Association Between WFNS Grade at Admission & Glassgow Outcome Score after Surgical Clipping in Ruptured Cerebral Aneurysms

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Abstract- INTRODUCTION: Intracranial aneurysms are localized dilatations of the arteries in the brain due to weakness of the arterial wall, can lead to serious morbidity and mortality after rupture. Subarachnoid hemorrhage(SAH) usually occurs with rupture and is associated with a high rate of morbidity and mortality. The current study is an institution based study in an attempt to understand the outcome of surgical clipping and its association with WFNS grade at admission in light of established facts and principles in standard literature in a selected group of patient population.

AIM OF THE STUDY: To study the association between WFNS grade at admission and Glassgow outcome score after surgical clipping in patients with ruptured intracranial aneurysm at our centre.

METHODS: This is a prospective non randomized observational study carried over a period of 2 years and 5 months. All diagnosed cases of ruptured cerebral aneurysm admitted to our institute during the study period and treated by surgical clipping were included in the study. Patients undergoing open surgery were compared in terms of clinical condition before treatment using World Federation of Neurosurgical Societies (WFNS) score and clinical outcome was assessed using the Glassgow outcome scale (GOS).

RESULTS: Out of 76 patients who were admitted with the complaints of SAH, 35 patients i.e. half of the study subjects had WFNS grade II. 23 patients with SAH had WFNS Grade III. 35.5% of study subjects had Glassgow outcome score of IV.18.4% of patients in surgical group had Glassgow outcome score of V followed by 15.8% of subjects with a score of III. Mortality rate in surgical group was 28.9% (Glassgow outcome score of I)

CONCLUSION: There is a highly significant association between WFNS grades at presentation and post operative Glassgow outcome score. Patients with good WFNS grades at presentation had good Glassgow outcome scores.

I. Introduction

Intracranial aneurysms are localized dilatations or ballooning of the arteries in the brain due to weakness of the arterial wall, can lead to serious morbidity and mortality after rupture. Subarachnoid hemorrhage (SAH) usually occurs with rupture and is associated with a high rate of morbidity and mortality.[1,2,3] Aneurysmal subarachnoid hemorrhage is a disastrous and fatal medical emergency requiring immediate intervention as approximately 12% of patients die before receiving medical supports, 33% within 48 h and 50% within 30 days of a SAH and 50% of survivors suffer from permanent disability and dependency[2].

Our institute being a prominent tertiary care neurosurgical centre in eastern India receives a substantial proportion of patients with ruptured intracranial aneurysms. With state of the art DSA facility, the understanding of the disease has improved. The current study is an institution based study in an attempt to understand the outcome of surgical clipping and its association with WFNS grade at admission in light of established facts and principles in standard literature in a selected group of patient population.

II. AIM OF THE STUDY:

To study the association between WFNS grade at admission and Glassgow outcome score after surgical clipping in patients with ruptured intracranial aneurysm at our centre.

III. METHODS:

After obtaining clearance from the ethical committee of the institute, this study was carried out in Department of Neurosurgery, Bangur Institute of Neurosciences & SSKM Hospital, IPGME & R, Kolkata from 10th August 2016 to 20th January 2019. It is a hospital based non randomized prospective observational study. All diagnosed cases of ruptured cerebral aneurysm admitted to our institute during the study period and treated by surgical clipping were included in the study. The study protocol was explained to the patient/guardian and a written informed consent was obtained from each subject to be enrolled in the study.

Inclusion Criteria

Patients presenting with subarachnoid hemorrhage due to ruptured intracranial aneurysms diagnosed by CT angiography / MR angiography / DSA :

a. WFNS grade IV or better
b. No other contraindications for surgery such as coagulopathy, severe heart disease etc.

Exclusion Criteria

- Individuals not willing to participate in the study.
- Patients presenting with SAH which is found subsequently to be of non aneurysmal origin after proper radiological evaluation.
- Patients with poor neurological status (WFNS grade V) in whom definitive investigation to establish presence of cerebral aneurysm could not be done.

Study Tools:

Patients undergoing open surgery were compared in terms of clinical condition before treatment using World Federation of Neurosurgical Societies (WFNS) score and clinical outcome was assessed using the Glassgow outcome scale (GOS).

- **The World Federation of Neurosurgeons (WFNS) classification:**

GRADE	GCS	FOCAL NEUROLOGICAL DEFICIT
1	15	ABSENT
2	13-14	ABSENT
3	13-14	PRESENT
4	7-12	PRESENT OR ABSENT
5	<7	PRESENT OR ABSENT

- **Glasgow outcome scale (GOS)**

Grade	Brief description	Full description
5	Good	Recovery Full, independent life, no or minimal neurological deficit
4	Moderately disabled	Moderately disabled, neurological deficit or intellectual impairment, but independent life
3	Severely disabled	Conscious, but totally dependent on others
2	Vegetative	Vegetative survival
1	Dead	Dead

Study Techniques:

This is an observational study among the members of the study population. Results were explained in the form of percentage and by extrapolating and comparing it with standard literature. Patients were examined clinically, radiologically and operated by surgical clipping. Outcomes were assessed using the Glasgow outcome scale (GOS).

