Late Clipping of Anterior Communicating Artery Aneurysms: Postoperative Clinical Outcome

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ABSTRACT

Objective: *In this retrospective review of prospectively collected data, we report the clinical outcomes of thirty patients with anterior communicating artery (ACoA) aneurysms who presented and operated upon late (from day 4 to day 14) from the onset of subarachnoid hemorrhage (SAH).* ***Methods:*** *(A)Patient selection: patients presented to the Neuroemergency unit in Kasr El-Einy Hospital from January 2006 to December 2007with ACoA aneurysmal SAH of clinical grade I,II &III presented late (after 4th day) who underwent clipping of ACoA aneurysms at day 4 to day 14 form the onset of SAH. (b) Procedure: conventional operative clipping of the neck by the appropriate clip. (c) Evaluation of postoperative clinical outcome by the modified Rankin Scale at the time of hospital discharge and at 6-months thereafter, then comparing the clinical outcomes with those of the early clipping procedures as well as those with late clipping in other researches.* ***Results:*** *The overall outcomes at the time of hospital discharge using the modified Rankin Scale were good in 21 patient (70%), fair in 6 patients (20%), and poor in 3 patients (10%). At 6-months follow up, outcomes were good in 24 patients 80% as 3 patients were back to normal life among 21 patients who had previously worked , fair in 3 patients (10%), poor in 3 patients (10%).mortality was 2 cases, vegetative state was 1 case . overall ,80%of patients returned to work after 5 months , 10% were mildly disabled.* ***Conclusions:*** *With suitable perioperative resuscitation the timing of surgery for ruptured anterior communicating aneurysms apparently no longer affects surgical outcome. In this series late surgery was done due to certain delay in diagnosis, referral , logistic factors and not due to clinical decision found that there is no difference in surgical outcome between results of our series and the results of other series underwent operation in early period , however we did not recommend any delay in clipping as early clipping will reduce the high risks of rebleeding and also results in a more rapid discharge from hospital resulting in decreasing the cost.*

Key words*: Anterior communicating artery aneurysm, late clipping.*

INTRODUCTION

Aneurysms of ACoA account for the largest percentage of ruptured aneurysms (39%) and are associated with the worst surgical outcomes among all anterior circulation aneurysms[1-10]. The clinical presentation of ruptured ACoA aneurysms in general is not different from that of aneurysms in other locations varying from mild headache up to deep coma.[11] Initial SAH impact and vasospasm account for the morbidity and mortality of ACoA aneurysms.[12-13]

Therefore targeted intervention on those variables should result in improved outcomes .although little can be done to limit initial SAH damage and moderate progress has been made in treatment of vasospasm, surgery – related morbidity and mortality appear to be areas in which intervention could improve patient outcomes .this problem has been recognized by others who have explored alternative approaches and techniques.[14-25]

Timing of surgical clipping is classified into early clipping (within 72h), late clipping (from day 4 to day 14), delayed clipping (after day 14)[8].

ACoA aneurysms remain surgically challenging lesions mainly because of three anatomic features: (1) their bilateral anterograde arterial supply; (2) their deep midline location; and (3) their intimate relationship to 11 crucial arteries.[26]

Although ACoA aneurysms are midline structures, they nevertheless are approached best through Pterional approach. There are two complications that are most common in patients with ACoA aneurysms: electrolyte abnormalities and cognitive dysfunction.[27]

In this retrospective review of prospectively collected data, we evaluate the surgical outcome of 30 patients with ruptured ACoA aneurysms who underwent aneurysm clipping at day ranging from 4th to 14 th day post onset of SAH. There are two main risk factors in late clipping, first is the rebleeding, second is vasospasm with loss of brain elasticity.

Clinical material and methods:

Between Jan 2006 and December, 2007, thirty patients with late presentation (between day 4 and 14) of ruptured ACoA aneurysm were admitted and managed in the neurosurgery emergency unit in Cairo university hospital after 72h from the onset of SAH. The delay in patient's presentation was due to either a delay in the patient's presentation to medical help, or due to a long time lag of patient referral from primary health care centers to main hospitals.

The diagnosis was established on the basis of clinical picture as well as an admission CT scan and CT angiography and /or 4 vessel angiography. All the patient underwent complete neurological examination and Hess and Hunt grading system evaluation.

All the patients underwent routine medical treatment for SAH, which included calcium antagonist; either oral nimodipine (60 mg 4-hourly) is continued for 21 days if the patients can swallow, or by the intravenous route (0.5-2 mg /h) if the patient's conscious level is disturbed. Clinical monitoring of daily fluid and electrolyte balance, anticonvulsant drugs, deep venous thrombosis prophylaxis, and post operative hypervolemia.

