

Surgery for Intracerebral Aneurysms in Eastern Nepal: A New Beginning

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Surgery for cerebral aneurysm is one of the most challenging aspects of neurosurgical practice and had been limited to the capital alone in Nepal. The advancements in technology and the increasing availability of CT angiography have made interventions for cerebral aneurysm possible now beyond Kathmandu. This is a prospective study of all cases of intracerebral aneurysm that were operated upon in this centre from February 2010 to January 2012. The factors like, age, sex, Hunt and Hess grades, world federation of neurosurgical societies (WFNS) score, Glasgow coma score (GCS) at admission and discharge, site and location of aneurysm and the type of intervention done were recorded. Out of a total of 40 cases with positive findings on CTA, 33 cases with 37 aneurysms were operated upon. The age ranged from 25-73 years and there was almost equal male to female incidence (M-15, F-18 cases). 31 cases were operated within the first 72 hours of ictus and the rest after the ninth day. The most common site was the anterior communicating (ACOM) followed by internal carotid (ICA) and middle cerebral (MCA). Postoperative chest infection developed in 7 cases and renal failure in 3 cases. Although aneurysm surgery is still at its infancy in Nepal, the need for a national database, further improvement in technology and the availability of endovascular embolisation will definitely pave way for better outcomes in this country.

Key Words: ACOM, aneurysm, barbiturate coma, eastern Nepal, carotid artery, subarachnoid hemorrhage

Surgery for cerebral aneurysm is one of the most challenging aspects of neurosurgical practice and had been limited to the capital alone in Nepal. The common reasons of the slow progress of neurovascular surgery are mainly the need for specialized investigations like angiography, proper training and exposure to the surgical principles and lack of proper allied specialty backup. The advancements in technology and the increasing availability of CT angiography have made interventions for cerebral aneurysm possible now beyond Kathmandu. Search of internet revealed only two large study and a case report pertaining to aneurysm surgery/coiling in Nepal (2001) and this would probably be the second larger series.^{2,13,14}

Materials and Methods

This is a prospective study of all cases of intracerebral aneurysm that were operated upon in this centre from

February 2010 to January 2012. The factors like, age, sex, Hunt and Hess grades, world federation of neurosurgical societies (WFNS) score, Glasgow coma score (GCS) at admission and discharge, site and location of aneurysm and the type of intervention done were recorded. All cases of atraumatic subarachnoid hemorrhage underwent multi-slice CT angiography (CTA) at presentation. All cases with aneurysm were planned for immediate microsurgical clipping if presenting within 72 hours of ictus or after the 9th day if presenting later. Cases with bilaterally fixed pupils and GCS of less than 5 were excluded from the study. In the operating theatre trachea intubated with a standard sized ETT and fixed after confirming with ETCO₂ and checking bilateral equal air entry. Central venous pressure (CVP) inserted in the right Sub-Clavian Vein and maintained at around 10 mmHg. Intraoperatively the head the head was fixed on a Sugita clamp system (AVM Surgicals, India) and barbiturate coma used in all cases. No preoperative lumbar drain was used and intraoperative external ventricular drain (EVD) inserted via point after dural opening if the

