ICNSJ Case Serie

Intracranial aneurysm surgery: a case serie

Afsoun Seddighi[1], Amir Saied Seddighi[1], Hesam Rahimi Baghdashti[1], Mehrnush Vahidi[2], Mahsa Ashrafi[2], Mohmmad Yousef Yaghubi[2]

[1] Functional Neurosurgery Research Center, Shohada Tajrish Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[2] Qazvin University of Medical Sciences, Qazvin, Iran

ABSTRACT

Background: Intracranial aneurysms are fatal but also curable diseases of nervous system which often present suddenly with Subarachnoid Hemorrhage (SAH). The aim of this study is to show the results of 7 years surgery performed on patients with intracranial aneurysm admitted in our center.

Methods: This study is a retrospective case series that is performed by "existing data" in patient's documents. Different factors such as age, sex, sign and symptoms, anatomical location of deficit and before-after surgery complications have been analyzed.

Results: From February 2003 to June 2010, 54 cases (totally 62 aneurysms) were operated in our center. Male to female ratio was 1.28 and mean age was 50.47 years. The most common symptom was sudden severe headache. The most common sites were anterior communicating artery (40%), internal carotid artery bifurcation (35%) and middle cerebral artery (25%). Most of the patients were in grade 1 of Hunt & Hess scale. The most common mortality was due to cardiopulmonary arrest.

Conclusion: Considering that mortality rate in older patients with different risk factors is so high, it seems that operating these patients on an emergency basis and intensive care for vasospasm leads to favorable outcome.

Keywords: Subarachnoid Hemorrhage; Cerebral Aneurysm; Early Surgery; Late Surgery

ICNSJ 2015; 2 (1):36-39 www.journals.sbmu.ac.ir/neuroscience

Correspondence to: Amir Saied Seddighi, MD; Functional Neurosurgery Research Center of Shohada Tajrish Hospital, Shahid Beheshti University of Medical Sciences; E-Mail: a_sedighi@sbmu.ac.ir

Received: July, 24, 2014 Accepted: November, 11, 2014

INTRODUCTION

Intracranial aneurysms are localized, blood-filled balloon-like bulge in the wall of a cerebral blood vessel due to wall weakness under hemodynamic stress. More than 90% of these aneurysms are found next to Willis circle and are more likely in anterior circulation[1]. The main etiology for aneurysm formation is still unclear but it is believed that genetic and congenital factors, hemodynamic conditions, ageing and infectious agents are related[2]. The main risk factors for cerebral aneurysms are age, sex, hypertension, smoking and alcohol overuse[3] and approximately 10 percent of patients have a family history[4]. It is estimated that about 3% of population have intracranial aneurysm[5] which is more common in the sixth decade of life[6]. Prevalence of occurrence of warning signs and symptoms varies between 15 to 60% and the annual rate of rupture is about 2% [7,8]. About 95% of subarachnoid hemorrhages are caused by a ruptured aneurysm that is a fatal form of stroke[6].

Hemorrhage in subarachnoid cavity causes signs and symptoms of increased intracranial pressure and meningeal irritation signs. Neurological signs and symptoms are often caused by pressure effect of intracranial hemorrhage (hematoma)[10]. Although the gold standard for diagnosis evaluation of an intracranial aneurysm is Digital Subarachnoid Angiography, other

methods such as Magnetic resonance imaging (MRI), CT scan, CT Angiography and lumbar puncture can also be useful[2].

Today the recommended surgery methods are coiling, embolization, intra cranial stent and clipping[10,11]. The best time for performing a surgical procedure is still controversial[12].

The objective of this study is to show the results of 8 years surgery on intracranial aneurysm cases in our center. Results of this study may be useful to provide the documented information based on academic research in order to form the health care service programs in patients with intracranial aneurysm.

MATERIALS AND METHODS

This research is a retrospective study that is based on existing data recorded in documents of patients with intracranial aneurysm who admitted at emergency unit of Shahid Rajai Hospital, Qazvin University of Medial Sciences, Qazvin, Iran, from February 2003 to June 2010 and have been operated.

