

Correlation of revised fisher scale with clinical grading (WFNS) in patients with non-traumatic subarachnoid haemorrhage

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Abstract

Aneurysmal Subarachnoid hemorrhage (aSAH) is the collection of blood in subarachnoid spaces, caused by ruptured intracranial aneurysm. It presents with a wide range of clinical symptoms and final outcomes. The patient factors, pathology involved, the time and treatment rendered all affects the final outcome of the patient. The final outcome of aSAH can be predicted at the time of admission. Factors used to predict the outcome are neurological grade on admission (World Federation of Neurosurgeons (WFNS) grading), amount of blood on early computed tomography (CT) (revised Fisher Scale- RFS), angiographic vasospasm and re-bleeding. Other factors such as age, sex, pre-existing medical diseases, aneurysm size and location; however there is inconclusive evidence of their effect on the outcome. The purpose of our study was to evaluate the role of RFS in predicting the final clinical outcome and assess the correlation of RFS with WFNS scale at the time of presentation and at discharge. A total of 55 patients were analyzed retrospectively. Their medical history and neurological assessment, according to WFNS grading at the time of admission and discharge were recorded. The radiological findings seen on CT brain and angiography (particularly the amount of SAH, the number, size, and location of the aneurysm) were recorded. The amount of SAH (RFS) and WFNS grade at admission and discharge were correlated with the outcome using Fishers exact test. Unfavourable outcome was associated with increasing age, worsening neurological grade, more SAH on admission CT, intracerebral or intraventricular hemorrhage. In our study there is significant correlation ($P= 0.001$) was noted between WFNS grade and RFS at the time of admission and at the time of discharge from the hospital. Out of 55 patients, 43 patients (78.1%) had good outcome and 12 patients (21.8%) had unsatisfactory outcome, 7 of them died (13%).

Keywords: Aneurysmal SAH, intracranial aneurysm, Revised Fisher scale, WFNS grading.

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INTRODUCTION

There are large numbers of studies done to develop CT scales for clinical grading of patients with aSAH to assess the severity of initial neurological injury, to provide prognostic information regarding outcome, to guide treatment decisions, and to standardize patient assessment across medical centers. Based on the pattern of blood

visualized on initial CT scanning the scale assigns a grade. The Fisher Scale was initially designed to predict cerebral vasospasm, however a good correlation in predicting the clinical outcome has been reported.^{1,5} It presents with a wide range of clinical symptoms and final outcomes. The patient factors, pathology involved, the time and treatment rendered, all affects the final clinical outcome of the patient.¹ Aneurysm repair is the only effective treatment to prevent re-bleeds. Surgery has been the mainstay of therapy for intracranial aneurysms, however, endovascular techniques are becoming more widely used.²⁻¹⁰ The final outcome of aSAH can be easily predicted at the time of admission. Factors that are used to predict the outcome in patients with aSAH are neurological grade on admission (World Federation of Neurosurgeons (WFNS) grading), amount of blood on early computed tomography (CT) (revised Fisher Scale), angiographic vasospasm and re-bleeding. Other factors such as age, sex, pre-existing medical diseases, aneurysm

size and location may be assessed; however there is inconclusive evidence of their effect on the outcome.²⁻¹⁰

AIMS

The purpose of this study is to determine the risk factors that affect the outcome of patients with aneurysmal subarachnoid haemorrhage (aSAH). To evaluate the role of revised Fisher CT Scale in predicting the final clinical outcome and to assess the correlation of revised Fisher scale with WFNS scale at the time of presentation and at the time of discharge from the hospital.

Settings and design

Retrospective sampling technique will be used to select cases with history of SAH which were referred for to the Department of Radio diagnosis; Father Muller Medical College for non-enhanced CT and CT angiography of brain (GE bright speed 16 slice), over a period of 3 years from Jan 2011 to Jan 2014. Images will be evaluated for presence of SAH and grading, presence of aneurysm and its characters and then correlated with clinical grading of the patient at the time of admission and at discharge.

