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STUDY ON THE FUNCTIONAL OUTCOME OF SURGERY IN PATIENTS WITH RUPTURED INTRACRANIAL ANEURYSM

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ABSTRACT **BACKGROUND:** Intracranial aneurysms are usually asymptomatic and if they do rupture it often presents with subarachnoid hemorrhage (SAH) or associated with intraparenchmal/ intraventricular hemorrhage in a few patients. This can be problematic and affect the life of these patients in variety of ways for a prolonged period of time that requires support with proper treatment and regular follow up. **METHODS:** A retrospective-prospective clinical study of 30 patients was conducted on patients with ruptured intracranial aneurysm who underwent surgery in Department of Neurosurgery, Govt. TD Medical College, Alappuzha, Kerala. Patients were then evaluated with modified Rankin scale and Functional Independence measurement scale at subsequent follow up visits (3 and 6 months) to assess the functional outcome of surgery. **RESULTS:** Patients with better Fischer's grade at presentation and with absence of pre operative hydrocephalus, intra parenchymal/ intra ventricular hemorrhage, intra operative aneurysm rupture, onset of post operative vasospasm or infarct or CSF diversion or re exploration had better outcomes. The mean mRs and mean FIM score obtained pre operatively showed improvement at 3 and 6 months follow up. **CONCLUSION:** Surgical intervention in ruptured intracranial aneurysms did yield an optimal functional outcome.

KEYWORDS : : Intracranial aneurysms, subarachnoid hemorrhage, follow up.

INTRODUCTION

Intracranial aneurysm is a common neurosurgical presentation. The prevalence rate of various retrospective and prospective autopsy studies were 0.4% and 0.3% respectively while that of angiographic studies were 3.7% and 6.0% respectively[1]. One of the most common presentation of intracranial aneurysm is subarachnoid hemorrhage (SAH)[2] and if not intervened at the right time it can have a fatal outcome[3]. Most of them are asymptomatic until the aneurysm ruptures, with only 10% prior to rupture, with symptoms of mass effect[4]. About 90% of the intracranial aneurysms are saccular while the rest being fusiform, dissecting or mycotic types. The diffuse SAH that is often seen after rupture of an aneurysm can lead to toxic damage of the brain, along with subsequent vasospasm and ischemia leading to local damage. As a result, most of these patients have some degree of cognitive or psychological deficits if not treated properly[6-9]. To ideally provide the best care to these patients it is necessary to study the various pre, intra and post operative factors that influence the surgical treatment of intracranial aneurysms.

OBJECTIVES: To assess the outcome of surgery in patients presenting with ruptured intracranial aneurysm.

METHODOLOGY: This study was undertaken in patients admitted and diagnosed with ruptured intracranial aneurysm in neurosurgical wards of Govt. TD Medical College Hospital, Alappuzha, Kerala.

TYPE OFSTUDY: Retrospective and Prospective

NO. OF PATIENTS: 30

INCLUSION CRITERIA:

- All patients with various manifestations, complications and investigations diagnosed to have ruptured intracranial aneurysm warranting surgical intervention.
- Patients of all age group and both sexes will be included in this study.

EXCLUSION CRITERIA:

- Patients not willing to undergo investigations and refusing surgical line of management.

Preoperatively all selected patients were evaluated with time since bleed and GCS score along with modified Rankin scale (mRs) and Functional Independence Measurement (FIM) scale. Patients were also investigated with imaging to look for associated intra parenchymal/ ventricular hemorrhage, presence of preoperative hydrocephalus, Fischer's grade, location & size of aneurysm. A written informed consent was obtained from these patients and then planned for surgical intervention. The intra operative factors that were evaluated are the method used for securing the aneurysm (clipping, wrapping, clipping + wrapping), intra operative aneurysm rupture and need for temporary clipping. Postoperatively the parameters that were evaluated are vasospasm, early and late infarct, need for CSF diversion or re-exploration or decompression and duration of ventilator support and ICU stay. At discharge motor and sensory deficit if any were assessed. Patients were then again evaluated with modified Rankin scale (mRs) and Functional Independence measurement (FIM) scale at subsequent follow up visits at 3 and 6 months.

