Surgery for Ruptured Aneurysms: Analysis based on 40 cases

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Intracranial aneurysms are commonest cause of spontaneous subarachnoid haemorrhage. The aim of this retrospective study was to see distribution of this disease over circle of willis and analyse outcome of surgical treatment in our set-up. Forty patients with subarachnoid haemorrhage due to ruptured intra-cranial aneurysms were operated upon from October 99 to September 2002. Age ranged from 30-65 years with mean of 40 years. There were 24 females and 16 males (sex ratio 1.5:1). Those patients who died while waiting for cerebral angiogram and angio negative patients were excluded from this study. Clinical grading was done according to Hunt & Hess Scale(table 1) and only those patients proceeded to cerebral angiogram who improved to at least grade 3 on this scale. We found that 80% aneurysms in our referrals were ACoA (Anterior communicating artery), 15% MCA (Middle cerebral artery) and 5% P-Com (posterior communicating artery). There was no posterior circulation aneurysm among 40 cases. Only one patient had multiple aneurysms. Timing of operation ranged from 3-18 days with mean of 10 days. We conclude that ACoA is the commonest aneurysm (80%), followed by MCA and P-Com. This is in contrast to most of western literature where ACoA Aneurysm is found in 35-40% cases of SAH. Rarity of posterior circulation aneurysm (none in our study) suggests different distribution of disease in this part of the world. Moreover, less multiplicity (2.5%) could suggest low incidence of disease in Pakistan. It is possible to clip aneurysms with only 5% mortality at our centre, which compares favourably with western series.
Key Words: Cerebral aneurysms, subarachnoid haemorrhage, and outcome

Aneurysms are commonest cause of spontaneous subarachnoid haemorrhage and affect 10 of every 100,000 people per year in United States. It accounts for 6-8% of all cerebrovascular accidents. The patients who survive the initial haemorrhage and are clinically well, if primary cause (aneurysms) is not treated, there is significant risk of rebleed and mortality, the risk being 38% at 6 weeks. Aneurysm surgery is geared towards reducing this risk.

Surgery for intracranial aneurysms is being performed in Pakistan from just over one decade. It is still not widely available in many Neurosurgical centres of the country and there is element of apprehension and skeptiscism among treating physicians, when it comes to Neurosurgical intervention. Endovascular treatment of aneurysms is in infancy in Pakistan. So only, surgical option is available to patients. The aim of present study, carried out in a series of 40 patients with angio +ve subarachnoid haemorrhage, was to evaluate the safety of surgery and determine main causes and consequences of unfavourable outcomes.

Material and methods:

It was a retrospective study. Names of patients who underwent aneurysm clipping over last 3 years between October 1999 to September 2002 were noted from theatre register. The admission notes of these patients were studied in detail for age, sex, conscious level at time of admission, findings of investigations, timing of surgery, surgical approach and peroperative difficulties, postoperative course, hospital stay and follow up. CT and angiogram findings were discussed with our neuroradiologist in detail. After CT scan and confirmation of diagnosis of subarachnoid haemorrhage, all patients were started on 60 mg nimodipine orally, intramucular injectable analgesia (diclofenac sodium) with intravenous normal saline and daily electrolytes. Clinical grading of patients with subarachnoid haemorrhage was done according to Hunt & Hess Scale (Table 1). Cerebral angiogram was performed when patients improved to minimum grade this Scale. Those patients who died while waiting for angiogram and angio-ve subarachnoid haemorrhage were excluded from study. Outcome was assessed according to Glasgow Outcome Scale (Table 2) at time of discharge and 6 Weeks follow up visit.

Age of our patients ranged from 30-65 years with mean of 40 years. There were 24 females and 16 males with male to female ratio of 1.5:1. Twenty two cases were referred from emergency department and medical units of Mayo hospital while 18 were referred from other local hospitals of Lahore and privately. On admission 9 patients were grade 2, 22 patients were grade 3 while 9 were grade 4 according to Hunt& Hess Scale.

