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CLINICAL STUDY OF TRAUMATIC SUBARACHNOID HAEMORRHAGE AND ITS MANAGEMENT: AN INSTITUTION BASED PROSPECTIVE STUDY

Dr. Suresh Kumar Kumawat*	M.ch Neurosurgery Resident (Final year), Department of Neurosurgery, RNT Medical College, Udaipur, Rajasthan) *Corresponding Author
Dr. Gaurav Jaiswal	M.ch, Professor & Head, Department of Neurosurgery, RNT Medical College, Udaipur, (Rajasthan)
Dr. Kaushal Yadav	M.ch, Assistant Professor, Department of Neurosurgery, RNT Medical College, Udaipur, (Rajasthan)
Dr. Abhinav Kumar Rai	M.ch Neurosurgery Resident (Final year), Department of Neurosurgery, RNT Medical College, Udaipur, (Rajasthan)

ABSTRACT **Objective:** Head injury has been the leading cause of death and disability in people younger than 40 years and the incidence is rising continuously. Anticipation of the pathological consequences of post-traumatic subarachnoid haemorrhage (tSAH) and an outcome-oriented management are very important in these cases. This study aims at to estimate the incidence of traumatic subarachnoid haemorrhage, to study the patient population in the light of their age, sex, mode of presentation, geographical location, natural history of the disease etc in traumatic subarachnoid haemorrhage and different modalities of management for traumatic subarachnoid haemorrhage in our institute and their prognostic significance. **Materials & Methods:** All diagnosed cases of traumatic SAH attending and being admitted to Department of Neurosurgery, RNT medical college and hospital, Udaipur Rajasthan between July 2022 – December 2022. For statistical analysis SPSS (version 25) used.A Total of 50 patients of traumatic SAH with different age group admitted and managed with different plans and study outcome. **Results:** It was found that male gender was more common than female and RTA was highest mode of injury in our study. We found that poor Glasgow outcome score was more in higher fisher grade patient but good recovery was more in lower fisher grade patient which was statistically significant. Higher GCS score presented at admission has favourable Glasgow outcome score and lower GCS had unfavourable outcome which was statistically significant. Our study showed that associated brain injury was higher in poor Glasgow outcome score and it is statistically significant. Poor outcome was observed in the elderly as most of the patients have poor GCS at admission. **Conclusion:** Traumatic subarachnoid haemorrhage may have different courses in different age groups. Whereas in paediatric patients, pure tSAH with good clinical outcome is frequently seen, in the elderly, other intracranial traumatic lesions usually accompany tSAH, as most of the cases are admitted with severe head injury and clinical outcome is worse. Other important factors affecting outcome in tSAH are amount of subarachnoid blood on first CT, presence or absence of accompanying intracranial lesions, and severity of head injury, as in other traumatic intracranial lesions.

KEYWORDS :