CSF diversion via ventriculoperitoneal shunt is done only in the presence of hydrocephalus. The aneurysm clipping was carried out as early as the date of admission once the patient's diagnostic tools were fulfilled, that is from day 4 to day 14 after aneurysm rupture. The operative approach in this study was the classical Pterional approach from the side of the dominant anterior cerebral artery.

It is mandatory to do an adequate sphenoid ridge drilling, wide opening of the sylvian fissure and resection of part of the gyrus rectus. The following microsurgical procedure and events were noticed: difficulties of aneurysm dissection, intraoperative rupture, temporary clipping, brain plasticity and operation time for each patient. The patients are awakened immediately after operation, the conscious level and signs of focal deficit are monitored together with fluid balance and seum electrolytes. Vasospasm each case was assessed clinically. Postoperative complications, Hunt and Hess scores were also recorded.

CT scanning was routinely performed on the second day postoperatively to assess the ventricular size, the ischemic areas and

the general outlook of the brain tissue. Follow up angiography was done only if residual aneurysm is suspected during surgery. Patients were prospectively followed up clinically after 6 months.

Modified –Rankin scores (mRS) was applied and recorded at the time of discharge and at the time of the last follow up .Work status at last follow up was also recorded. All patient were evaluated through the Disability Rating Scale at last follow up.

RESULTS

From January 2006 to December 2007, thirty patients; 20 women and 10 men with age ranged from 30 to 65 years were admitted to our hospital presented with aneurysmal SAH. Clinical & radiological evaluation showed a ruptured ACoA aneurysm. They underwent clipping of ACoA aneurysms between days 4 to 14 from the onset of SAH. Size of the ACoA aneurysm ranged from 3 to 27 mm (mean 6.4 mm).

Aneurysm clipping was performed at 4 to 14 days after SAH, 21 patients at 4-6 days, 3 patients at 6-8, 2 patients at 8-10, 4 patients at10-14 days, this late clipping was attributed to the delayed referral of all these patients from distant hospitals and due to patient own delay to present or delay in the basic health service at rural areas.

All the patients underwent standard surgical clipping using classic Pterional approach via the dominant anterior cerebral artery side (19 from RT side, 11 from LT side). The direction of aneurysm was mainly superior in 11 cases (36.7), mainly anterior in 8 cases (26.7%), mainly posterior in 6 cases (20 %), and mainly inferior in 5 cases (16.6%). Three cases was associated with unruptured middle cerebral artery aneurysm. Also, previous ACoA coiling was done in one case who presented to us again by SAH one month later most probably due to incomplete obliteration of the aneurysmal sac. In two cases, we discovered a fenestrated ACoA during clipping.

Table 1: Hunt and Hess grades distribution

Hunt –Hess score	Number of patients
1	13
2	10
3	7

Table 2: Fisher grades distribution

Fisher grade	Number of patients
1	2
2	5
3	20
4	3

Table 3: Summary of postoperative sequelae and complications:

Complications	Patients
Neurological	
Vasospasm	11
Hydrocephalus	7
Perforators injury	3
Rebleeding	1
Medical	
Electrolyte imbalance	2
Pneumonia	6
Sepsis	3
Deep venous thrombosis	2
Acute respiratory distress	1
Pulmonary embolism	1

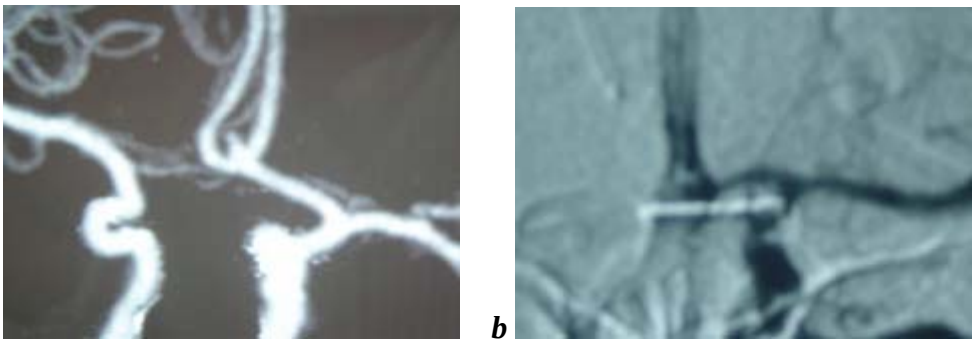
Five patients were also presented with hydrocephalus for which they underwent ventriculoperitoneal shunting at the time of surgical clipping, another two patients developed hydrocephalus few days after clipping and they underwent shunting latrer. Vasospasm worsened the final outcome in 6 patients; of which 2 patients died, one patient acquired a vegetative state, and 3 patients ended with fair mRS outcome.