METHODS AND MATERIAL

All scans were done using GE Bright speed 16 –slice MDCT with 120 KVp and 300 mAs with 5mm slice thickness, 0.8 second gantry rotation. Scanning protocol consisted of unenhanced and CT angiography of brain. Scanning protocol consisted of unenhanced and contrast enhanced scans. 90-100 ml of 350mg/ml non ionic iodinated contrast was injected using automated injector at the rate of 3-4ml/second. Bolus tracking method was

used. Images were retro reconstructed with 0.625 mm slice thickness. The initial axial images and the processed images using 2D multiplanar reconstructions, 3D maximum intensity projection and volume-rendered techniques were used for assessment.

STATISTICAL ANALYSIS

Collected data will be analyzed by frequency, percentage and Fishers exact test for the possibility of an association between revised Fisher scale with WFNS scale at the time of admission and at discharge.

RESULTS

A total of 55 patients were evaluated. The mean age was 52 years (28-82 years), 24(44%) were males and 31(56%) were females. Clinical grading was done using the World Federation of Neurosurgeons (WFNS) grading system at the time of admission. Sixty percent (33) of patient categorized as grade 1, 20% (11) grade 4, 14% (8) grade 2, 3%² grade 3 and 2%¹ grade 5. Radiological evaluation of done with non-enhanced CT at time of admission, followed by brain angiography. According to modified Fisher scale 13%⁷ patient were categorized into grade 0, 44% (24) grade 1, 5%³ grade 2, 24% (13) grade 3, 14%⁸ grade 4. Highly significant correlations (Fisher exact test p=0.001) of each grade of WFNS with modified Fisher scale at the time of admission to our hospital and at discharge are obtained and are summarized in table 2 and 3 respectively. Twenty-eight (51%) patients were managed conservatively and 27(49%) underwent aneurismal clipping.

Table 1: Age of Patients

Age (yrs)	Frequency	Percent
40 and below	8	14.5
41-50	10	18.2
51-60	23	41.8
Above 60	14	25.5
Total	55	100

Table 2: Correlation between each grade of mod fisher and WFNS system at the time of admission

	Mod. Fisher grade at admission	Admission neurological grade (GCS and WFNS)					Total
		1	2	3	4	5	
0	5 71.4%	0 0%	1 14.2%	1 14.2%	0 0%	7	
1	18 75.0%	5 20.8%	0 0%	1 4.2%	0 0%	24	
2	1 33.3%	2 66.7%	0 0%	0 0%	0 0%	3	
3	8 61.5%	0 0%	0 0%	4 30.8%	1 7.7%	13	
4	1 12.5%	1 12.5%	1 12.5%	5 62.5%	0 0%	8	
Total	33 60%	8 14.5%	2 3.6%	11 20.0%	1 1.8%	55	

Table 3: Correlation between each grade of MOD fisher and WFNS system at the time of admission discharge

		Admission neurological grade (GCS and WFNS)					Death	Lama	Total
		1	2	3	4	5			
Mod. Fisher grade at admission	0	0 0%	6 100%	0 0%	0 0%	0 0%	0 0%	0 0%	6
	1	1 0%	19 79.2%	0 0%	1 4.2%	0 0%	1 4.2%	3 12.5%	25
	2	0 0%	2 66.7%	0 0%	0 0%	0 0%	0 0%	1 33.3%	3
	3	2 15.4%	4 30.4%	0 0%	1 7.7%	0 0%	4 30.8%	2 15.4%	13
	4	0 0%	0 0%	1 12.5%	1 12.5%	1 12.5%	2 25.0%	3 37.5%	8
	Total	3 3.7%	31 57.4%	1 1.9%	3 5.6%	1 1.9%	7 5.6%	9 1.9%	55

Fishers exact test p= 0.001, HS

Table 4: World federation of Neurosurgeons (WFNS) grading system of subarachnoid haemorrhage

WFNS grade	Glasow coma score	Focal signs
I	15	-ve
II	13-14	-ve
III	13-14	+ve
IV	7-12	+/-ve
V	3-6	+/-ve

Table 5: Revised fisher scale

Fisher Revised Scale	
Grade 0	No SAH or IVH ¹
Grade 1	Minimal/thin SAH, no IVH in either lateral ventricle
Grade 2	Minimal /thin SAH, with IVH in both lateral ventricles
Grade 3	Dense SAH, *no IVH in either lateral ventricle
Grade 4	Dense SAH, *with IVH in both lateral ventricle