INTRODUCTION

Subarachnoid haemorrhage (SAH) refers to extravasation of blood into the subarachnoid space in between the pia and arachnoid membranes. Most common of SAH is head trauma. The incidence of tSAH varies from 26% to 53% in patients with TBI. Road traffic accidents account for approximately 59% of TBIs. it will be the fifth leading cause of death in India by the year 2030. The incidence of head injury varies from 67 to 317 per 100,000 individuals and the mortality rate ranges from approximately 4%–8% for moderate injury to approximately 50% for severe head injury. Head injury has been the leading cause of death and disability in people younger than 40 years and the incidence is rising continuously. The role of serial computed tomography (CT) scans, perfusion studies, transcranial doppler, magnetic resonance imaging (MRI), and angiographic studies as diagnostic tools, has been described. Recently, MRI fluid attenuated inversion recovery (FLAIR), gradient reversal echo (GRE), and susceptibility weighted imaging (SWI) have emerged as excellent complimentary MRI sequences which have a role in the diagnosis and prognostication of patients with tSAH. Traumatic brain injury (TBI) is a daunting challenge faced by neurosurgeons from all over the world. Among the wide spectrum of injuries included in TBI, traumatic subarachnoid haemorrhage (tSAH) is one of the leading causes of morbidity and functional impairment. [1,2] tSAH was first defined by Wilks as "sanguineous meningeal effusion" in 1859. [3] Eisenberg evaluated the CT scans of 753 patients with severe head injury. He discovered that the CT findings most often related to abnormal intracranial pressure (ICP) and to death were a significant midline shift, compression, or obliteration of the mesencephalic cisterns, and the presence of subarachnoid blood.[4] tSAH induced vasospasm, dyselectrolytemia, pituitary or hypothalamic dysfunction, and hydrocephalus may be the cause of poor outcome in these patients.. In India, more than 1 million accidents occur every year that led to more than 1,50,000 deaths per year (as per the 2011 statistics). The overall rate is one accident per minute and one death in every 45 minutes. Nearly 350 people die due to road traffic accidents in India per day. Per 1 million kilometres' driven, there are six deaths in India. In total, 60% of all cases of head injury in India are caused by road traffic accidents. The fatality rate is 70 per 10,000 vehicles, which is 30 times higher than that in the United States. The incidence of alcohol related injuries constitutes 15%-20% of the total head injuries. Of the victims classified as "severely injured" in road traffic accidents, 76% have an associated head injury.[5,6] Specialized scores used to classify tSAH are as follows: Fisher grade classification: The Fisher grade classifies the appearance of an SAH on CT scan (Table no 1) [7], Morris Marshall classification: Based on the CT findings (Table no 2), Greene et al., classification (Table no 3).

Table No.1: - Fisher Grading Of SAH

Grade	Appearance of haemorrhage on CT
1	No subarachnoid blood detected
2	Diffuse or vertical layer<1mm thick
3	Localised clot and/or vertical layer >1mm thick
4	Intracerebral or intraventricular clot with diffuse or no SAH

Table No. 2: - Morris- Marshall Grading Of SAH, (tSAH- Traumatic Subarachnoid Haemorrhage), CT- Computed Tomography.

Grade	CT scan finding
0	No CT evidence of tSAH
1	tSAH present at only one location
2	tSAH present at only one location but quantity of blood fills that structure or tSAH is at two sites, filling neither of them
3	tSAH at two sites, one of which is the tentorium, filled with blood
4	tSAH present at three or more sites any quantity

Table no. 3: - Greene Et Al., Classification, (tSAH- Traumatic Subarachnoid Hemorrhage, CT- Computed Tomography.

Grade	CT scan finding

1	Thin tSAH(<5mm)
2	Thick tSAH(>5mm)
3	Thin tSAH with mass lesion
4	Thick tSAH with mass lesion

The etiology of tSAH is unknown but the possible mechanisms are as follows:(1) rotational acceleration causing short lasting oscillatory movements of the brain; (2) vertebrobasilar artery stretch due to hyperextension; (3) sudden rise of intraarterial pressure from a blow to the cervical carotid artery; (4) tearing of the bridging veins or pial vessels; and, (5) diffusion of blood from contusion into the 3 subarachnoid space. Sometimes, no cause can be found. SAH can be found associated with contusion and subdural hematoma, spreading outwards from lacerations and around penetrating injuries. tSAH can occur over the ventral surface of the brain stem (basilar SAH). Martin and colleagues have suggested three different circulatory stages after severe head injury: Phase I (hypoperfusion), phase II (hyperaemia), and phase III (vasospasm). [8] It may involve the supratentorial, convexity, sulcal, and interhemispheric spaces. In tSAH, PTV occurs early and resolves earlier than in an aSAH. PTV is not always associated with significant SAH and has been noted in patients with extra axial hematomas or even without any radiographic evidence of SAHs. [2]

Serum S100B, but not neuron specific enolase, was associated with delayed cerebral ischemia, but did not correlate with angiographic vasospasm.[9] Neurological examination should evaluate the level of consciousness, pupillary size and reaction, motor responses, and reflexes.[10] Trauma to the spinal cord, chest, and abdomen should be ruled out. It should be followed by immediate radiological and essential. The most frequently used diagnostic test is non contrast CT scan of the brain. Radiation hazards and beam hardening effects are some [11] of the disadvantages of the CT scan

MATERIALS AND METHODS

All diagnosed cases of traumatic SAH attending and being admitted to Department of Neurosurgery, RNT MEDICAL COLLEGE AND MB HOSPITAL OF GROUP, UDAIPUR, RAJASTHAN, INDIA. between July 2022– december2022

Inclusion Criteria

Patient admitted within 24 hours of trauma which includes fall from height, road traffic accidents, assaults in Department of Neurosurgery, RNT Medical College and MB Hospital of Group, Udaipur, Rajasthan, INDIA.