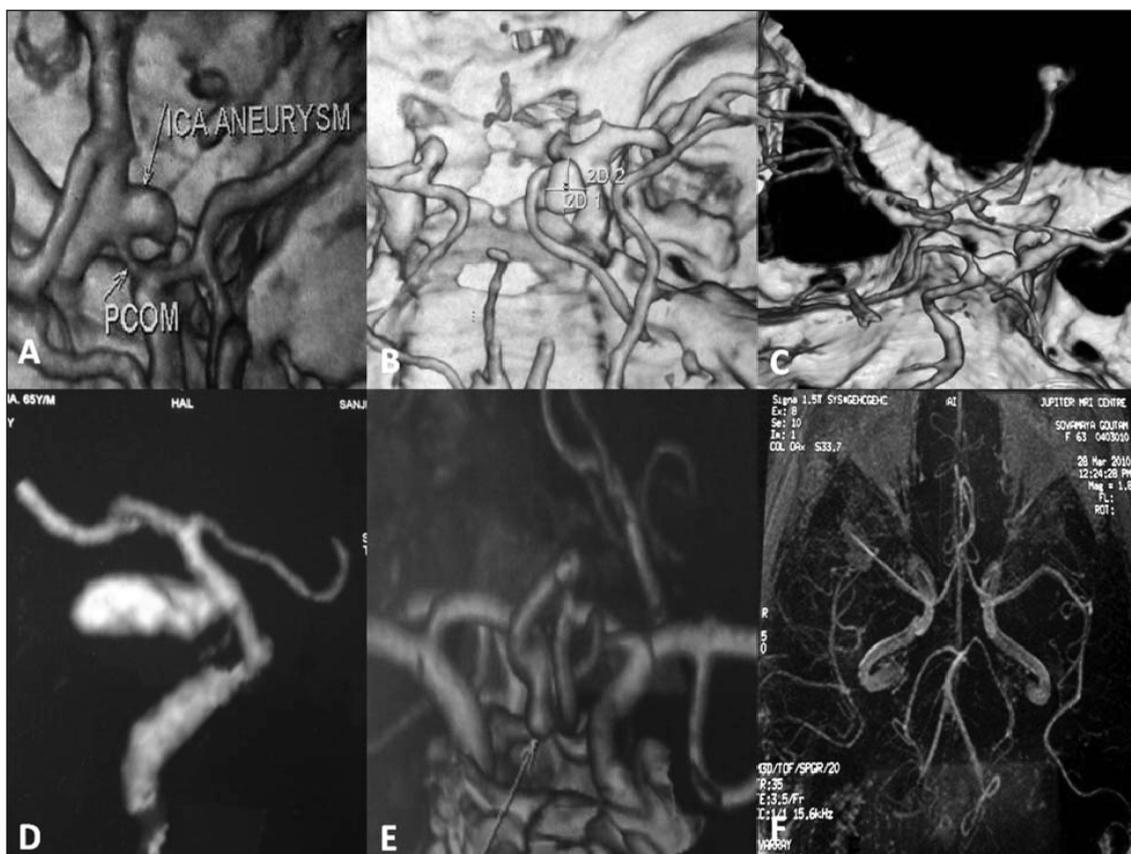


Figure 1: CTA showing the various locations of aneurysms ICA(a), ICA bifurcation(b), Distal A2(c), giant ICA (d), ACOM(e) and MCA(f).

Grade	Hunt and Hess score	Number
1	Asymptomatic /headache/ slight neck stiffness	13
2	Mod to severe headache cranial nerve palsy	8
3	Drowsy, minimal neurologic deficit	5
4	Stuporous; mod to severe hemiparesis	5
5	Deep coma; decerebrate rigidity; moribund	2
<i>WFNS Score</i>		
Grade	GCS and Focal neurological deficit	
1	15 Absent	11
2	13-14 Absent	8
3	13-14 Present	6
4	7-12 Present or absent	5
5	<7 Present or absent	3

Table 1: Data showing the Hunt and Hess and WFNS score

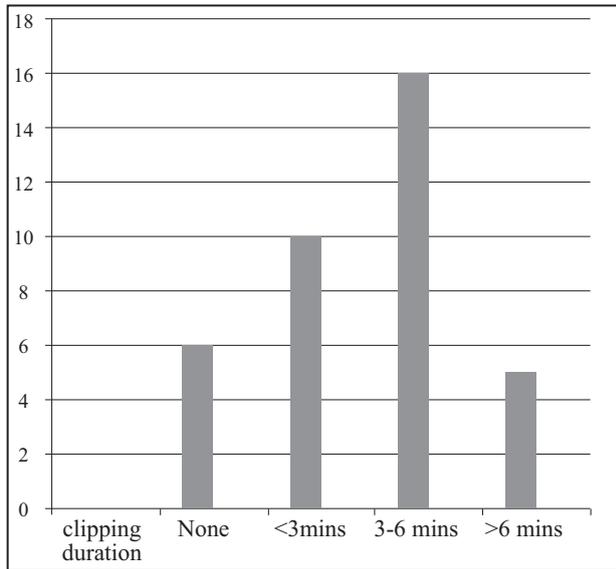


Figure 2: Chart shows the duration and number of temporary clipping cases.