Data thus generated was analyzed with the help of Microsoft excel 2007 and SPSS version 22nd software. Appropriate tables and graphs were generated. Chi-square test and other appropriate statistics as applicable was incorporated in the study for statistical inferences.

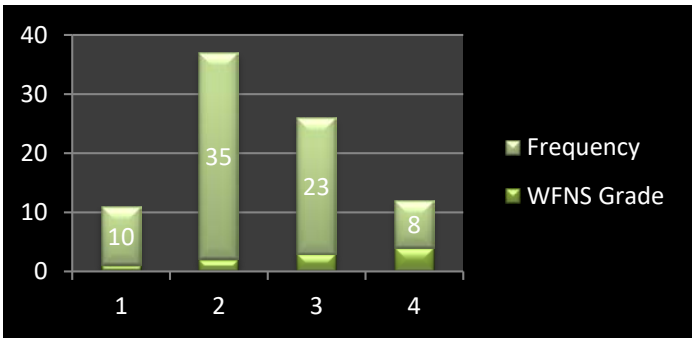
IV. RESULTS:

This is a prospective non randomized observational study from a tertiary care neurosurgical centre carried out on patients with diagnosis of ruptured intracranial aneurysms. Over a study period of two years & 5 months, 76 cases of diagnosed ruptured intracranial aneurysms were admitted for definitive management in the form of surgical clipping, all of them were included in study. Baseline data regarding age, sex and clinical presentation of the subjects was collected. Location and size of the ruptured aneurysm was also noted. 38.2% of study subjects belonged to age group 41-50 years followed by 27.6% of subjects in age group 51-60 years. 72.4% of study subjects were female. Only 21 patients (27.6%) were male

Aneurysmal SAH was the most common presentation. Acom artery was the commonest site for ruptured aneurysm in the present study accounting for 46% of the study subjects.. Majority of single ruptured aneurysms belonged to less than or equal to 10 mm in size.

TABLE 1: WFNS Score of study subjects in Surgical Group

WFNS Grade	Frequency	Percentage
1	10	13.2
2	35	46.1
3	23	30.3
4	8	10.5



Out of 76 patients who were admitted with the complaints of SAH, 35 patients i.e. half of the study subjects had WFNS grade II. 23 patients with SAH had WFNS Grade III.

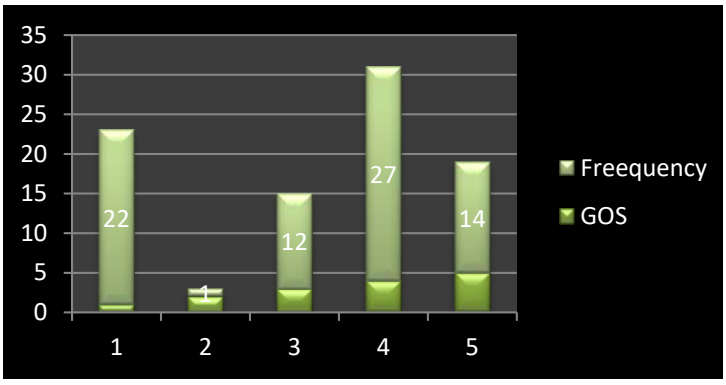
TABLE 2: WFNS Grading of Subjects with Different Location of Intracranial Aneurysm

Location	WFNS Grading of subjects with SAH				
	I	II	III	IV	V
ACOM	9	25	2	5	0
A1 Segment of ACA	0	1	0	1	0
DACA	0	3	4	0	0
ICA	0	2	4	0	0
ParaPCOM	0	2	1	1	0
M1 Segment of MCA	0	1	1	1	0
MCA Bifurcation	1	1	5	0	0
M2 Segment of MCA	0	1	3	0	0
PCOM	0	0	1	0	0
Multiple Aneurysms	0	0	2	0	0
Total	10	35	23	8	76

Out of 76 patients who were admitted with the complaints of SAH, 35 patients i.e. half of the study subjects had WFNS grade II. Out of these 35 patients 25 had location of the aneurysm in Anterior communicating artery. Out of 10 subjects with WFNS grade I, nine had location of the aneurysm in Anterior communicating artery. 23 patients with SAH had WFNS Grade III.

TABLE 3: Glassgow Outcome Score of study subjects in Surgical Group

GOS	Frequency	Percentage
1	22	28.9
2	1	1.3
3	12	15.8
4	27	35.5
5	14	18.4



35.5% of study subjects had Glassgow outcome score of IV.18.4% of patients in surgical group had Glassgow outcome score of V followed by 15.8% of subjects with a score of III. Mortality rate in surgical group was 28.9% (Glassgow outcome score of I)

TABLE 4: WFNS Grades and Glassgow outcome score of study subjects.

