The outcome after aneurysmal sub arachnoid hemorrhage: a study of various factors

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ABSTRACT

Background: Aneurysmal subarachnoid hemorrhage (A-SAH), despite improvement in surgical and medical treatments, is still a serious disease with high fatality and morbidity rates. Despite the huge advances in neurosurgical management of the disease, there has not been a proportional improvement in outcome of this condition.
Purpose: We studied various factors which can influence the final outcome and these included: World federation of neurosurgical societies (WFNS), Hunt & Hess (H&H) and Fisher grade, size of aneurysm, intra operative rupture (IOR), temporary clipping (TC) – and correlate their individual impact in final outcome.
Methods: We studied 100 patients of aneurysmal subarachnoid hemorrhage prospectively all of whom were operated upon .Post operative course was followed and final outcome studied.
Results: Pre operatively, higher WFNS and H&H grades had a worse outcome. This correlation was not found for Fisher grade. Nonetheless, presence of IVH(Fisher grade 4) acted as an independent risk factor for poor outcome.
Conclusion: Diabetes and smoking led to a worse outcome in contrast to hypertension . IOR led to poor outcome while temporary clipping did not.

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Introduction

Aneurysmal subarachnoid hemorrhage (a-SAH) is a neurosurgical disaster. Few conditions in neurosurgery consume so many resources, with such a relatively poor outcome, as a-SAH. A-SAH, despite improvement in surgical and medical treatments, is still a serious disease with high case fatality and morbidity rates.[1,2] Outcome following SAH has shown modest improvement during the past few decades but there still exists a vast lacuna in knowledge regarding factors which determine the severity of disease and hence its final outcome. It has been very often seen that two patients with similar profile regarding age, co morbidities and amount of bleed may ultimately behave differently with regard to clinical course and final outcome. How does this difference occur? There are still some unknown yet unidentified factors which control the disease process.

Despite the huge advances made in neurosurgical management of the disease, there has not been proportional improvement in outcome of this condition. Although more people are surviving, our ability to impact on the primary pathology has been minimal.

Our goal was to study the impact of – World federation of neurosurgical societies (WFNS), Hunt & Hess (H&H) and Fisher grade, size of aneurysm, intra operative rupture (IOR), temporary clipping (TC) on final outcome.

Methods

A prospective study was performed involving 100 patients (60 females and 40 males) who presented with aneurysmal SAH patients and were operated. Preoperative informed consent was taken from patients. Poor grade SAH patients not operated upon and in those in whom coiling was done were excluded. After clinical assessment (GCS, H&H grade & WFNS grade), patient was investigated. CT cerebral angiography was done using non-ionic contrast media (Iohexol). Conscious patients were taken up for surgery i.e. craniotomy and clipping of aneurysm. Those in poor grade continued to be resuscitated till they were conscious when they were taken up for surgery. Following surgery, the clinical course of patients in hospital was followed. Final outcome was calculated on the basis of Glasgow outcome score (GOS). This GOS was then compared with various pre operative variables/ factor viz. – WFNS, H&H, Fisher grades, co-morbidities, IOR and TC.

Results

In our series of 100 patients, the youngest was 23 year of age while the oldest was 85 year of age. The maximum number of patients were in the age group of 46–65.

The final outcome in our series of 100 patients was:

Table 1: Final outcome

GOS	No. of patients
5	44
4	23
3	14
2	2
1	17

Pre op grading and final outcome

WFNS and H&H Grade: Patients with initial good clinical *grade* had better outcome. This was seen both for WFNS grade and H&H grade.

Out of 78 patients in WFNS 1 & 2, 59 patients (75.64%) had favorable outcome while in WFNS grade 3 & 4, this percentage was only 36.66%. (Table 2)

H&H grade: Similar results were obtained with H&H grades. Out of 73 patients in good grade (H&H 1 & 2), 56 patients (76.71%) had good recovery while outcome was favorable in only 11 out of 27 (40.74%) poor grade H&H patients. (Table 3)

Fisher Grade: Fisher grade did not correlate well with final outcome. An increasing Fisher grade did not necessarily signify a bad outcome. (Table 4)

However, presence of IVH was an independent predictor of a poor outcome. We analyzed fisher grade 4 (presence of IVH/ICH) further into presence or absence of IVH. prognostic member for final outcome. Out of 22 patients with IVH only 10 patients (45.45%) made good recovery (GOS 4 & 5). In non IVH group (78 patients), 57 patients (73.07%) made good recovery. (Table 5) Thus presence of IVH (Fisher grade 4) was an independent risk factor for poor outcome.

