ORIGINAL REPORT

SURGICAL OUTCOMES IN PATIENTS WITH ANTERIOR COMMUNICATING ARTERY ANEURYSMS

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Abstract- Surgery of ruptured anterior communicating artery aneurysms has a high incidence of complications. Successful treatment depends on understanding the anatomical location of aneurysm, early surgery, selecting the superior method of surgery and providing post-operative care. In this study 30 patients with anterior communicating artery aneurysms underwent surgery in a 3-year period. In all patients early surgery with pterioneal method was performed. We applied the basic tenets of aneurysm surgery, including vascular control, sharp dissection, meticulous preservation of perforating arteries and intraoperative monitoring of lesions of the anterior communicating artery complex. This focus eliminates unnecessary operative manipulations and makes surgeon prepare for any crises that might arise. The majority of patients (83.3%) were in grade I or II (Hunt and Hess scale). The mortality rate was 10%. The results of this study demonstrated that early surgery and selecting the superior method of surgery improve the surgical outcome of ruptured anterior communicating artery aneurysms.

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Key words: Aneurysm, Anterior communicating artery, Subarachnoid hemorrhage, Outcome

INTRODUCTION

Anterior communicating artery aneurysms are lesions with a high incidence of complications. They account for approximately 20% of all aneurysms and 30% of all ruptured aneurysms (1). These aneurysms usually become symptomatic and diagnosed as a result of subarachnoid hemorrhage (SAH). The successful treatment absolutely depends on understanding the anatomical location of the aneurysm. In a survey done on 400 cadavers, 227 variations of anterior communicating artery were reported (2).

This study aimed to investigate the effect of early surgery and intraoperative planning on the outcome of anterior communicating artery aneurysms surgery.

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MATERIALS AND METHODS

In this survey, surgery was performed on 30 patients who were admitted to Firoozgar Hospital with the diagnosis of ruptured anterior communicating artery aneurysm during the years 2001 to 2004. All of the patients had a ruptured aneurysm at the time of admission. Patients' ages were in the range of 14-75 years old. Seventeen patients were male and 13 patients were female.

The majority of patients presented the typical symptoms of SAH at the time of admission including headache, neck rigidity and decreased consciousness and the majority of these were in grade I or II (Hunt and Hess scale). Subfrontal hematoma, interhemispheric hematoma and intraventricular hemorrhage were also detected (Fig. 1 A, B, C).

Radiology techniques

Computed tomography (CT) scan without injection was the first choice imaging in these patients (3).

Four-vessel angiography of brain was confirmed at the earliest possible time; specific views was requested with dominancy on A1 segment, the difference of the diameter of A1 in right and left, the size of anterior communicating artery, oblique position, and the aneurysm projection. Magnetic resonance (MR) angiography and CT angiography were not performed routinely because of the lack of access to these noninvasive methods in our center.

The time of surgery

Our policy for the patients with anterior communicating artery aneurysm was early surgery. After stabling the general condition of the patients (cardiovascular and respiratory system, fluids and electrolytes and coagulation state) and performing angiography, the surgery was done with the collaboration of anesthesiologists in the first 72 hours (4).

Surgical approach to the aneurysms

Among the four standard techniques (frontoorbitozygomatic, interhemispheric, transorbital and pterional), we chose the ptreional technique (5). In grades IV and V we did craniotomy in addition to ventriculostomy.

Positioning

The patients were placed supine on the operating table. The head was rotated (45 to 60 degrees) to the side opposite to the surgical incision.

The patient's head was rotated with 10-15 degrees to the vertex and it was placed superiorly to the heart. The patient's neck was also slightly extended (6, 7).