brain was swollen. Barbiturate (thiopentone) was commenced 30 minutes prior to clipping with initial bolus dose of 5 mg/kg was followed with infusion rate of 1.5-3 mg /kg and the infusion was stopped after successful clipping of the aneurysm. Proximal control either at the neck or with use of temporary clipping was used if necessary with maximum occlusion time of 3 minutes at one clipping. Immediate extubation was done if possible and the patient started on triple H therapy based on CVP and mean arterial pressure (MAP) readings. Ambulation was started in suitable cases on the third day and patients discharged on the 8th. Repeat scan was done on the second postoperative day and at six weeks. The final outcome was assessed with the dichotomized Glasgow outcome score at 3 months.

Results

Out of a total of 40 cases with positive findings on CTA, 33 cases with 37 aneurysms were operated upon. The age ranged from 25-73 years and there was almost equal male to female incidence (M-15, F-18 cases). Sudden severe headache with or without altered sensorium was the most common presentation followed by loss of consciousness (LOC) and focal neurological deficit. The associated symptoms were vomiting, pupillary inequality and neck stiffness. The Hunt and Hess score and the WFNS score both showed the majority in the good grade (Table 1).

The most common site was the anterior communicating (ACOM) followed by internal carotid (ICA) and middle cerebral (MCA) (Figure 1). The other sites were paraclinoid, distal anterior cerebral, bilateral MCA bifurcation, posterior communicating (PCOM) and paraclinoid (Table-2). Right sided aneurysm (n=20) were more common than the left with multiple aneurysm in three cases and one case of bilateral MCA. No cases of posterior circulation were clipped. 31 cases were operated within the first 72 hours of ictus and the rest after the ninth day. 32 cases went direct clipping and one underwent wrapping with muslin. Proximal internal carotid artery control in the neck was done in one case each of with giant ICA, ACOM and

paraclinoid aneurysm. Tandem clipping for giant aneurysm was done for three cases (maximum of three clips). Temporary clipping was used in 28 cases and the time ranged from 2.5 to 19 minutes with a mean of 11.2 minutes with the majority within the 3-6 minute duration (Figure 2). Intraoperative rupture was present in 4 cases (10%) and intraoperative hypotension secondary to the barbiturate for maximum of 5 minutes was observed in 4 patients which were treated with boluses of IV fluids. There were no cases with brochospasm, allergic reactions or hypokalemia secondary to barbiturate.

The degree of recovery at the end of operation was acceptable in that nearly 70% were awake and talking, or responding to speech at the conclusion of the procedure. 5 patients had new neurological deficit in immediate post operative period but in only two did these persist. Postoperative chest infection developed in 7 cases and renal failure in 3 cases. 10 patients required post operative ventilatory support, (maximum of 6 days). 6 cases developed permanent focal deficits (weakness of upper limb-2, ptosis-2, motor aphasia-1 and weakness of leg-1). One case with giant ICA aneurysm developed sudden large subgaleal hematoma extending to epidural space on the seventh postoperative day and underwent re-exploration with successful recovery. The overall mortality was 9. There were 4 cases of postoperative deaths (12%) with those of poor grade, 3 cases had acute renal failure and 2 cases expired secondary to chest infection. Repeat scan was done on the second postoperative day and at six weeks. The GOS at 3 months in the surviving 24 cases showed 87% in the good outcome group and 13 % in the moderately disabled. 70% of these were already in their previous professional activities and three had mild headache sometimes. The rest with permanent neurological deficit were care dependent but activities of daily life independent.