WFNS	Glassgow outcome score					Test of significance
	I	II	III	IV	V	
I	0	0	0	4	6	χ^2-43.038
II	9	1	5	13	7	df-16
III	5	0	7	10	1	p value-.000
IV	8	0	0	0	0	
Total	22	1	12	27	14	

There is a highly significant association between WFNS grades at presentation and post operative Glassgow outcome score. Patients with good grades at presentation had good outcome scores.

V. DISCUSSION

There is abundance of literature regarding various aspects of epidemiology, clinical presentation, pathophysiology as well as management of these lesions from various parts of the world. Contrary to earlier assumptions, intracranial aneurysms are quite prevalent in the Indian population as evident from the work of Sambasivan et al[4] from Trivandrum and Tandon et al in the ICMR collaborative study.[5] India being such a vast and diverse country comprehensive population based studies are however very few and far in-between.

The present study reflects on a section of population mostly from the eastern part of the country where similar studies focusing on intracranial aneurysms are hard to find. Our institute being a prominent tertiary care neurosurgical centre in eastern India receives a substantial proportion of patients with intracranial aneurysms. The present study has shown light on various aspects of this subset of population with ruptured intracranial aneurysms and also brought to light many limitations and difficulties which are unique to this study.

In the present study, 38.2% of study subjects belonged to age group 41-50 years followed by 27.6% of subjects in age group

51-60 years. Weir et al.[6] described Mean age in patients with ruptured aneurysms as 46 years. Sodhi et al[7] in their series found mean age of 51.3 (±13.5) years in their patients from Chandigarh. 72.4% of study subjects were female. Only 21 patients out of 76 (27.6%) treated by surgical method were male .The female suffers 1.78 times more than the male in SAH as evident from a population based study from Kashmir in India[8]. However another Indian study[7] from Chandigarh in north India has shown the male: Female ratio was nearly equal.

WFNS grades on admission have been recognized as independent factors influencing outcome of management. Patients presenting with SAH (Total 76) were categorized in accordance with WFNS grade on admission. Out of 76 patients who were admitted with the complaints of SAH, 35 patients i.e. half of the study subjects had WFNS grade II. Out of these 35 patients 25 had location of the aneurysm in Anterior communicating artery. 23 patients with SAH had WFNS Grade III. Sodhi et al[7] in their series of north Indian population found an overall mortality in the surgical clipping group at discharge was 21.2%. Mortality in patients with WFNS grade I and II SAH was 14.2 and 16.2%, respectively. Their series of surgical intervention had WFNS grade at presentation (%) as Grade I in 53.9%; grade II in 22.1; III in 9.4; IV in 14.5 % no patient had grade V presentation.

35.5% of study subjects had Glassgow outcome score of IV. 18.4% of patients in surgical group had Glassgow outcome score of V followed by 15.8% of subjects with a score of III. Mortality rate in surgical group was 28.9% (Glassgow outcome score of I). A significant association has been observed between WFNS grades at presentation and Post operative Glasssgow outcome score. In a similar study conducted over a period of 5 years, good outcome (Glasgow Outcome Scale V and IV) was seen in 57.19 of the patients, 14.3% had a poor outcome, and 28.6% died. The cause of death in most patients was found to be a poor clinical grade, postoperative infarct, or presence of multiple aneurysms.[10] Sodhi et al [7] found 63.6% of the patients at the end of three months follow up had a favorable outcome in the form of GOS 5 and 4. They also found that WFNS grades at admission of I and II had favorable outcome at discharge and 3 months follow up.

VI. CONCLUSION

53.2% of patients undergoing surgery had a favorable outcome in the form of Glasgow Outcome Score of 5 and 4. Majority of patients with SAH presented in WFNS grade I and II. There is a highly significant association between WFNS grades at presentation and post operative Glassgow outcome score. Patients with good WFNS grades at presentation had good Glassgow outcome scores.

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ABBREVIATIONS

ACOM	ANTERIOR COMMUNICATING ARTERY
ACA	ANTERIOR CEREBRAL ARTERY
A1	ANTERIOR CEREBRAL ARTERY SEGMENT 1
CT	COMPUTED TOMOGRAPHY
MRI	MAGNETIC RESONANCE IMAGING
DACA	DISTAL ANTERIOR CEREBRAL ARTERY
DSA	DIGITAL SUBSTRACTION ANGIOGRAPHY
GOS	GLASGOW OUTCOME SCORE
ICA	INTERNAL CAROTID ARTERY
MCA	MIDDLE CEREBRAL ARTERY
MCA	MIDDLE CEREBRAL ARTERY
MRI	MAGNETIC RESONANCE IMAGING
PCOM	POSTERIOR COMMUNICATING ARTERY
SAH	SUBARACHNOID HEMORRHAGE
WFNS	WORLD FEDERATION OF NEUROSURGEONS