Outcome and Mortality of Post Clipping Ruptured Cerebral Aneurysm Patients – Our Experience of 20 Cases.

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This is an observational analytic study on cerebral aneurysms. All the patients who underwent craniotomy for aneurysm clipping have been included in this study. Place of study was Square Hospitals Ltd. Dhaka and period of study was 2 years. Most of the patients were male. Male female ratio was 1:1.2. Highest number of the aneurysms was located in anterior communicating artery (A Com A) (45%). Next common location was middle cerebral artery (MCA) (35%). More than half of the patients were of world federation of neurological surgeons (WFNS) grade-1 type. One fifth patients were in grade-IV group. Post operative good recovery was achieved in 65% of cases. We lost 10% of our patients after surgery. Mortality rate and good outcome of our patients shows a similarity with those of International Cooperative study.

Key words: Aneurysm clipping, outcome, mortality, WFNS grading

The word 'aneurysm' is derived from Greek and means dilatation. Norman Dott, in 1931, was the first to demonstrate an aneurysm angiographically. [3] The first successful clipping of neck of an aneurysm was done by Dandy in 1944. [2] The incidence of cerebral aneurysms in the general population is about 1 percent. However, large autopsy studies revealed an incidence of two to six percent. [11] The pathogenesis of saccular aneurysm is controversial. [14] Both congenital and acquired factors have been proposed. The congenital anomalies of the circle of Willis, developmental defects of tunica media and the frequency of atherosclerosis are important causes of congenital aneurysms. The arterial wall certainly has defects of the muscular coat (congenital) at the point of sacculation of aneurysm. Subsequent degeneration of the elastic lamina (acquired lesion) may result in the development of an aneurysm. There is also evidence to suggest genetic determination of cerebral aneurysms as they are associated with genetically transmitted disorders like polycystic kidney, Marfan syndrome and Ehler Danlos syndrome. Aneurysms also occur in identical twins and there is familial aggregation. [15]

Aneurysms may be classified based on size, location etiology and pathology. Aneurysms more that 2.5 cm in diameter are considered giant. By far most common aneurysm is acquired saccular aneurysm. Incidence of aneurysm is higher in anterior circulation in comparison to posterior circulation. Internal carotid artery (ICA) aneurysms are predominant in females, anterior cerebral artery (ACA) and middle cerebral artery (MCA) aneurysms

have no sex predilection. Yasargil reported that 24 percent of his patients had more than one aneurysm, although these included aneurysms less than 3 mm (microaneurysms), which were only diagnosed intra-operatively. [16]

The hallmark of subarachnoid haemorrhage (SAH) is sudden, severe headache. In one study it was found that headache was present in 74%, nausea and vomiting in 74 %, loss of consciousness in 53 % and nuchal rigidity in 35%.[6] Ruptured aneurysms at specific sites may produce distinct clinical features.[12] Transient bilateral lower extremity weakness may be due to anterior cerebral artery aneurysm rupture. SAH due to middle cerebral artery aneurysm is more likely to produce hemiparesis, paresthesia, hemianopsia and dysphasia. Seizure occurs more frequently with anterior cerebral artery and middle cerebral artery aneurysm. Third nerve palsy or unilateral retro-orbital pain suggests an aneurysm arising at the internal carotid – posterior communicating artery junction. Third nerve lesions also occur with aneurysms at the origin of superior cerebellar artery. Carotid-ophthalmic artery aneurysms may produce unilateral visual loss or visual field defect. Immediate pathological sequelae of aneurysm rupture are haemorrhage, brain herniation, acute hydrocephalus and acute brain swelling. Known delayed complications are rebleeding, vasospasm, cerebral edema and chronic hydrocephalus.

A good quality non-contrast high resolution 4th generation CT will detect SAH in > 95% of cases if scanned within 48 hours of SAH.[9] Blood appears high density within subarachnoid spaces. Cerebral angiogram is the 'gold standard' for evaluation of cerebral aneurysms. It demonstrates aneurysms in 80 – 85% of cases. CT Angiogram is the more recent development. Its role is just now becoming defined but appears to hold promise, with reported sensitivity of 95% and specificity of 83% in detecting aneurysms as small as 2.2 mm. Unlike conventional angiography, CTA shows a 3-dimensional image and demonstrates the relation to nearby bony structures. Numerous SAH grading scales have been proposed. Four are in common use, the most widely quoted one is WFNS grading. In our study we have used the WFNS grading. This scale uses the Glasgow Coma Scale (GCS) to evaluate level of consciousness and uses the presence or absence of major focal neurologic deficit.