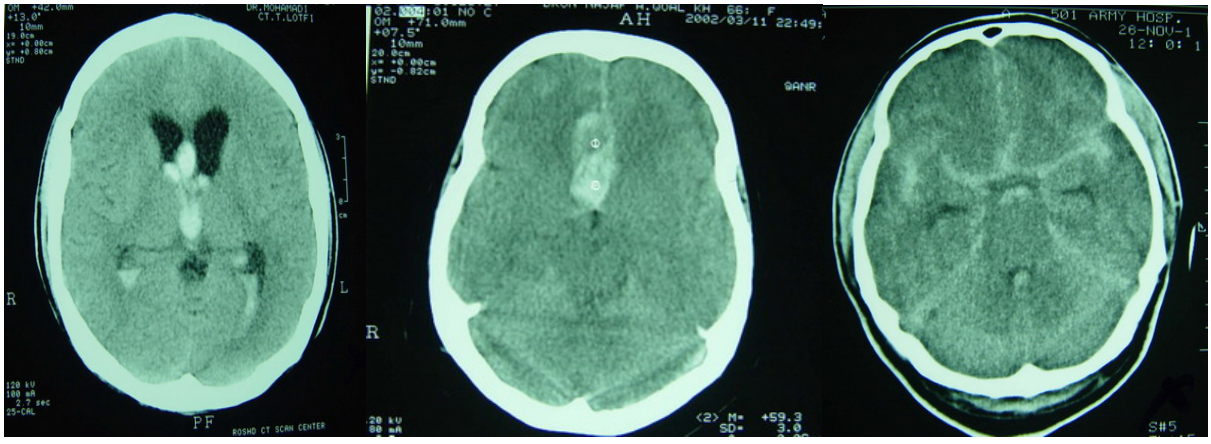
Primary exposure

During the craniotomy, we removed the lateral sphenoid ridge to the extent that the cisterns of base were reached with no significant retraction of brain. The primary corridor depends on the location and angle of the aneurysm to the adjacent arteries.

In the majority of anterior communicating arteries such as those with posterior and anterior direction and the aneurysms placed superior to the tuberculum cella, the primary exposure from the frontal corridor is much more secure. In aneurysms with anterior direction and adherence to the tuberculum cella or in aneurysms with inferior direction, it is safer to expose primarily from temporal corridor. The cisterns of optic carotid were opened in the depth of sphenoid wing. Then the retraction was placed gradually on temporal lobe and the dissection was commenced. Placing the retraction on the frontal lobe must be done with precaution.

Rectus gyrus corticotomy

In the majority of patients (25 cases), we performed rectus gyrus corticectomy. The corticectomy was commenced to the extent of 5 mm parallel to olfactory tract and it was continued to the top of optic nerve. It was performed by suction and bipolar cutter.



A **B** **C**

Fig. 1. A. Intraventricular hemorrhage; **B.** Intracerebral hemorrhage; **C.** Subarachnoid hemorrhage.

Enough attention have to be paid to interhemispheric piarachnoid to remain intact; it plays a major role in protecting the aneurysms and other important segments of arteries. After marking A1 and perforans we continued to dissect interhemispheric by opening the arachnoid, A2 and aneurysm were distinguished. A1 and A2 in the other side should also be exposed (8).

Temporary clipping

We used temporary clipping in our patients. Protection of brain during the temporary clipping was performed with the collaboration of anesthesiologists and it included: mannitol 100 mg, thiopental, phenytoin 250 mg, SBP: 120-170 mmHg. The duration of clipping was 5-7 minutes. If further time was needed, clipping was arranged intermittently.

Permanent clipping of the neck of aneurysm

1- Aneurysms with anteroinferior projection (9 cases) (Fig. 2. A): perforating branches usually doesn't exist in these aneurysms. We must pay attention while retracting the frontal lobe, because the dome of these aneurysms is attached to the tuberculum sella and the probability of rupture is high.

2- Aneurysms with posterior projection (6 cases) (Fig. 2. B): these are the most complicated type of aneurysms. The majority of perforant vessels are placed adjacent to the neck or in the inferior surface of the dome of aneurysms, they have to be shared and to be released before permanent clipping. In these types of aneurysms, some of the surgeons place the temporary clipping in both A2s, but we placed it just in ipsilateral A1.

3- Aneurysms with superior projection (15 cases) (Fig. 2. C): in these types of aneurysms the A2 segment may be detected hardly or it is necessary to use fenestrated clipping (2 cases). In one of our patients, anterior communicating artery had become aneurysmal completely and clipping was impossible, so we performed wrapping.