The majority of cases were found to be in the age group of 50 years to 60 years (43.3%) with total male to female ratio of 0.5: 1.

The commonest symptom with which the patients sought advice was headache alone that was seen in 20 patients (66.7%), followed by headache with vomiting seen in 4 patients (13.3%), followed by headache with loss of consciousness in 2 cases (6.7%). Headache with either seizures or weakness, were 1 case (3.3%) each respectively. Also seizures alone in 1 case (3.3%) and weakness alone in 1 case (3.3%).

Patients had history of smoking tobacco alone in 2 cases (6.7%), alcohol consumption alone in 1 case (3.3%) and smoking & alcohol consumption in 8 cases (26.7%).

It was found that 5 patients (16.7%) were operated at < 7 days and 13 patients (43.3%) were operated at 7 to 14 days and 12 patients (40%) were operated after 14days since the bleed.

The GCS at presentation was recorded and was seen that the initial GCS of 14 in 14 patients (46.7%) followed by GCS of 13 in 10 patients (33.3%). In 3 patients (10%) the GCS was 12 and in 2 patients (6.7%) the GCS was 15 and only in 1 patient (3.3%) the GCS was 11 at the initial presentation.

The Fischer's scale at presentation was 1 in 2 patients (6.7%).The maximum number of patients belonged to grade 3, a total of 19 patients

(63.3%) followed by grade 2 in 5 patients (16.7%) and grade 4 in 4 patients (13.3%).

Total of 25 patients (83.3%) harbored aneurysm of size 4 to 6mm. 3 patients (10%) had aneurysm of size <3mm and the remaining 2 patients had size >7mm.

In this study, 9 patients (30%) harbored aneurysm at M1 segment of middle cerebral artery (MCA) and 2 patients (6.7%) at M2 segment (MCA). 8 patients (26.7%) had aneurysm arising from anterior communicating artery (Acom) and 2 patients (6.7%) each from junction of anterior cerebral artery with anterior communicating artery (ACA-Acom) and A2 segment of anterior communicating artery (Azygous type) respectively. 6 patients (20%) had aneurysm arising from internal carotid artery (ICA) and 1 patient (3.3%) from basilar artery.

Pre operative intra parenchymal bleed was seen only in 1 patient (3.3%) while 3 patients had associated intra ventricular bleed.

Intra operatively 23 patients (76.7%) underwent clipping alone and the remaining 7 patients (23.3%) underwent clipping with muscle wrapping technique.

The relationship between Fisher's grade and postoperative events are represented in the graph below (Fig 1).

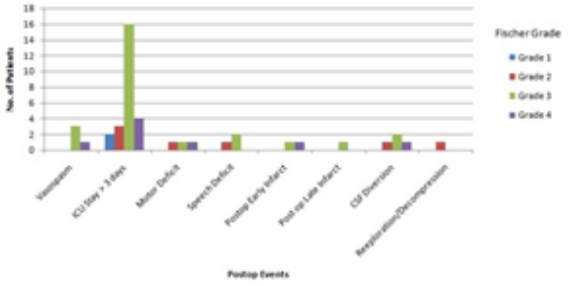

Fig 1 – Graph showing Fischer's grade and postoperative events

It can be seen that among the patients with higher Fischer's grade (Grade 3 and 4) the occurrence of postoperative vasospasm was seen in 17.3%, need for increased ICU stay in 86.9%, postoperative speech and motor deficit in 8.6% each and early infarct (<7 days post operative) in 8.6% and late infarct (>7 days post operative) in 4.3%, need for CSF diversion in 13%. Re exploration/ decompression was however performed in 1 patient with Fischer's grade 2.

