Multiple cerebral aneurysms of middle cerebral artery. Case report

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Abstract

Multiple cerebral aneurysms present a wide variation in incidence with averages of 13% at angiographic studies and 22.7% at autopsy.

High blood pressue, cigarette smoking, stress and possible also age and female sex seem to be risk factors for multiple intracranial aneurysms (MIAn) in patients of working age who have suffered a subarachnoid hemorrhage (SAH). Aneurysms were situated on the same side in one-third of the patients with two aneurysms and the most common site was the middle cerebral artery (MCA). To manage these challenging lesions neurosurgeons must use all available innovations and advances, including diagnostic, technical and perioperative adjuncts. The author presents a case of middle age female, with two saccular aneurysms situated on the same side (right MCA), who was operated in our clinic, 20 days after first SAH episode, I grade on Hunt/Hess scale. The angio MRI was performed before, and control DS angiography after operation. After pterional approach, the author used the magnification, microsurgical technics, temporal clip, and two permanent Yasargil curved clips. A postoperative good recovery enable the patient go to work and drive one month later.

Keywords: angio-MRI, multiple intracranial aneurysms, middle cerebral artery, subarachnoid haemorrhage, substraction angiography

Introduction

Arterial aneurysms (AA) are local out-pouching of a blood vessel wall. The most frequent sites for the aneurysms are the sites of bifurcation, anastomosis of the basal arteries of the circle of Willis, where the hemodynamic forces are higher, and in rare cases, the aneurysm can form directly from the sidewall of the non-branching artery. The aneurysmal sack may have a narrow neck or wide base (or detach from an artery on a wide stalk). In time, because it is supposed to chronic hypertension the vessel wall thickens and the aneurism enlarges and eventually ruptures, usually associated to an acute rising in blood pressure.

The incidence of multiple aneurysms varies from 14 to 45% presenting with SAH (3, 7, 15). There are a few variables that need to be taken into account in making the diagnosis of multiple aneurisms, including the experience of the radiologist, the number of vessels injected at angiography,

and the quality of the angiography equipment. Multiple aneurysms are observed in a fifth to a third of all cases at intracranial locations of aneurysm (13, 14). About 75% of patients have two aneurysms, 15% have three and in 10%, more than three aneurysms. In cases with multiple aneurysms, an association with gender (more frequently in women) has been observed. Multiple aneurysms are often observed in patients with diseases such as vasculopathy, fibromuscular dysplasia and polycystic renal disease

Factors that lead to aneurism development:

- Traumatic brain injury such as a blow to the head (less than 1% of all cases)
- An infection (termed a mycotic aneurysm, (2% of all known cases)
- A hereditary predisposition (They can run in families; this accounts for 20% of all aneurysms)
- Cigarette smoking and hypertension or high blood pressure
- Use of drugs such as cocaine and amphetamines
- Certain blood disorders: fibromuscular dysplasia, cerebral arteritis, arterial dissection.

The risk factors for an aneurysm rupture are:

- Medical family history
- Hypertension
- Tobacco use
- Female sex (3:2 female to male ratio for aneurismal rupture)
- Between the ages of 35 and 60.

The cause of aneurysm bleeding remains unknown in most cases. Studies have shown, however, that the following increase the risk of a rupture:

- Hypertension
- Strong emotions such as anger can raise blood pressure and cause a rupture (9).

In outlining symptoms of ruptured cerebral aneurysm, it is useful to make use of the Hunt and Hess scale of subarachnoid hemorrhage severity:

Clinical status	Grade
Asymptomatic, mild headache, slight nuchal rigidity	1
Moderate to severe headache, nuchal rigidity , no neurologic deficit other than cranial nerve palsy	2
Drowsiness / confusion, mild focal neurologic deficit	3
Stupor, moderate-severe hemiparesis	4
Coma, decerebrate posturing	5

Case report

The patient is a 49-year-old female, smoker, presenting with sudden onset of severe excruciating headache followed by vomiting episodes. She was a known hypertensive and often disrupted her treatment, heavy smoker of about 20-30 cigarettes/day, one liter light coffee/day and occasionally alcohol consumer. 25 years ago, the patient was operated for persistent ductus arteriosus. She was admitted 18 days after the simptomatology onset. Her clinical exam revealed an alert and oriented individual, slight neck stiffness, and no visual disturbances. No other deficits were recorded.

A clinical diagnosis of subarachnoid hemorrhage, Hunt and Hess grade-I was made. MRI- angiography revealed a small SAH in the right sylvian fissure,

moderate ventriculo-megaly and on right middle cerebral artery, two saccular and bilobated aneurysms.

First aneurism located at the junction of M1 with M2, 6 mm in diameter, with an inferior and lateral orientation was ruptured. The second, unruptured aneurism rested at the bifurcatiom of the right M2, with a diameter of 7 mm, was oriented superiorly.