In the end of surgery, after removing the temporary clipping, we stabled the patients' blood pressure to 150-170 mmHg to become assured of the hemostasis of the surrounding of aneurysm and the region of rectus gyrus corticotomy.

Post- operative

In intensive care unit (ICU) we stabled the blood pressure to 170-180 mmHg in order to treat the vasospasm. We begun 3 lit serum daily and we prescribed nicardipine 8 mg/ q8 h and Dilantin 100 mg/q8 h for 3 weeks. After surgery we did angiography as control in all patients.

Complications

Potential complications include aspiration, congestive heart failure, seizure, DV-T, electrolyte disturbances, mental change, meningitis and making mistake between the right and left side of radiography. Any complication was treated.

A **B** **C**

Fig. 2. A. A 49 years old male, grade 2; **B.** A 45 years old male, grade 2; **C.** A 53 years old female, grade 1.

RESULTS

Among 30 patients who have been operated, 25 cases were in grade I and II (Hunt and Hiss scale). The majority of low grade patients recovered without neurological deficits. The outcome of patients categorized based on Glasgow outcome scale. Surgical mortality was 10% in our study (Table 1).

DISCUSSION

In this survey after stabling the general conditions of patients with ruptured anterior communicating artery aneurysms, we operated them at the earliest possible time. To avoid rebleeding and to confirm vigorous treatment of ischemic events of vasospasm, we must treat the patients with ruptured intracranial aneurysms as soon as possible (9, 10). It has been shown that early surgery in ruptured anterior communicating artery aneurysms has a good prognosis with a low morbidity (11). Among the four standard techniques of anterior communicating artery aneurysms operations, we selected the pterional technique for these reasons (12-14): 1) the distance between skull and anterior communicating region will be shortening; 2) approach to the aneurysm is more vertical than approaching from the neck; 3) the proximal control is performed easily; and 4) the majority of surgeons are more familiar and experienced in this method. We did rectus gyrus corticotomy in the majority of patients because of the better exposure, less retraction and the lack of retraction deficits.

Since the rupture of aneurysm during surgery triples mortality and morbidity (15) we used temporary clipping in all patients. The duration of temporary clipping was 5-7 minutes in our survey whereas in the cases which further time was needed, we did the clipping intermittently. In some of the reports the duration of clipping is permissible to extend to as much as 40 minutes (16). In a survey done in the patients with temporary clipping during their surgery, especially those with the duration more than 9 minutes, cognitive deficits has been detected in long-term follow-up. The results showed the consequences of temporary vessel occlusion on cognitive changes occur before ischemic injuries (17).

In our survey, the surgical mortality was 10% and the results of our survey are similar to the majority of the surveys done. French and colleagues reported a series of 25 patients with 4% mortality (18), Hook and Norlen reported 67 patients with 7% mortality (19) and Pool reported 56 patients with 7% mortality (20). In a cooperative study by Kassel and colleagues surgical mortality for AGA-ACA aneurysms was 16.8% (21).

Yashargil and colleagues reported a series of 371 cases of ruptured anterior communicating artery aneurysms (grades I-IV) operated during the years 1967 to 1979. All patients were operated on using Yashargil's microsurgical pterional approach. In their survey the rate of mortality was 5.9% (22). In our survey 80% of patients were in grade I or II (Hunt and Hess scale) and this is the same as the Yashargil study, whereas in other studies the average of 54.4% of patients were in grade I or II (23).

In conclusion, the results of this study demonstrated that prompt and on time attempts and the superior technique of surgery improves the surgical outcome. The successful surgery of these aneurysms depends on extensive preoperative and intraoperative planning. The focus is on planning and technical maneuvers that in our experience significantly affect the eventual surgical outcome.

Conflict of interests

We have no conflict of interests.

Table 1. Outcome of surgery on the basis of Glasgow outcome scale

Grade	Number and percentages of cases	Excellent	Good	Fair	Poor	Dead
1	19 (63%)	16	3	-	-	-
2	6 (20%)	4	1	-	-	1
3	2 (6%)	-	-	1	1	-
4	2 (6%)	-	-	-	1	1
5	1 (3%)	-	-	-	-	1

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