their cases had severe head injury. 67% of the cases were due to road traffic accidents which are similar to present study of 71.4% of cases. 59.3% of their cases were managed conservatively which is similar to our study of 62.9%. All patients presented at an average of 13.8 hours while in the present study, 85.7% cases presented within 48 hours. The authors reported that 6.6% cases died while there was no fatality in the present study.

Bell RB et al[11] found that the incidence of CSF rhinorrhea was 1.2% which is slightly lesser than the present study of 2.1%. Males were more than females which is similar to the present study finding. The authors reported that six patients had persistent CSF leakage while we found that there were no such complications till one year of follow up. The authors concluded that CSF leakage after trauma is rare and most cases resolve without need for surgical intervention.

Amin Z et al[12] inspected records of 1309 cases of head injury and found that 4.7% had temporal bone fracture; 85.9% were attributed to road traffic accidents and 88.5% were males. These findings are in accordance with the present study findings. 36% of their cases presented with blood rhinorrhea and 32.7% had blood otorrhea. 9.8% of the cases had loss of hearing, 8.2% had cranial nerve palsy and 8.2% had CSF oto-rhinorrhea. 21.3% died as a result of head injury which was very severe in nature.

Ologe FE et al[13] studied recorded 794 cases of head injury cases for 10 years to observe the CSF rhinorrhea or otorrhea. The incidence of CSF rhinorrhoea and/or otorrhoea was 4.9%. Males were more than females which is similar to the finding of the present study. Out of these 39 cases (4.9%); 19 (48.7%) had CSF rhinorrhea, 13 (33.3%) had CSF otorrhea while 7 (18%) had both CSF rhinorrhea and CSF otorrhea. The authors found that road traffic accidents were the most common cause of head injuries which is in accordance with the present study findings.

Varshneya K et al[14] studied 13,861 children with fracture of the skull and the incidence of CSF leakage was found out to be 1.46%. Among these 202 cases with CSF leakage, 41.6% had CSF rhinorrhea. Older children were significantly more at risk of CSF leak compared to their younger counterparts. Skull base fracture was more common. The children with CSF leak were exposed to longer hospital stay compared to children without CSF leak and they required more neurosurgical intervention; they had more complication rate also.

Sivanandapanicker J et al[15] noted that 3.85% of the cases had fracture of the base of the skull out of total 5041 head injury cases. Males were more than females. Road traffic accidents were the most common cause of head injuries. 43 cases had CSF leakage and among these cases, CSF rhinorrhea was more common. The authors also observed that in eight cases the CSF leak was present for more than ten days and among them four required surgical intervention.

Conclusion:

Most active age group and males are commonly affected by CSF rhinorrhea. It commonly presents with salty taste and majority present within 48 hours. Management either conservative or surgical is successful and complication rate is negligible.

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