Original Research Article

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Outcome Predictors of Non-Aneurysmal Spontaneous Subarachnoid Hemorrhage: A Retrospective Analysis in A Tertiary Care Center

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Abstract

Background: Non aneurysmal subarachnoid hemorrhage accounts for about 15% of all spontaneous subarachnoid hemorrhages. Literature has less data of outcome of these patients. To analyze factors affecting the outcome of patients with angio-negative subarachnoid hemorrhage (SAH). *Methods:* Retrospective analysis of data of patients with angio-negative SAH admitted in a tertiary care hospital from 2013 to 2018. Outcome was assessed according to the modified Rankin Scale (mRS) at 6 months. *Results:* Total 44 patients (18 Males, 16 Females with a ratio of 1.1:1) were included in the study. The mean age of presentation was 48.9±11.8. On imaging, 24 (55.5%) patients had perimesencephalic SAH (PM-SAH) and 20 (45.5%) had non-perimesencephalic SAH (NPM-SAH). Among 44 patients, 37 (84 %) of were clinically in good conditions (WFNS I/III) at presentation. 91% (22 out of 24) of patients with PM-SAH had a good clinical status compared to the patients with NPM-SAH (75%) which clinically was not significant (p=0.13). 19 (43%) Patients were having arterial hypertension (Systolic BP >140). 10 (23%) patients were on anticoagulation medications. Overall, 12 (27%) patients developed an early hydrocephalus and required an EVD. Good outcome was seen in 35 (83%) patients. On multivariate analysis early hydrocephalus and poor admission clinical status emerged as an independent factors for the poor outcomes [Table 2]. *Conclusions:* Early onset hydrocephalus and poor admission WFNS grade are the independent predictor of poor outcomes. Permanent shunt dependency is significantly higher in patients with NPM-SAH. Patients with a NPM-SAH special attention as they have relatively poor neurological course compared to the patients with PM-SAH.

Keywords: Spontaneous Subarachnoid Hemorrhage; Perimesenchalic; Aneurysm; Angionegative.

Introduction

Spontaneous subarachnoid hemorrhage (SAH) generally happens due to the rupture of the intracranial aneurysms. But nearly in 15-20% of cases cause remains occult even after performing the angiography (CT angiography or DSA)and spinal magnetic resonance imaging(MRI) [1-2]. In about 20-70% of angio-negative cases primary distribution of blood would be perimesenchaphalic [3]. These group of patients are usually have a good outcome compared to the non-perimesenchaphalic group [3]. Unfortunately there are few data over the outcome of angionegative SAH [4-5]. Considering the scarcity of literature, this study has been done to analyzed the cases of non-aneurysmal spontaneous SAH admitted over a period of five years in a tertiary care center.

Materials and Methods

This is a prospective study which was conducted in a Tertiary care hospital. We included 40 admitted patients with a spontaneous non-aneurysmal SAH confirmed on computed tomography (CT) at tertiary care center from 2013 to 2018 after the exclusion of trauma. This study was approved by the Institutional Ethical Committee. Standard medical treatment and care were administered to all patients and consent were obtained from each of the patient's attender. Patients were divided in to two arms depending on the distribution of blood into two groups:

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perimesencephalic subarachnoid hemorrhage (PM-SAH) and non-perimesencephalic subarachnoid hemorrhage (NPM-SAH).

Standard of Care

All the patients with SAH on CT scan brain were evaluated with the four-vessel 3D digital subtraction angiography (DSA) to rule out intracranial cause of SAH. In case of negative angiography, patients were managed conservatively which comprised of ventilation, hydration, anti-seizure prophylaxis, nimodipine, ranitidine for gastric ulcer prophylaxis and continuous bladder drainage. Magnetic resonance imaging (MRI) of the spine was performed to rule out any spinal bleeding sources. Repeat DSA was performed in all initial DSA negative patients after 2 months.

On admission, depending on the WFNS grades patients were divided in to good grade (WFNS grades I – III) and poor grade (WFNS IV – V). The modified Rankin Scale (mRS) was used to assess the outcome at 6 months.

Hydrocephalus was defined as clinical deterioration (like deterioration from somnolence to stupor) and enlargement of the temporal horns of more than 2 mm. Enlargement of the temporal horns was defined as hydrocephalus in comatose patients.

Statistical Analysis

The data were expressed as a mean and standard deviation. Categorical variables were analyzed with Chi-square test or Fishers exact test wherever appropriate. Multiple logistic regression tests were conducted for adjusting well-known variables such as age, sex and WFNS grade. Two-sided significance tests were used throughout and the significance level was kept at p=0.05. Statistical analysis was done using the SPSS 16 software package.

Results

Total 44 patients (18 Males, 16 Females with a ratio of 1.1:1) were included in the study. The mean age of presentation was 48.9±11.8 On imaging, 24 (55.5%) patients had PM-SAH and 20 (45.5%) had NPM-SAH.

Among 44 patients, 37 (84%) of were clinically in good conditions (WFNS I/III) at presentation. 91% (22 out of 24) of patients with PM-SAH had a good clinical status compared to the patients with NPM-SAH in whom 75% (15 out of 20) had a better clinical status which clinically was not significant (P= 0.13). 19 (43%) Patients were having arterial hypertension (Systolic BP >140). 10 (22%) patients were on anticoagulation medications.