WFNS scale for SAH[5] is as follows

Grade 1 - Glasgow Coma Score (GCS) of 15, motor deficit absent
Grade 2 - GCS of 13-14, motor deficit absent
Grade 3 - GCS of 13-14, motor deficit present
Grade 4 - GCS of 7-12, motor deficit absent or present
Grade 5 - GCS of 3-6, motor deficit absent or present.

We assessed the outcome and mortality of post operative patients and compared our results with that of international studies.

Materials and Methods

This is an observational analytic study on cerebral aneurysms. Twenty patients who underwent craniotomy for aneurysm clipping have been included into this study. All the cases were ruptured aneurysm leading to SAH. Place of study was Square Hospitals Ltd. Dhaka and period of study was 2 years. Data was collected by checklist, imaging reports, patient's clinical file and clinical examinations. Follow up clinical examination was done after 2 months of surgery. Data was collected, tabulated and was analyzed.

Results

Table 1 shows the sex distribution of 20 patients. Most of them were male (55%), the male female ratio being 1:1.2.

Sex	No. of cases	percentage
Male	11	55%
Female	9	45%

Table 1. Sex distribution (n=20)

Table 2 demonstrates the distribution of all patients according to their age group. More than one third patients were in 41 to 50 years age group. Second common was 31 to 40 years age group (30%). Next common was 21 to 30 (15%). Age group of 51 to 60 years and above 60% had 10% cases in each group. There was no patient aged below 20 years.

Age group	No. of cases	Percentage	Mean
< 20	0	00	
21-30	3	15%	45 years
31-40	6	30%	
41-50	7	35%	
51-60	2	10%	
> 60	2	10%	

Table 2. Age distribution (n=20)

Site of aneurysm	No. of cases	Percentage
Anterior communicating artery	9	45%
Middle Cerebral artery	7	35%
Posterior communicating artery	2	10%
Fronto-polar artery	1	5%
Posterior Inferior Cerebeller Artery	1	5%

Table 3. Case distribution according to site of aneurysm (n=20)

Table 3 shows the distribution of aneurysms according to their site. Commonest site was anterior communicating artery (A Com. A) (45%) followed by MCA (35%). There were two patients (10%) of posterior communicating artery

aneurysm. Number of fronto-polar artery and Posterior Inferior Cerebeller Aretry (PICA) aneurysm was 1 in each.

Table 4 illustrates distribution of patients according their pre-operative status according to WFNS scale. More than half of the patients were of grade-1 type. One fifth (20%) patients were in grade-IV group. Grade -2 and grade-3 had only 2 patients in each group. Only one patient was in Grade-V group.

WFNS Grade	No. of cases	percentage
WFNS Grade I	11	55%
WFNS Grade II	2	10%
WFNS Grade III	2	10%
WFNS Grade IV	4	20%
WFNS Grade V	1	5%

Table 4. Case distribution according to pre-operative WFNS grade (n=20)

Table 5 shows the distribution of patients according to the period of time of surgery after SAH. Two third patients were operated within 1 week of SAH. Nine patients (45%) were operated within 3 days of ictus. Only two patients (10%) underwent surgery 3 weeks after SAH.

Time from SAH	No. of patients	percentage
Within 24 hours	3	15%
1 day – 3 days	6	30%
4 days – 1 week	6	30%
2 weeks – 3 weeks	3	15%
> 3 weeks	2	10%

Table 5. Case distribution according to the time of surgery after SAH (n=20)

Table 6 elaborates the distribution of patients according to time of surgery after admission. Two third patients were operated within 3 days after admission. Among them 4 patients were operated within 24 hours of admission. One patient was operated in between 2 to 3 weeks and one patient was operated after 3 weeks of admission.