Discussion

Surgery for intracerebral aneurysm is one of the challenging subspecialties in neurosurgery. Whether ruptured or not clipping of aneurysm has been the standard treatment until the advent of endovascular coiling.^{4,8,5} The relative advantage of one method over the other is controversial although the International Subarachnoid Hemorrhage Treatment (ISAT) found better outcome of aneurysm coiling over clipping therapy with a lower mortality and epilepsy rates at 1 year for ruptured aneurysms.¹⁰ A recent study from united states of over 3000 aneurysm cases also found lesser cost, morbidity and better outcome in the coiled cases.¹ Except for one case report endovascular coiling has yet to be done on a regular basis in Nepal.¹⁴

Due to its complexity, technical difficulties, sufficient training and need for specialized care it was limited to the capital alone in Nepal. There are many centers in Kathmandu operating for aneurysm but there has yet to be a national record or study regarding the number and outcome. The eastern Nepal covers roughly one fourth the area of Nepal and is populated by almost a fifth. Although there are innumerable private hospitals and five medical colleges none of them cater to the neurosurgical needs.

No. Of Cases	Age Range	Sex	Side	Site
33 Clips-36 Wrapping-1	25- 73 yrs	Male- 15 Female- 18	Right- 20 Left- 13 Multiple-3 Bilateral-1	MCA- 7 ICA- 10 A2- 2 A Com-13 Paraclinoidal-1 ICA+MCA-1 B/L MCA- 1 ICA+Acom-2

Table 2: Data showing the demographic and anatomical profile of aneurysm.

	Devkota et al (2001) (N=40)	Sharma et al (2011) (N=127)	Present study (N=33)
Duration of study	8 years	5 years	2 years
Sex Male		48	15
Female		79	18
Common Site of aneurysm	18		
ACOM	9	47	13
MCA	5	37	7
ICA	10	22	10
PCOM		15	-
Timing of surgery			
<72 hours	-	18%	93%
@ 1 week	-	82%	7%
Outcome			
Good recovery	90%	84%	87%
Moderately disabled	-	8%	13%
Death	10%	8%	12%

Table 3: Comparison of the three studies of aneurysm surgery from Nepal.

This is the largest series outside the capital and the results are comparable with the two previous study (Table 3). Many previous studies have shown the benefit of barbiturate coma during temporary clipping and this

was used in all cases in this study.^{12,9} This role though has been questioned by the Intraoperative Hypothermia for Aneurysm Surgery trial which found no benefit by the use of barbiturate or hypothermia.⁶ In our study no lumbar

drain was used and the EVD inserted at Paines point only after the dura was opened to reduce the chances of aneurysmal rebleed in 8 cases.^{3,11,7} The lamina terminalis was opened to further relax the brain when needed. Temporary clipping has been advised for aneurysms of a larger size, irregular fundus shape or midline location and the potential need for temporary clipping considered for every patient with an aneurysm.³ In this study it was used in all but six cases. Immediate extubation was done in the majority of cases, which allowed for early diagnosis of any deficits. Post operative infarcts have been found to occur in 39% of cases and the most common location is the ACA territory.¹⁵ Prolonged clipping, intraoperative rupture and poor Hunt and Hess grades are associated with increased incidence of infarcts.³ In our study repeat scan was done on the second postoperative day and there were three cases of infarcts involving the internal capsule and MCA territory. Renal failure has been one of the complications in this study and due to lack of dialysis in this institute the patients have to be referred to other centres.

During the initial period of the study all patients were referred to India for CTA and then followed up, thus we lost few to follow-up, but CTA was made available and this has led to increase in the number of these procedures. This study is still in the starting phase and thus has few limitations which include the lack of intraoperative imaging, use of Doppler intraoperatively or transcranially and the absence of coiling facility in the center. The cost of the aneurysm clip (NRS 15000), of the intensive care and medications is also a major burden to the population. A comparison table between the three studies from Nepal has shown almost similar results though we prefer to clip within 72 hours of ictus (Table 4).

Conclusions

Although aneurysm surgery is still at its infancy in Nepal, the need for a national database, further improvement in technology and the availability of endovascular embolisation will definitely pave way for better outcomes in this country. Donations or better still government supply of the aneurysm clip and improvement at the government medical centers will undeniably facilitate to reduce the economic burden on the family and allow for increase in the number of such procedures. Further advancements in technology and the countrywide availability of endovascular coiling will definitely help to improve the results.

Conflict /Declaration of interest: None

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