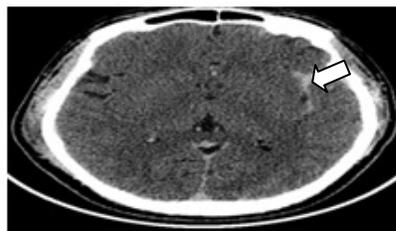


Figure 1: Axial plain CT shows grade 1 SAH in left sylvian fissure

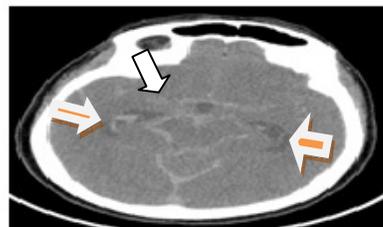


Figure 2: Grade 2 SAH- blood in perimesencephalic cistern (white arrow) and lateral ventricle(orange arrow)



Figure 3: Grade 3 SAH- Dense SAH in cisterns, without intraventricular component

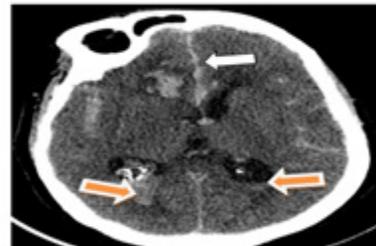


Figure 4: Grade 4 SAH: dense SAH (white arrow) with intraventricular component(orange arrow)



Figure 5: volume rendered image showing Acom aneurysm (arrow)



Figure 6: volume rendered image showing M1-M2 bilobed aneurysm (arrow)

DISCUSSION

The final outcome of the management of a ruptured cerebral aneurysm is far from easy to predict at the time of admission. Factors that are consistently associated with poor outcome in patients with aSAH are poor neurological grade on admission, amount of blood on early CT scan, angiographic vasospasm and re-bleeding. Other factors such as age, sex, pre-existing medical diseases, aneurysm size and location may be associated with poor outcome; however there is inconclusive evidence of their effect on the outcome. In our study, there was significant correlation ($P = 0.001$) between preoperative WFNS grade and the outcome; out of 55 patients with good WFNS grade, 43 patients (78.1%) had good outcome and 12 patients (21.8%) had unsatisfactory outcome, 10 of them died (18.1%). The presence of ICH, IVH with development of hydrocephalus associated with higher WFNS grade and these factors are known as bad prognostic factors and negatively affect the outcome of patients with SAH. David S. Rosen and R. Loch Macdonald¹ reviewed the literature for articles pertaining to the grading of patients presenting with aSAH, including publications on the Hunt and Hess Scale, Fisher Scale, Glasgow Coma Score (GCS), and World Federation of Neurological Surgeons Scale (WFNS) and the advantages and limitations of these scales as well as more recent proposals for other grading systems based on these scales with or without addition of other factors known to be prognostic for outcome after aSAH. R. Risselada *et al*², assessed which clinical and neuro-imaging characteristics, available on admission, will predict 60 day case fatality in aSAH, and concluded that WFNS grade was the most important predictor of case-fatality, followed by age, lumen size of the aneurysm and Fisher grade. Sherif Elwatidi³ showed that the amount of subarachnoid hemorrhage in CT scan, aneurysm size and progressive hydrocephalus were the most significant factors that affect the outcome. Axel J. *et al*⁴, concluded that most prognostic factors for outcome after SAH are present on admission and are not modifiable, a substantial contribution to outcome is made by factors developing after admission and which may be more easily influenced

by treatment. Arthur Maynart Pereira Oliveira *et al*⁵, concluded that level three of the FS and FRS seemed to be compatible with regard to predicting the likelihood of progression to severe vasospasm, thus affecting the final outcome of the patient. Limitations of our study was, we did not consider the patient's demographics, pre-existing medical illness, effects of management either surgical or medical. We did not follow up the cases for long term outcome of the disease.

CONCLUSION

Most prognostic factors for outcome after aSAH are present on admission and are not modifiable. The modified Fisher scale is a simple classification method that appears to have greater correlation with clinical grading. A substantial contribution to outcome is made by factors developing after admission and which may be more easily influenced by treatment.

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