Table 2: Initial WFNS and Outcome

Initial WFNS	No. of patients	Favourable GOS (GOS 4 & 5)	Poor GOS (GOS 1,2 & 3)
1	48	37 (77.08%)	11
11	30	22 (73.33%)	8
111	10	4 (40%)	6
1V	12	4 (33.33%)	8
Total	100	67	33

Table 3: Initial H&H Grade and Outcome

Initial H&H Grade	No. of patients	Favourable GOS (GOS 4 & 5)	Poor GOS (GOS 1,2 & 3)
1	25	20 (80%)	5
11	48	36 (75%)	12
111	15	7 (46.7%)	8
1V	12	4 (33.33%)	8
Total	100	67	33

Table 4: Fischer grade and outcome

Fisher Grade	No. of patients	Favourable GOS (GOS 4 & 5)	Poor GOS (GOS 1,2 & 3)
1	2	2 (100%)	0
2	28	22 (78.57%)	6
3	34	27 (79.41%)	7
4	36	16 (44.44%)	20
Total	100	67	33

Table 5: IVH and Outcome

IVH	No. of Patients	Favourable GOS (GOS 4 & 5)	Poor GOS (GOS 1,2 & 3)
Present	22	10 (45.45%)	12
Absent	78	57 (73.07%)	21
Total	100	67	33

Co-morbidities and other risk factorsVs. final outcome

Pre existing hypertension was present in 43% of patients. No correlation was there between hypertension and final outcome.

Diabetes was present in 12% of patients. They had a far worse outcome than those without it.

Smoking in 24 patients adversely affected the outcome ($p<0.09$) in the form of increased incidence of chest complications (pneumonia, ARDS, Basal etelectasis) leading to increased morbidity/mortality.

Intra operative findings and outcome

IOR occurred in 38 patients. Of these only 12 patients had good outcome. In non IOR group (62 patients), 45 patients had good outcome. The IOR in most of the case was in dissection phase (25 patients) while the rest of 13 patients had rupture during clip application phase. Patients in whom there was IOR had significantly poor outcome.

Temporary Clipping: No adverse affect on outcome was observed after elective TC (in 55 patients). The average time of temporary clipping was 4 min 34 sec.

Size of aneurysm: In our series, 90 patients had small (0.3–1.4 cm), 7 patients had large (1.5–2.4 cm), had giant (≥2.5 cm) aneurysms. We did not find any correlation of size with final outcome.

Discussion

This prospective study was conducted on 100 patients of a-SAH and their related clinical and epidemiological data including clinical presentation, radiological findings, and intra-operative characteristics of the aneurysms was acquired. The final outcome was analyzed on the basis of GOS.

We found that 67% patients had good outcome (GOS 4 & 5) while 33% patients had poor outcome (GOS 1,2 & 3).17% patients had mortality which was slightly higher in our series as compared to literature review.

Pre op grading

Pre op WFNS grading revealed that higher grade had worse outcome. A study by Oshiro et al[3] found a stepwise increase in the likelihood of an unfavourable outcome with increasing WFNS grade.

Similarly, H&H grading in the pre operative period had a bearing on the final outcome. Poor grade had consistently worse outcome. This was in consonance with a study by Rosen et al[4] were of the opinion that H&H Scale has strongest predictive power for outcome. They also found that scores on the day of operation were of more prognostic value than values observed immediately after hospitalization.

However, in our study we did not find a relationship between higher Fisher grade and final outcome. But notably, presence of IVH leads to a far worse outcome. Rosen[5] et al also concluded that GOS was worse for patients who had SAH with IVH when compared to those having SAH without IVH ($p = 0.007$)

Co-morbidities and other risk factors

Diabetes Mellitus and smoking act as independent risk factors leading to a far worse outcome when compared with those without it. However, hypertension did not alter the final outcome.

Intra operative characteristics

Patients with intra operative rupture of aneurysm had a far worse outcome while application of temporary clipping during dissection did not alter the outcome significantly. When the causes of IOR were reviewed, we found an interesting correlation. Out of 38 patients with IOR, 20 were smokers. Smoking appears to be associated with increased chances of IORin previous studies also.[6] No other identifiable risk factor was seem to be associated. We found that in few cases (9 patients), there were dense adhesions in the sylvian fissure and peri aneurysm. this led to increased chances of rupture during dissection. When history was reviewed again and on deep probing, there was history of headache (?herald bleed) about 3–4 weeks prior to the ictal episode which brought the patient to hospital. The poor outcome in IOR can be attributed to the fact that once there is IOR, the field gets filled with blood, hampering vision. There is a sense of panic in surgeon and blind clipping can result in a perforator injury. In contrast, temporary clipping (average time less than 5 min) is a relatively controlled situation with no major catastrophic results.

Authorship Contribution

Ashish Aggarwal: Data collection, preparation of manuscript, **Manoj K Tewari:** Critical review of manuscript, **Suresh N Mathuriya:** Critical review of manuscript, **Vivek Gupta:** Interpretation and review of radiology

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