Overall, 12 (27%) patients developed an early hydrocephalus and required an EVD. Among them, 7 patients suffered the late post-hemorrhagic hydrocephalus and underwent a VP shunt. More number of patients with NPM-SAH (40%) had an early hydrocephalus compared to the patients with PM-SAH (16%) [Table 1].

Good outcome was seen in 35 (83%) patients. Univariate analysis showed the poor outcomes in patients >60yrs, in patients with early hydrocephalus and patients with poor admission WFNS grade

Table 1: Patient characteristics

Variables	Non aneurysmal SAH	Peri-mesencephalic	Non peri-mesencephalic	P value
No of patients	44	24	20	
Age (Mean)	48.9±11.5	52±10.2	48±12.8	
Sex (Female)	16	10	6	
WFNS I-III	37(84%)	22 (91%)	15(75%)	0.21
Hypertension	19(43%)	11(42%)	8(44%)	0.76
Anticoagulation	10(22.7%)	06 (23%)	4(22%)	0.73
Favorable outcome	35(79.5 %)	22(91 %)	13(65 %)	0.057
Mortality	04 (9%)	02(7%)	02(11%)	1.0
Early hydrocephalus	12 (27%)	04(16%)	08(40 %)	0.1
Late hydrocephalus	07 (15%)	01(4%)	6(30 %)	0.03

Table 2: Analysis of effect of variables on the outcome of spontaneous SAH

Variables	*P*-value	95%C.I.
Age	0.18	0.4 – 93.2
WFNS I-III	0.01	0.9-202
Early hydrocephalus	0.04	2.2-561
Arterial hypertension	NS	NS
Female sex	NS	NS

(IV and V). But on multivariate analysis only early hydrocephalus and poor admission clinical status emerged as an independent factors for the poor outcomes [Table 2].

Discussion

Usual cause of spontaneous subarachnoid hemorrhage is rupture of intracranial aneurysm. In 15-20% of cases no angiographic abnormality could be identified. Compared to the aneurysmal bleed, non-aneurysmal bleed patients are clinically in good conditions at admission [1,2,6].

Causes of SAH could be severe hypertension [7], coagulation abnormalities including the consumption of antiplatelet/anticoagulation agents [8], spinal vascular lesions [9] or ruptured aneurysm not visualized on angiography due to the variours reasons. But the probability of identifying the reasons is very less.

Many studies shows [10,11] that clinical conditions of the patients with non-aneurysmal SAH are usually better compared to the patients with SAH due to the aneurysmal rupture. Our study also confirms that fact, as 37 (84)% of patients had a good WFNS grade (I-III) on admission. Although the more number patients with perimesencephalic bleed (91%) had a good clinical status compared to the patients with non- perimesencephalic bleed (75%), but that was not statistically significant (p= 0.21).

Rate of false negative DSA could be as high as 46% according to one study [12]; so it is mandatory perform repeat angiography in all angio-negative SAH patients especially when it is NPM-SAH [13,14].

In our study, intracranial aneurysms were identified in 3 patients (6%) on the repeat DSA done at 2 months follow up. This is comparable to the other studies where the rate is varies from 7-18% [17-17]. Most devastating complication is the rebleeding; we have to try our best to prevent it. In this present study repeat angiography done at 2 months follow up and spinal angiography in all patients to rule out the spinal vascular lesions. So, re-bleeding found in only one patient (Poorly controlled hypertension).

Hydrocephalus

Occurrence of hydrocephalus was 27% in this study which is comparable to the study done by the Konczalla J et al. [15] where 30% of patients had hydrocephalus. This quite high compared to the other studies (5-25%) [2,6]. But the requirement of VP shunt (15%) was similar to the other studies (3-13%). And this study also shows that shunt dependency is significantly higher in patients with NPM-SAH (p= 0.03). Higher risk of hydrocepahalus and poor out come in NPM-SAH was observed by a study done by Dalyai et al.[17].

Male predominace has been obsereved in our study like certain other studies [3].

But there are lots of variability in this finding as certain studies shows female predomince [18] and others shows none [19]. But no influence of sex was found over the outcome.

Outcome

Outcome of the patient with Non-aneurysmal SAH is better compared to the patient aneurysmal SAH although the exact cause and the pathophysiology is not very known [20,21].

In present study better outcome was seen in good number of patients (79.5%) especially in patients with PM-SAH group (91%) and even delayed cerebral ischemia was less in PM-SAH patients when compared to the patients NPM-SAH. This could be the cause for the better outcomes in the patients with PM-SAH. Similar type of outcomes has been described by the certain other authors [10,22].

Although the chances of vasospasm is less in non-aneurysmal SAH, in this study 11% of vasospasm was found. Severe vasospasm which required a endovascular intervention have been reported by certain studies. [13,23].

In a Study done by Konczalla J et al.,[15] poor admission status was the independent predictor for the poor outcome in the patients with non-aneurysmal SAH. ($p < 0.0001$, OR = 13.2, 95% CI = 4–40). In the present study, after the multivariate analysis, poor clinical status at admission (WFNS IV-V) emerged as a independent predictors for the poor outcomes (Table 2).

Conclusions

Early onset hydrocephalus and poor admission WFNS grade are the independent predictor of poor outcomes. Permanent shunt dependency is significantly higher in patients with NPM-SAH. Patients with a NPM-SAH special attention as they have relatively poor neurological course compared to the patients with PM-SAH.

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