Table 1. Hunt and Hess classification of subarachnoid haemorrhage

Category	Criteria
Grade 1	Asymptomatic or minimal headaches and slight nuchal rigidity
Grade 2	Moderate to severe headache, nuchal rigidity. No deficit other than cranial nerve palsy
Grade 3	Drowsiness, confusion or mild focal deficit
Grade 4	Stupor, moderate to severe hemiparesis, possibly early decerebrate rigidity and vegetative disturbance
Grade 5	Deep coma, decerebrate rigidity, moribund appearance

Add one grade for serious systemic disease (e.g., hypertension,diabetes mellitus, chronic obstructive pulmonary disease) or severe vasospasm on angiography

On CT scan, Diffuse subarachnoid haemorrhage / intraventricular blood was found in 16 cases. Out of 23 patients who had localised subarachnoid haemorrhage, 19 had blood in interhemispheric fissure/Gyrus rectus (Fig 1) while 4 had blood in sylvian fissure/temporal ICH. CT scan was negative in one patient and subarachnoid haemorrhage was diagnosed on lumbar puncture. Time to get cerebral angiogram ranged between 2-16 days with mean of 8 days. 4-vessel digital subtraction angiogram was done in 37 patients while only bicarotid angiogram was done in 3 cases. This was due to technical reasons in performing angiogram. 32 patients (80%) had ACoA aneurysm (Fig 2), 6(15%) had MCA and 2(5%) patients had

P-Com aneurysms. Only one patient had multiple aneurysms (bilateral MCA). This patient had bled from right side, underwent right craniotomy and unilateral clipping. He recovered well but never turned up for surgery of contralateral unruptured aneurysm. No posterior circulation aneurysm was found in our series. Size of aneurysm could not be measured accurately on angiogram, again due to technical reasons. Timing of operation ranged from 3-18 days with mean of 10 days (from time of initial haemorrhage). Only 2 patients had been operated on day 3 (early surgery). Hospital stay ranged from 9-20 days with mean of 14 days.

Table 2. Glasgow Outcome Scale

Score	Meaning
5	Good recovery,resumption of normal life despite minimal deficits
4	Moderate disability(disabled but independent)travel by public transportation, can work in sheltered setting (exceeds mere ability to perform activities of daily living)
3	Severe disability(conscious but disabled) dependant for daily support
2	Persistent vegetative state. Unresponsive and speechless after 2-3 weeks. May open eyes and have sleep/wake cycles
1	Death

Table 3 Morbidity:

Wound infection	3
Hydrocephalus needing shunt	2
MCA territory infarct	1
Hemiparesis (recovered)	4
Fits	3

Operative details:

After general anaesthesia, lumbar drain was inserted in 4 patients. (Personal preference of one of operating surgeons). Standard osteomyoplastic flap was made using Hudson brace. After opening dura, microscope was brought in and rest of operation was performed under high magnification. Among 32 ACoA aneurysms, subfrontal approach was used in 24 cases while pterional approach was used in 8.

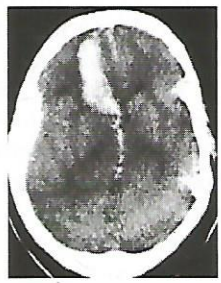

Fig 1: CT showing Gyrus rectus bleed

Fig 2: Carotid angiogram of same patient with forward projecting ACoA Aneurysm

Fig 3: A clip applied to neck of ACoA aneurysm with preservation of surrounding vessels

Sylvian fissure had to be split only in 10 cases of ACoA aneurysms. For 6 MCA artery aneurysms, sylvian fissure was split from proximal to distal in 4 cases while dissection was done distal to proximally in 2

cases.(Personal preference of operating surgeons). There were 5(12.5%) intraoperative ruptures in last stages of aneurysm dissection which were easily controlled and aneurysms clipped successfully (Fig 3). In 12 patients temporary clipping had to be performed, out of these 10 were ACoA and 2 MCA aneurysms.

All patients recovered very well from operation and were transferred to high dependency unit. Morbidity has been shown in table 3. Both patients needing VP shunt for hydrocephlus had ACoA aneurysms. Only 1 patient had permanent disability from MCA territory infarct.