Factors which have been evaluated in this study include: age, sex, time of SAH occurrence, duration between SAH and hospitalization, duration between SAH and surgery, history of background diseases, clinical manifestations, angiography results, neurological and non-neurological complications before and after surgery, surgical approach and mortality rate. Entire data was analyzed by using Microsoft Excel 2007 software.

RESULTS

From February 2003 to June 2010, 53 patients (with 62 aneurysms) had been admitted and operated in our center. Male to female ratio was 1.28. The mean age (± standard deviation) was 50.47 ± 15.4 (minimum 1.5 years and maximum 83). The mean age of men was 48.06 ± 17.6 and mean age of women was 48.66 ± 11.8.

The most common clinical symptom was sudden severe headache (88%). In order of prevalence, they showed loss of consciousness in 39%, neck stiffness in 31%, cranial nerves palsy and motor paresis each in 20%, seizure in 15%, nausea and vomiting and dizziness each one in 8%, blurred vision and neck pain 5%, sphincter dysfunction and vertigo 3%, photophobia and fever and ataxia 1%.

CT scan in 72% patients showed confirmed SAH, in 11% the diagnosis was made by lumbar puncture and in 20% there was no evidence of SAH. 83% of the patients had single and 17% had multiple aneurysms.

The most common involved vessel was anterior cerebral artery in 40%. Other areas were ICA bifurcation in 35%, middle cerebral artery in 31%, posterior cerebral artery and pericallosal each one in 1%. According to Hunt & Hess (H&H) grading 48% of patients were in grade 1, 37% in grade 2, 14% were in grade 3 and 1% in grade 4 and 3% in grade 5.

Before surgery, 45 patients had neurologic complications. The most common complications were hydrocephalus in 13 cases, 11 patients had intracerebral hemorrhage and 8 patients had seizure. The average time between the occurrence of subarachnoid hemorrhage and hospitalization was 3 days and the average time between the occurrences of subarachnoid hemorrhage and surgery was 4 days. Surgery on 8 of cases had been performed before 3rd day of ictus, in 26 cases between fourth and fourteenth day and in 69 cases after the day 14.

The most common neurologic complications after surgery were clinical vasospasm (in 22%) and hydrocephaly (in 12%): 9% were treated by external ventricular drainage and 3% needed ventriculoperitoneal shunt. The most common non neurological complication was hyponatremia (7%).

The mortality rate was 7.4% (4 cases). The average age of these patients was more than the average age of the survivals (56.2 years comparing to 50). The cause of death in 2 cases was pneumonia, in 1 case myocardial infarction and in 1 patient severe vasospasm infarction.

Using Glascow outcome scale 85% of the patients were in good recovery, 12% in moderate disability, 2% in severe disability and 1% death. After surgery the average time of follow up was 1.5 year (minimum of 1.5 y and 3 years maximum) and the average number of visits to follow up was 7 times.

DISCUSSION

The development of microscopic surgery of cerebral aneurysms began after the publication of an article by Krayenbühl et al[13]. According to this study, great results were obtained in aneurysm surgery in about 83% of patients. In another study, Nornes & Wikby reported 80% of excellent or good outcomes in their study (including complete neurological status improvement or slight disability)[14]. Sundt et al, operated 722 cases of cerebral aneurysm and obtained good or excellent results in 87% of the patients[15].

Le Roux et al, studied 224 cases of subarachnoid hemorrhage related to ruptured aneurysm in a ten-year period using advanced care equipment such as measuring intracranial pressure, using various hemodynamics monitoring, daily blood flow test using of Doppler

transcranial and treatment of severe vasospasm due to early surgery in patients with a good clinical status (1-3 grade of H&H) and they reported 86.6% rate of success[16]. Yasargil in his huge study including 1012 cases of cerebral aneurysm with a majority of late surgery obtained 94.7% success or good clinical status[18]. In the present study, the success rate is 85% which is comparable with other centers[19-20]. With regard to the correlation of H&H grading with the outcome, the results of the investigation reveals that in cases of lower H&H grading, more optimal outcomes were observed.