Exclusion Criteria

1. Individuals not willing to participate in the study
2. Polytrauma patients
3. Gunshot patients [penetrating trauma]
4. Post operative subarachnoid haemorrhage

Detailed history was taken and thorough physical examination and central nervous system done and relevant radiological investigation was recorded, and patient bladder catheterisation, early enteral nutrition, analgesia, antiemetic and antiepileptic medicines are essential in initial part of treatment. Keeping patient head elevated, avoid compression of neck veins, frequent turning of patient, and physiothery is given [12]. Apart from baseline monitoring, the intensive care unit care should include intracranial pressure, jugular bulb venous oxygen saturation and brain tissue oxygen tension monitoring; cerebral micro dialysis; transcranial Doppler ultrasonography; mechanical ventilation; hemodynamic support; hyperosmolar therapy; Lund therapy; stress ulcer prophylaxis; and rarely, barbiturate coma for control of the raised intracranial pressure. To study various manifestation of the disease and categorization as preclinical and radiological grading on presentation.

Different plans of management: patients had Managed, Conservatively, CSF diversion, and had surgical Hematoma evacuation.

Statistical Analysis

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analysed by SPSS (version 25.0). Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two-sample t-tests for a difference in mean involved independent samples or unpaired samples. Paired t-tests were a form of blocking and had greater power than unpaired tests. One-way analysis of variance (one-way ANOVA) was a technique used to compare means of three or more samples for numerical data (using the F distribution). A chi-squared test ($\chi 2$ test) was any statistical hypothesis test wherein the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as short for Pearson's chi-squared test. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate. Explicit expressions that can be used to carry out various t-tests are given below. In each case, the formula for a test statistic that either exactly follows or closely approximates a t-distribution under the null hypothesis is given. Also, the appropriate degrees of freedom are given in each case. Each of these statistics can be used to carry out either a one-tailed test or a two-tailed test. Once a t value is determined, a p-value can be found using a table of values from Student's t-distribution. P-value ≤ 0.05 was considered for statistically significant.

RESULTS

1. Incidence Traumatic Subarachnoid Haemorrhage In TBI:" We found that 204 patients of traumatic brain injury were admitted in our hospital during study period. The incidence of traumatic subarachnoid haemorrhage was 25.1%.

2. Distribution Of Age Group:

Parameters	Group 1	Group 2	Group 3
Age (years)	0-15	15-64	>64
No of patients	13(26%)	25(50%)	12(24%)

3. Distribution Of Gender:

Gender	Male	Female
No of patients	34(68%)	16(32%)

4. Distribution Of Mode Of Injury:

Mode of injury	RTA	Fall	Assault
No of patients	35(70%)	14(28%)	1(2%)

5. Table:- Distribution Of Fisher Grade:

Fisher grading	Grade 1	Grade 2	Grade 3	Grade 4
No of patients	17(34%)	8(16%)	11(22%)	14(28%)

6. Table: - Distribution Of GCS

Distribution of GCS	Mild	Moderate	Severe
No of patients	23(46%)	15(30%)	12(24%)

7. Table: - Distribution Of Glasgow Outcome Score In Association With Gender, Age, Mode Of Injury, Fisher Grading, GCS Score, Brain Injury, Complications