Time from admission	No. of patients	percentage
Within 24 hours	4	20%
1 day – 3 days	11	55%
4 days – 1 week	3	15%
2 weeks – 3 weeks	1	5%
> 3 weeks	1	5%

Table 6. Case distribution according to time of surgery after admission (n=20)

Table 7 shows the outcome of the patients at the time of discharge according to Glasgow Outcome Score (GOS). More that half of the patients (65%) had a good recovery. Three patients (15%) were moderately disable, 2 patients (10%) were severely disable at the time of follow up after 2 months. We lost 10% of our patients.

Glasgow outcome score	No. of cases	Percentage
1- dead,	2	10%
2- vegetative,	0	00%
3- severely disabled,	2	10%
4- moderately disabled,	3	15%
5- good recovery	13	65%

Table 7. Case distribution according to Glasgow Outcome score (2 months after surgery) (n=20)

Table 8 shows the distribution of patients comparing outcome (mortality and good outcome) with their pre-operative WFNS grade. All the patients of grade-I and grade-II showed a good outcome. On the other hand we had 100 % mortality in grade V and 25% mortality in grade-IV pre-operative status patients. None of the poor pre-operative status patient had good outcome.

WFNS grade	No. of patients	Good outcome %	Mortality %
Grade I & grade II	13	100 %	00 %
Grade III	02	0 %	00 %
Grade IV	04	0 %	25 %
grade V	01	0 %	100 %

Table 8. Comparison of outcome with pre-operative WFNS grade

Discussion

This is an analytic observational study of all ruptured aneurysm patients who underwent craniotomy for clipping of aneurysms. This is a series of 20 cases. All the patients who were treated surgically by clipping at Square Hospitals Ltd. in last 2 years were included in this study. We had documented the follow up record of all patients after 2 month of surgery and included in our study.

Our series shows slight male predominance. Male were 1.2 times more than female. In our study we found peak age group was 41 to 50 years with the mean age of 45 years. Biller et al found peak age of rupture aneurysm between 55 – 60 years in their study. [1] They had only 20% of their patient aged 15-45 years, where as in our series we found more than 50% of patients below 41 years of age.

We found 45% of aneurysms in A Com. A. Percentage of aneurysms in middle cerebral artery was 35%. According to the cooperative study, highest number of aneurysms were found in anterior cerebral artery (ACA) territory (39%) followed by internal carotid artery (ICA) (30%).[8] They had middle cerebral artery (MCA) aneurysms in 22% of their cases. Yasargil operated 41% ACA territory aneurysms, 32%

ICA aneurysms and 18% MCA aneurysms according his series. [17]

According to the Glasgow Outcome Score 53% of our patients had a good recovery who had returned to the same quality of life as before SAH. Drake found 34% of his patients to be returned to the same quality of pre-operative life after successful clipping of ruptured aneurysms. [4]

Mortality rate was 10% in our study. The same was 14% in study of Krupp. [9] Saveland et al found 5% mortality in their study. [13] Mortality rate was 10.5% in the series of Lee et al. [10] Mortality and good outcome is usually related to the pre-operative present status. International cooperative study has shown that they had mortality 9% in grade I and grade II patients. [8] In our study we didn't have any mortality in this group. Good outcome was 79% in this group in their study which was 100% in our series. In their study mortality was 35% and good outcome was 33% for grade IV patients. We found no good outcome patient in this group and mortality rate was 25% in this group. According to cooperative study mortality and good outcome was consecutively 45% and 14% for grade V patients. In our study mortality was 100% and good outcome was 0% for grade V patients.

We found a fair similarity between our results and the results of other international studies. We had few limitations of our study. Number of patients was not enough to perform any significant test. Follow up was performed after 2 months. Long term follow of these patients would help to get a precise result of outcome.

Conclusion

This was an observational analytic study of 20 patients. All patients underwent craniotomy for clipping of the ruptured aneurysms. Mean age of patients was 45 years. Commonest location was aneurysm of A Com. A. Most of the patients had a good pre-operative status. Out come of the patients after surgery showed a relationship with the pre-operative status of the patients. Patients of good pre-operative status had a good recovery after surgery.

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