Complications and death due to intracranial aneurysm mostly occur in the first 14 days, and the most important reason for inaccurate prognosis after aneurysmal rupture is recurrent hemorrhage and vasospasm. Considering the lower recurrent hemorrhage risk, following surgical operation, neurosurgeons were encouraged to do early surgeries of the aneurysm. Although during brain surgery, the brain is very swollen in a way that it is hard to retract and observe the vital areas, and due to severe swelling the risk of mortality during surgery or post surgical brain stroke would be increased.

After the introduction of microscopes to neurosurgical surgeries and advances in the techniques of neurological anesthesia, intracranial aneurysm surgeries became easier and more possible[21]. Results of the studies in the last fifteen years show a preference of early surgeries in the first 72 hours in cases with a good clinical status. According to this study, those patients with a good clinical status (H&H grade 1-3) who went under operation between the days 4 and 14 had 61% success. However, those who were operated hastily (day 1-3) had 86% success, and those with delayed (late) surgeries (after day 14) also had a good final result. In this study, a few patients had critical primary clinical status (H&H grade 4-5), so accurate investigation was not possible.

The main role of neurosurgeons in cases of intracranial aneurysm is the prevention of recurrent hemorrhage. Aneurysm hemorrhage is a serious problem with 50-60% mortality rate and 20-30% complications. In case of rebleeding of an aneurysm, the prognosis would be much poorer and the mortality rate would become about 70-90% [22].

In a multi-center study on 2265 patients with cerebral aneurysm, the most risk of further hemorrhage was in the first 24 hours (4.1%) and in two weeks the cumulative incidence reaches to 19%. Between the days 4 till 9 risk of rebleeding was 2.1% and in 2 weeks it reaches to 16.8% [21]. Nowadays it is accepted that early surgeries have many advantages than late surgeries of cerebral aneurysms; for example, lowering risk of further hemorrhage, prevention and successful treatment of ischemic events, prevention and effective treatment of medical complications, successful treatment of vasospasm, bringing down patient's mental stress and lowering time of hospitalization. According to the results of a multicenter study about cerebral aneurysm the best outcome in these cases was for patients with good clinical status who were under surgery between the days 0-3; and in patients without a primary well clinical status, the best surgical outcomes is in late surgeries after 10 days.

Although the advantages of late surgeries will cause higher risk of further hemorrhage[22], in our country as a result of limited numbers of facilitated centers and limitation of facilities for transportations of patients according to unstable systemic and neurological conditions and unavailability of emergency diagnostic services, specially angiography, number of early surgery cases is less than other centers.

ACKNOWLEDGMENT

The authors wish to thank Mrs. Banooashraf Saberi and Mr. Esmail Seddighi for their great participation in the data analysis and editing this manuscript.

REFERENCES

1. Britz GW, Winn HR. The natural history of unruptured saccular cerebral aneurysms. In: Winn HR, Eds. Youmans Neurological Surgery. 5th Edition. Philadeiphia: W. B. Saunders; 2004. pp. 1781-91.
2. He H, Jazdzewski K, Li W, Liyanarachchi S, Nagy R, Volinia S, et al. The role of microRNA genes in papillary thyroid carcinoma. Proc Natl Acad Sci U S A. 2005 Dec 27;102(52):19075-80.
3. Feigin VL, Rinkel GJ, Lawes CM, Algra A, Bennett DA, van Gijn J, et al. Risk factors for subarachnoid hemorrhage: an updated systematic review of epidemiological studies. Stroke. 2005 Dec;36(12):2773-80.
4. Huttunen T, von und zu Fraunberg M, Frösen J, Lehecka M, Tromp G, Helin K, et al. Saccular intracranial aneurysm disease: distribution of site, size, and age suggests different etiologies for aneurysm formation and rupture in 316 familial and 1454 sporadic eastern Finnish patients. Neurosurgery. 2010 Apr;66(4):631-8; discussion 638.
5. Vlak MH, Algra A, Brandenburg R, Rinkel GJ. Prevalence of unruptured intracranial aneurysms, with emphasis on sex, age, comorbidity, country, and time period: a systematic review and meta-analysis. Lancet Neurol. 2011 Jul;10(7):626-36.
6. van Gijn J, Kerr RS, Rinkel GJ. Subarachnoid haemorrhage. Lancet. 2007 Jan 27;369(9558):306-18.
7. Okawara SH. Warning signs prior to rupture of an intracranial aneurysm. J Neurosurg. 1973 May;38(5):575-80.