Glasgow outcome score	Death	Persistent vegetative state	Severe disability	Mild disability	Good recovery	P value
	12(24%)	3(6%)	4(8%)	7(14%)	24(48%)	
Association with gender	M- 9(75%) F- 3(25%)	M- 3(100%)	M- 3(75%) F- 1(25%)	M- 4(57.1%) F- 3(42.9%)	M- 15(62.5%) F- 9(37.5%)	0.6473
Association with age	Age group 1-1(8.3%) Age group 2-5(41.7%) Age group 3-6(50%)	Age group 2-2(66.7%) Age group 3-1(33.3%)	Age group 2-2(50%) Age group 3-2(50%)	Age group 1-2(28.6%) Age group 2-4(57.1%) Age group 3-1(14.3%)	Age group 1-10(41%) Age group 2-12(50%) Age group 3-2(8.3%)	0.1021
Association with mode of injury	RTA- 7(58.3%) Fall- 5(41.7%)	RTA- 3(100%)	RTA- 4(100%)	RTA- 6(85.7%) Fall- 1(14.3%)	RTA- 15(62.5%) Fall- 8(33.3%) Assault- 1(4.2%)	0.6326

Association with fisher grading	FG 4- 12(100%)	FG 3- 2(66.7%) FG 4 - 1(33%)	FG 3- 3(75%) FG 4- 1(25%)	FG 2- 2(28.6%) FG 3- 5(71.4%)	FG 1- 17(70.8%) FG 2- 6(25%) FG 3- 1(4.2%)	0.0001
Association with GCS	Moderate- 2(16.1%) Severe- 10(83.3%)	moderate-2(66.7%) severe - 1(33%)	moderate- 3(75%) severe- 1(25%)	Mild- 1(14.3%) Moderate-6(85.7%)	Mild- 22(91.7%) Moderate- 2(8.3%)	0.0001
Association with brain injury	5(41.7%)		2(50%)	2(28%)	2(8.3%)	0.0080
Association with complications	Dyselectrolytemia-3(25%)		Hydrocephalus-2(50%)			0.0001

8. Distribution Of FOLLOW UP HEADACHE: 6(12.0%) patients had HEADACHE.

9. Distribution of Management: 45(90.0%) patients had Conservative Management, 2(4.0%) patients had CSF diversion, and 3(6.0%) patients had surgical Hematoma evacuation

DISCUSSION

In our study we enrolled 50 pt among them 34 pt were male and 16 were female Blinger KG et al[15] (2015) also found that majority of patients were male (64%). We devides all [patients into three groups as per age group 1(0-15 yrs) , group 2(16-64 Yrs) and group 3(>64 yrs). Guzey FK et al[14] (2006) also distribute patients into three groups, <16 yrs childrens, 16-64yrs adult, >65 yrs elderly.

The incidence of traumatic subarachnoid haemorrhage was 25.1%. In Glasgow outcome score, 12(24.0%) patients died, 3(6.0%) patients had persistent vegetative state, 4(8.0%) patients had severe disability, 7(14.0%) patients had mild disability and 24(48.0%) patients had good recovery. Ökten Aİ et al [13] (2006) they supports ours study and found that the GCS scores of patients at admission were mild (9%), moderate (39%) and severe (52%). In the CT scans, the amount and distribution of bleeding was grade 1 (small SAH) in 21 patients, grade 2 (moderate SAH) in 17 patients, and grade 3 (extensive SAH) in 20 patients according to Neurological outcomes of patients were favourable (good recovery or moderate disability) in 59%, and unfavourable (severe disability, persistent vegetative state or death) in 41% according to GOS.

We found that 13(26.0%) patients were under Age Group 1 (0-15 Yrs.), 25(50.0%) patients were under Age Group 2 (16-64 Yrs.) and 12(24.0%) patients were under Age Group 3 (>64 Yrs.). The association between Age Groups vs Glasgow outcome score was not statistically significant (p=0.1021).

We found that 35(70.0%) patients had injury due to RTA, 14(28.0%) patients had injury due to fall and 1(2.0%) patient had injury due to assault. The patient who died, 7(58.3%) was due to RTA, 5(41.7%) patients was due to fall. Persistent vegetative state was the outcome of 3(100.0%) patients due to RTA. Severe disability was the outcome of 4(100.0%) patients due to RTA. Mild disability was the outcome of 6(85.7%) patients due to RTA and 1(14.3%) patients due to fall. Good recovery was the outcome of 15(62.5%) patients due to RTA, 8(33.3%) patients due to fall and 1(4.2%) patients due to assault. The association between mode of injury vs Glasgow outcome score was not statistically significant (p=0.6326).