The average hospital stay for patients with good outcome was 7-10 days, but patients with fair outcome the hospital stay was 3 weeks in average.

Table 4: Functional outcome at the time of discharge and at one year follow up

Outcome (mRS)	Discharge %	Last follow up %
good	21 (70%)	24 (80%)
fair	6 (20%)	3 (10%)
poor	3 (10%)	3 (10%)

Good (mRS 0-2), fair (mRS 3), poor (mRS 4-5 and mortality cases).



a ***b***

Fig (1): CT angiography showing ACoA aneurysm (a), 4 vessel angiography showing clipped ACoA aneurysm (b).

Fig 2: Clipping of ACoA aneurysm anteriorly directed (RT Pterional)

Fig (3): Clipping of previously coiled ACoA aneurysm (RT Pterional).

DISCUSSION

Aneurysmal SAH is a neurosurgical emergency that should be managed promptly and early. In this study, 30 cases of low grade ruptured ACoA aneurysms grade I, II, III were operated upon at day 4 to day 14, we did not deliberately delayed the clipping of these cases but–in fact- they presented to us after the 4th day of the ictus due to some delay in diagnosis, transfer, and logistic factors, but not clinical decision.

Clinical vasospasm occurred in eleven patients (37% of cases) in this study which is slightly higher than what is found in many series (20-30%).[1,10,28]

Out of eleven patients in whom vasospasm occurred, only three patients suffered from sever irreversible deficit; two of them died while one acquired a chronic vegetative state. Despite of the higher incidence of vasospasm in our study, most of them were mild and reversible with the routine management of vasospasm that might explain the little effect of the vasospasm on the final outcome compared with other studies.

Hydrocephalus was seen in seven patients (23%) of the study group, which it is slightly higher than what is mentioned by **Andaluz and Zuccarello** who recorded up to 15% of their cases developed hydrocephalus that necessitated a CSF diversion procedure.[29]

Although, the maximal incidence of aneurysmal rebleeding occurred in the first day (4% on day one), then 1.5% daily for 13 days i.e. 15-20% rebleeding within first 14 days,

rebleeding occurred in only one case in this study. This low percentage of cases might be due to the fact that only the survivors of the initial subarachnoid hemorrhage could present to medical help[30].

We found that the postoperative functional outcome (assessed by mRS) in these cases with ruptured ACoA aneurysms was good in 24 patients 80% by the end of the study, fair in 3 patients (10%), and poor in 3 patients (10%). We found there were no differences in the outcome if compared to other studies in which the patients underwent clipping in early period (72h) like Andaluz and Zuccarello study in 2008, in which the results were good 81%, fair 9.5%, poor 9.5%[31]

In Crowell and Ogilvy series which performed on ruptured ACoA grade I and II only, in the first three days of onset of SAH, the results were good in 92%, fair in 2% and poor in 6%. ,and in Fox and Sengupta series which performed on ruptured ACoA grade I and II in the first three days, the results were good in 84%, fair in 12% and poor in 4%[32,33]. The difference between our results and those of Crowell and Ogilvy, and Fox and Sengupta as our study include ruptured ACoA grade I, II, III but the other series include only grade I, II.

Ross et al. had an interesting study in 2002, they addressed the timing of operation of the supratentorial ruptured aneurysms by prospective analysis of the patients in their center and dividing them into three groups according to the time of clipping early, late and delayed and they found that 60.2% of cases fell into the early surgery group, 32.3% into the intermediate group, and 7.5% into the late operated group. There was no significant difference Glasgow Outcome Score (GOS) between the surgical timing groups at 6 months (favorable GOS score 4 and 5: 83.2%, 80.5%, and 83.8% respectively; p=0.47).[34]

So they concluded that current management of patients presenting with SAH from anterior circulation aneurysms allows early surgery to be done safely. The only independent variable affecting the outcome appears to be the age and the clinical grade at presentation. The timing of surgery in this study has apparently no significant effect on the postoperative outcome; still, a standard policy for early surgery that avoids the known risks of rebleeding and reduces inpatient stay should be emphasized.

We do not advocate late or delayed clipping in this study but we stress on dealing with the ruptured aneurysm as an emergency operation that should be done when the patient is fully diagnosed and stabilized at any time but as soon as possible from the onset of diagnosis whatever in early or late or delayed period.

CONCLUSION

In summary, with suitable perioperative resuscitation the timing of surgery for ruptured anterior communicating aneurysms no longer affects surgical outcome. In this series late surgery was done due to certain delay in diagnosis, referral, logistic factors and not due to clinical decision found that there is no difference in surgical outcome between results of our series and the results of other series underwent operation in early period, however we did not recommend any delay in clipping as early clipping will reduce the high risks of rebleeding and also results in a more rapid discharge

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