8. Day AL. Aneurysms of the ophthalmic segment. A clinical and anatomical analysis. J Neurosurg. 1990 May;72(5):677-91.

9. Laissy JP, Normand G, Monroc M, Duchateau C, Alibert F, Thiebot J. Spontaneous intracerebral hematomas from vascular causes. Predictive value of CT compared with angiography. Neuroradiology. 1991;33(4):291-5.

10. Shima H, Nomura M, Muramatsu N, Sugihara T, Fukui I, Kitamura Y, et al. Embolization of a wide-necked basilar bifurcation aneurysm by double-balloon remodeling using HyperForm compliant balloon catheters. J Clin Neurosci. 2009 Apr;16(4):560-2.

11. Spiotta AM, Miranpuri A, Hawk H, Chaudry MI, Turk AS, Turner RD. Balloon remodeling for aneurysm coil embolization with the coaxial lumen Scepter C balloon catheter: initial experience at a high volume center. J Neurointerv Surg. 2013 Nov;5(6):582-5.

12. Findly JM. Cerebral vasospasm. In: Winn HR. Eds. Youmans Neurological Surgery. 5th Edition. Philadelphia: W. B. Saunders; 2004. pp. 1839-67.

13. Krayenbühl HA, Yasargil MG, Flamm ES, Tew JM Jr. Microsurgical treatment of intracranial saccular aneurysms. J Neurosurg. 1972;37:678-686.

14. Nornes H, Wikeby P. Results of microsurgical management of intracranial aneurysms. J Neurosurg. 1979 Nov;51(5):608-14.

15. Sundt TM Jr, Kobayashi S, Fode NC, Whisnant JP. Results and complications of surgical management of 809 intracranial aneurysms in 722 cases. Related and unrelated to grade of patient, type of aneurysm, and timing of surgery. J Neurosurg. 1982 Jun;56(6):753-65.

16. Le Roux PD, Elliott JP, Downey L, Newell DW, Grady MS, Mayberg MR, et al. Improved outcome after rupture of anterior circulation aneurysms: a retrospective 10-year review of 224 good-grade patients. J Neurosurg. 1995 Sep;83(3):394-402.

17. Yasargil MG. Microneurosurgery; Vol 11. Stuttgart: Georg Thieme Verlag; 1984. pp. 331-339.

18. Colli BO, Martelli N, Assirati Júnior JA, Machado HR, Sassoli VP. [Surgical treatment of intracranial aneurysms: comparison between early and late surgery]. Arq Neuropsiquiatr. 1993 Mar;51(1):87-95.

19. Varma A, Mehta VS, Singh VP, Patir R. Role of emergency surgery to reduce mortality from rebleed in patients with aneurysmal SAH. Neurol India. 2000 Mar;48(1):56-62

20. Kassell NF, Drake CG. Timing of aneurysm surgery. Neurosurgery. 1982 Apr;10(4):514-9.

21. Kassell NF, Torner JC, Jane JA, Haley EC Jr, Adams HP. The International Cooperative Study on the Timing of Aneurysm Surgery. Part 2: Surgical results. J Neurosurg. 1990 Jul;73(1):37-47.

22. Rosenørn J, Eskesen V, Schmidt K, Rønde F. The risk of rebleeding from ruptured intracranial aneurysms. J Neurosurg. 1987 Sep;67(3):329-32.