Outcome:

Only 2 patients died (5%). One had grand mal seizures on 2nd post- op day while the other one had meningitis on 7th post-op and never recovered. Only one patient was worse than pre-op status. He had MCA territory infarct on 3rd day post-op possibly due to vasospasm and was managed with hypertensive hypervolemic regimen but his deficit never recovered. 3 patients with pre-op dense hemiplegia (WFNS 3) remained same at the time of discharge.

Discussion:

SAH, most commonly secondary to aneurysmal rupture, is a subcategory of cerebrovascular accident, the 3rd leading cause of death in United States[2]. Epidemiological studies suggest that SAH causes 8% to 10% of the cerebrovascular accidents and 4% to 5% of related deaths[10]. Of approximately 28,000 people who suffer SAH yearly in North America, 18000 will die or be disabled; 8% to 15% die before receiving medical care, 35% within first 8 hours, 20% to 37% within 48 hours and 42% to 61% within the first month[8]. Overall mortality ranges from 5% to 52%[4]. Furthermore autopsy studies suggest that at least 1% of adults harbour unruptured aneurysms and approximately 0.01% to 0.02% suffer SAH; thus unruptured aneurysms outnumber ruptured aneurysms. Which unruptured aneurysms should be surgically treated is a matter of debate among neurosurgeons and neurologists[1]. The international co-operative study on aneurysms suggested that following factors relate significantly to mortality: thickness of subarachnoid clot on CT, basilar aneurysm, coexisting medical illness, level of consciousness, increased blood pressure and advanced age[4]. Progress in microneurosurgery and perioperative intensive care may have mitigated some of these factors, in particular age[3].

The most pressing reason to operate early and obliterate an aneurysm are to prevent rebleeding and allow more aggressive treatment of vasospasm, should it occur[5] Early surgery may allow evacuation of spasmogenic subarachnoid haematomas, with subsequent decrease in severity of vasospasm, although this is not of proven value. Delaying surgery allows the medical and neurologic condition of patient to stabilise, may make surgery easier and improves postoperative results. Concerns that dissection of aneurysm during early surgery is more difficult and is associated with higher incidence of catastrophic intraoperative rupture and of a tight brain requiring heavy retraction have not been borne out and are not reasons to defer surgery[6].

Despite many reports describing outcome with surgery performed at various times after SAH, scientific conclusion about when surgery should be performed cannot be made. Multivariate analysis of outcome after SAH shows that the timing of surgery is not the most important determinant of outcome[11]. Cerebral ischemia and infarction develop independent of what time surgery is performed, although increased rates may be observed in older series, when hypovolaemic patients underwent surgery while suffering from vasospasm and were often subjected to induced hypotension. When surgery is delayed because of late admission to hospital, a policy of delayed surgery, or for unstated reasons, then the advantage of early surgery is decreased or lost due to more favourable prognostic factors in late surgery groups[7].

Our series of 40 cases of ruptured aneurysms basically reflects surgical morbidity and mortality rather than management mortality. Only 2 out of 40 patients underwent surgery on day 3(early surgery) while rest were operated late with mean of day 10 from ictus. This is due to late referral, bad grade on Hunt and Hess scale, non-availability of cerebral angiogram and elective operation theatre on every day. So aneurysm surgery in our set up is mostly delayed. Only 1 patient was worse at time of discharge (had hemiplegia from MCA infarct) GOS 3, 2 patients with preop dense hemiplegia remained same at time of discharge while remaining 37 patients had good outcome as assessed on Glasgow outcome scale.

Conclusion:

Our study clearly shows that in Pakistan spontaneous subarachnoid haemorrhage due to ruptured AcoA aneurysms is found in 80% cases. This is in contrast to western literature where AcoA aneurysms are found only in 35%-45% of cases. Similarly rarity (none in our series while 10-15% in most western literature) of posterior circulation aneurysms could suggest different distribution of aneurysms in Pakistan. Less multiplicity (2.5%in our series while 15% in most western series) could suggest less incidence of this disease in our population.

Our study clearly shows that it is possible to clip aneurysms with only 5% mortality, which compares favourably with most of the Western literature.

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