We found that 17(34.0%) patients were under Fisher grade 1, 8(16.0%) patients were under Fisher grade 2, 11(22.0%) patients were under Fisher grade 3 and 14(28.0%) patients were under Fisher grade 4 SAH. In DEATH, 12(100.0%) patients were under Fisher grade 4. In persistent vegetative state, 2(66.7%) patients were under Fisher grade 3 and 1(33.3%) patient was under Fisher grade 4. In severe disability, 3(75.0%) patients were under Fisher grade 3 and 1(25.0%) patient was under Fisher grade 4. In mild disability, 2(28.6%) patients were under Fisher grade 2 and 5(71.4%) patients were under Fisher grade 3 . In good recovery, 17(70.8%) patients were under Fisher grade 1, 6(25.0%) patients were under Fisher grade 2 and 1(4.2%) patient was under Fisher grade 3. The association between fisher grade vs Glasgow outcome score was statistically significant (p<0.0001). okten AI et al[13] (2006) Fisher's criteria. The thickness of blood layer was grade 1 (no blood) in 6 patients, grade 2 (bleeding layer less than 1 mm) in 21 patients, grade 3 (bleeding layer more than 1 mm) in 15 patients and grade 4 (ventricular bleeding) in 16 patients. Gaetani P et al [16] (1995) found that Fisher's criteria: in 93 patients it was grade 1, in 36 grade 2, in 13 grade 3, and in six grade 4. There was a significant correlation between increasing clinical severity at admission and the amount of subarachnoid bleeding and a direct relation between a favourable outcome and a low Fisher grade.

It was found that 23(46.0%) patients had mild GCS, 15(30.0%) patients had Moderate GCS and 12(24.0%) patients had Severe GCS. In DEATH, 2(16.7%) patients had Moderate GCS and 10(83.3%) patients had Severe GCS. In persistent vegetative state, 2(66.7%) patients had Moderate GCS and 1(25.0%) patient had Severe GCS. In severe disability, 3(75.0%) patients had Moderate GCS and 1(33.3%) patient had Severe GCS. In mild disability, 1(14.3%) patient had Mild GCS and 6(85.7%) patients had Moderate GCS. In good recovery, 22(91.7%) patients had Mild GCS and 2(8.3%) patients had Moderate GCS. The association between GCS vs Glasgow outcome score was statistically significant (p<0.0001).

Our study found that 3(6.0%) patients had dyselectrolytemia and 2(4.0%) patients had hydrocephalus. In DEATH, 3(25.0%) patients had dyselectrolytemia. In SEVERE DISABILITY, 2(50.0%) patients had hydrocephalus. The association between complication vs Glasgow outcome score was statistically significant (p<0.0001). In poor outcome, 3(15.8%) patients had dyselectrolytemia and 2(10.5%) patients had hydrocephalus.

We found that 6(12.0%) patients had headache at 6 month of follow up.

In our study we found that 45(90.0%) patients were managed Conservatively, 2(4.0%) patients had CSF diversion, and 3(6.0%) patients had surgical Hematoma evacuation. Kurve A et al [17] (2005) found that on admission, Glasgow Coma Score was 6/15 and CT scan revealed grade III subarachnoid haemorrhage with evidence of diffuse axonal injury and small haemorrhagic contusion in left temporal lobe. Patient improved with conservative management,

CONCLUSION

It was found that male gender was more common than female and RTA was highest mode of injury in our study.

We found that poor Glasgow outcome score was more in higher fisher grade patient but good recovery was more in lower fisher grade patient which was statistically significant. Higher GCS score presented at admission has favourable Glasgow outcome score and lower GCS had unfavourable outcome which was statistically significant.

Our study showed that associated brain injury was higher in poor Glasgow outcome score and it is statistically significant. Poor outcome was observed in the elderly as most of the patients have poor GCS at admission.

Traumatic subarachnoid haemorrhage may have different courses in different age groups. Whereas in paediatric patients, pure tSAH with good clinical outcome is frequently seen, in the elderly, other intracranial traumatic lesions usually accompany tSAH, as most of the cases are admitted with severe head injury and clinical outcome is worse. Other important factors affecting outcome in tSAH are amount of subarachnoid blood on first CT, presence or absence of accompanying intracranial lesions, and severity of head injury, as in other traumatic intracranial lesions.