The mean mRs score at admission was 3.5 (moderate disability) and that on follow up at 3 months was 1.1 (mild symptoms) and that on 6 months was 0.5 (no symptoms) as shown in the table and graph below (Fig. 2A and 2B), implying that there was significant improvement in the outcome of surgery.

	Mean mRs	Std deviation	Std error of mean	95% CI of difference		t	df	Significance (2 tailed)
				Lower	Upper			
mRs at admission & 3 mts follow up	2.433	0.935	0.171	2.084	2.783	14.2	29	0
mRs at admission & 6 mts follow up	2.967	0.964	0.176	2.607	3.327	16.8	29	0

Fig 2A – Table showing mean mRs score at admission and at follow up and its significance

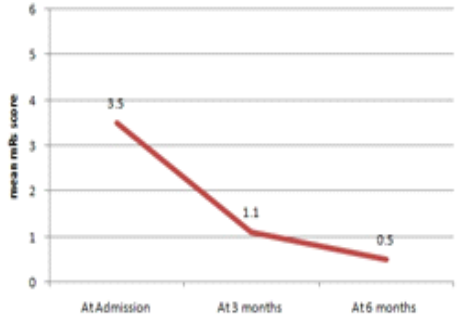

Fig 2B – Graph showing mean mRs score at admission and at follow up

The mean motor FIM score (normal score – 91) at admission was 56.4, on follow up at 3 and 6 months was 81.4 and 83.1respectively and the mean cognitive FIM score (normal score – 35) at admission was 28.1, on follow up at 3 and 6 months was 32.3 and 32.9 respectively. The mean total FIM score (normal score – 126) at admission was 84.5 and that on follow up at 3 months was 113.6 and that on 6 months was 116, as shown in the graph (Fig 3), implying improvement in motor and cognitive function of patients following surgery.

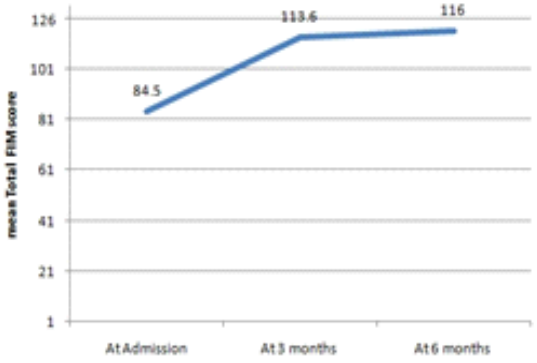

Fig 3 – Graph showing mean Total FIM score at admission and at follow up

DISCUSSION:

Ruptured aneurysms are frequently diagnosed in elderly patients, mostly older than 70 years[10]. In them, the clinical presentation is more severe, but vasospasm and re bleeding rates are the same as in younger patients[10]. In our study the majority of patients with ruptured aneurysm were in the age group between 50 to 70yrs.

A study by Gail et al.[11] showed that subarachnoid hemorrhage in females were mostly elderly and harbored more aneurysms, however the 3-month outcome of ruptured aneurysms in females and males were same. In our study also women suffering from subarachnoid hemorrhage were older and harbored more aneurysm.

Aneurysm size less than 10 mm has greater incidence of subarachnoid hemorrhage[12]. In our study, thick subarachnoid hemorrhage was seen with 77% (n=21) of patients with small aneurysm (<6mm).

In Danish Aneurysm Study, patients with aneurysm size 10mm or less had attained normal daily functional activity in terms of resuming their previous occupation, and also had attained normal mental outcome compared to patients with aneurysm size measuring 11mm to 24mm.

A study by Browers et al.[14] showed that the volume of subarachnoid hemorrhage on the initial computed tomogram had independent predictive power for the onset of delayed cerebral ischemia.