Limitations Of The Study

In spite of every sincere effort my study has lacunae. The notable short comings of this study are, the sample size was small, only 50 cases are not sufficient for this kind of study. The study was carried out in a tertiary care hospital, so hospital bias cannot be ruled out. I have not studied vasospasm as in our centre bedside colour Doppler facility is not available.

Conflicts Of Intrest- None

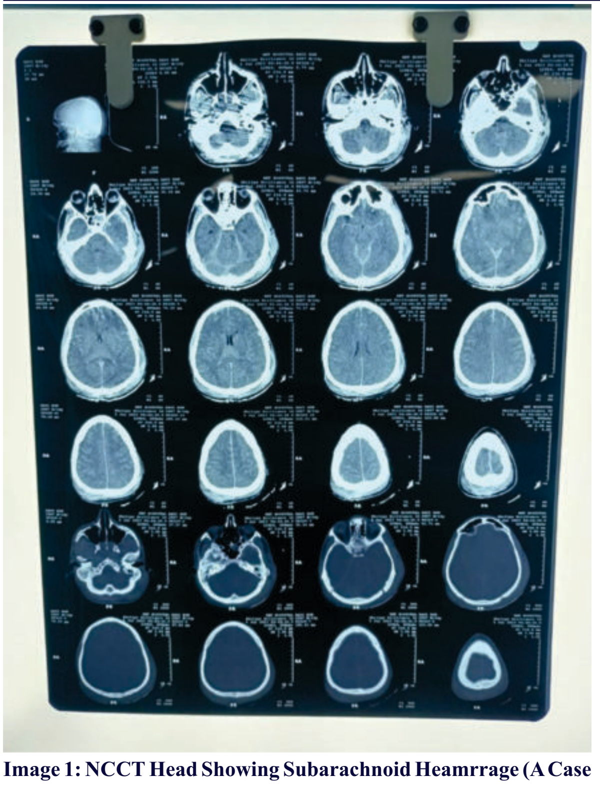

Image 1: NCCT Head Showing Subarachnoid Heamrrage (A Case Of Road Traffic Accident)

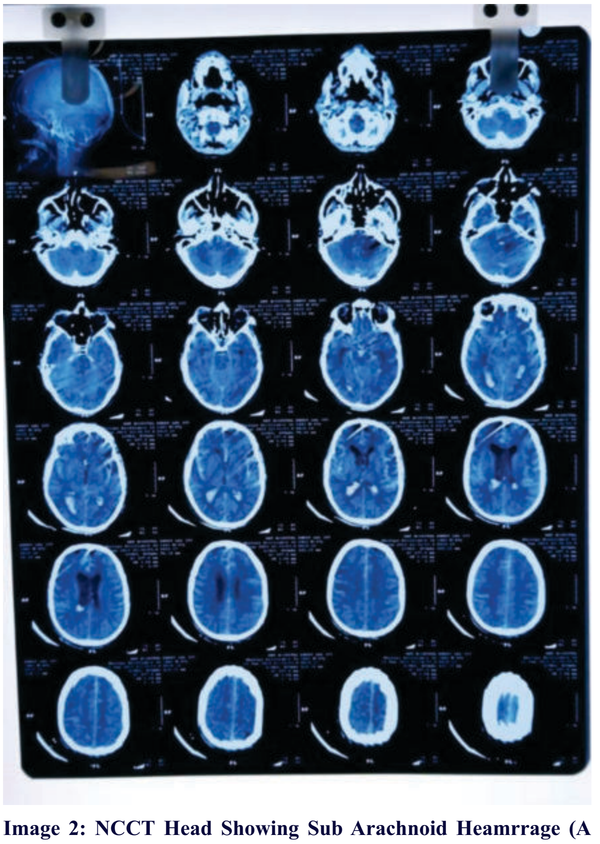

Image 2: NCCT Head Showing Sub Arachnoid Heamrrage (A Case Of Head Injury After Fall From Height)

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