Time from admission to surgery is still a controversy in ruptured aneurysm. The International Cooperative Study on the Timing of Aneurysm Surgery[16] reported that overall outcome in patients planned for surgery in days 0-3 was equivalent in terms of mortality to patients planned for days 11-32, however earlier the intervention, the better the recovery (70.9% versus 61.7%). The current practice suggests treatment of favorable grade aneurysms within the first 24 – 48 hours of rupture. The poor grade patients (WFNS Grade IV and some grade V) are managed in ICU till the grade/ patient condition improves.

The consequences of acute hydrocephalus in patients with subarachnoid hemorrhage and outcome after shunting was studied by Jan Van et al. [17] and found no significant benefit of shunting and also said that shunted patients were actually in a worse condition than non operated patients and with worse outcome.

Rosengart et al.[15] reported unfavorable outcome in patients with more subarachnoid hemorrhage on admission computed tomography and intra parenchymal/ ventricular hemorrhage.

Batjer et al.[18-19] found an increased mortality rate after intra operative aneurysm rupture and also worsened outcome in survivors after intra operative rupture. However, Sandalcioglu et al.[24] study found that intra operative aneurysm rupture had no impact on the outcome. In our study, 3 patients had intra operative rupture and among them 1 patient

had speech deficit alone while 1 patient had speech and motor deficit and the remaining 1 patient had no deficits.

In a study by Woertgen et al.[20], post operative computed tomogram showed an ischemic lesion in 29% of patients and in 58% of these patients, temporary occlusion was performed (versus 47% without temporary occlusion, p = 0.09). The mean occlusion time was longer in patients with infarction. In our study, post operative infarct was seen in 10% patients (n=3) and of these 3 patients temporary occlusion was performed only in 1 patient (33%) versus 2 patients where temporary occlusion was not performed (66.6%) which was statistically not significant (p > 0.05) probably as temporary occlusion time was of short duration, 3-4 minutes approximately.

Ogawa et al.[21] reported that clipping was performed safely in saccular type aneurysms and clipping on wrapping was safe with blister-type aneurysms. Also internal carotid artery (ICA) trapping, clipping and wrapping were associated with much worse results.

A study by Ana Rodriguez et al.[22] showed worse outcomes in patients with aneurysm rupture, poor grade, giant size and need for decompressive hemicraniectomy.

Rinne Jakko et al.[23] studied the anatomical and clinical factors with management outcomes and found poor outcomes in MCA aneurysms than other anterior circulation aneurysms, 32% and 25% respectively.

However, a study by Bornstein et al.[25] showed poor outcome in patients with anterior communicating artery aneurysms. Also in our study we found poorer outcomes with anterior communicating artery aneurysms (50%) when compared to other anterior circulation aneurysms (11.1%) and was statistically significant (p value = 0.03).

A study at Shifa International Hospital, Islamabad found that optimal functional outcome was achieved despite having cognitive and psychological deficits when surgical clipping of cerebral aneurysms was performed[26].

In the past, Glasgow Outcome Scale (GOS) was used to assess the motor outcome in these patients, but no longer used now[26-28]. In our study we used modified Rankin scale (mRs) and Functional Independence Measure (FIM) for assessing the outcome.

CONCLUSION:

In neurosurgical practice ruptured intracranial aneurysm is a common presentation and there is no definite method to foresee the onset of deficits accurately and likewise the time interval between onset of subarachnoid hemorrhage and surgery with postoperative outcome cannot be accurately predicted.

Those patients with better Fischer's grade, Hunt & Hess grade, WFNS grade and absence of pre operative hydrocephalus or intra parenchymal/ ventricular hemorrhage and absence of intra operative aneurysm rupture, prolonged temporary occlusion time, post operative vasospasm, infarct, need for CSF diversion or re exploration had better outcomes.

To conclude in our study the mean mRs and mean FIM scores showed improvement on follow up at 3 months and 6 months when compared to the pre operative mean scores thus implying that surgical intervention for intracranial aneurysm does significantly improve the functional outcome.

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