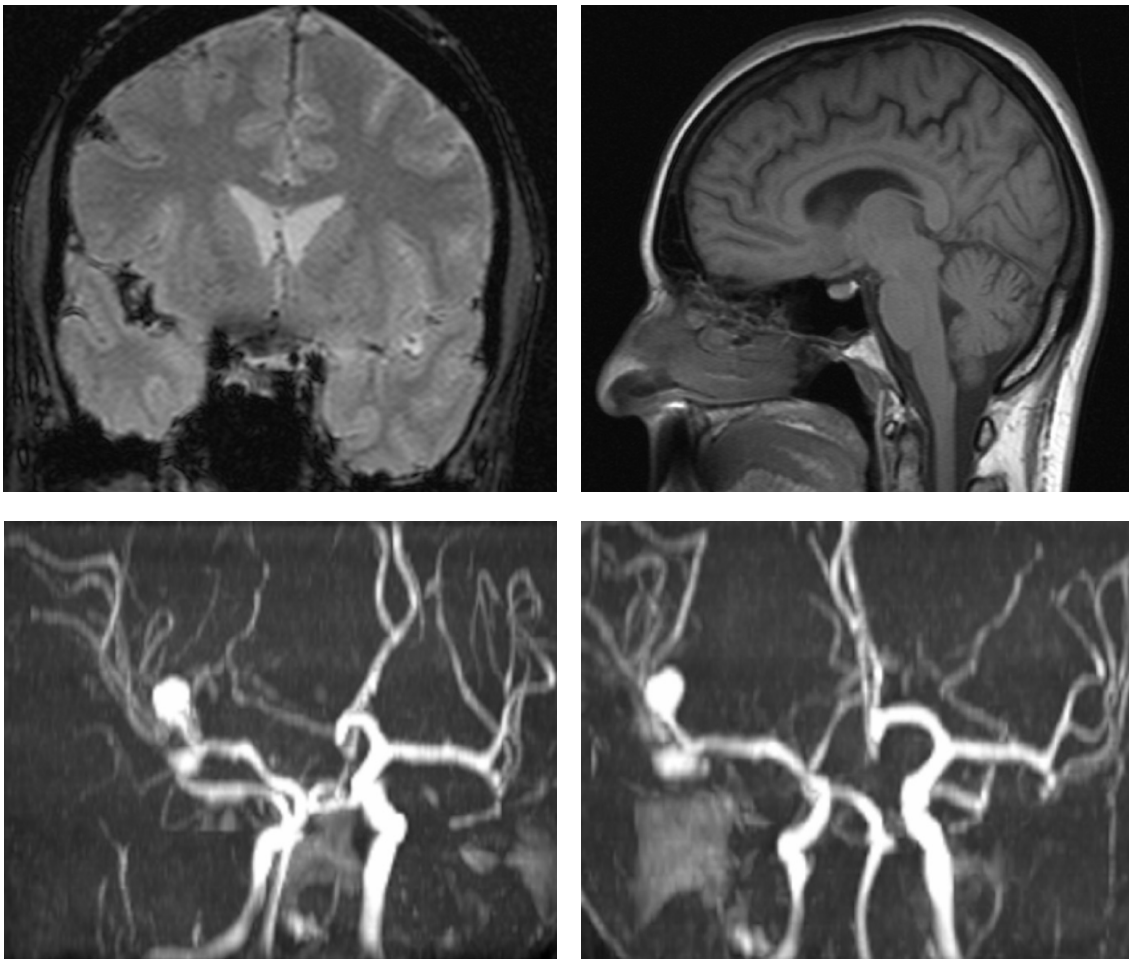

Figure 1, 2 Angio-MRI show two saccular and bilobated aneurysm: first to the junction M1 with M2 (ruptured) and the second between the two branches of M2 split (unruptured)

Preoperatory preparation:

Nimotop (60 mg in each 4 hours per os), algocalmin (500 mg three times a day), glycerin suppository was the preoperative medication.

After standard investigations (blood, ECG, X-ray lung), we operated the patient two day after admission.

The general anesthesia permitted the oro-traheal intubations, lumbar catheter for LCS evacuation and patient positioning: supine position, the head fixation in 45◦ left rotated and up to the cord line, with zygoma in top. The right pterional approach (Yasargil) was performed. After we performed the craniotomy, the dura was exposed and the rim of sphenoid wing was drilled off. Dura was opened in a curved fashion and temporary suspended. From that moment we were used the magnification, the microsurgical instruments and Leyla self-retractors. Using the lateral trans-sylvian approach, we dissected the M1 segment of right ACM and we found a large (12mm), saccular, bilobated aneurysm on the M1- M2 junction. The dissection was difficult in that moment because of adherences

secondary to SAH. The wall of first aneurism was impregnated with calcium plates. During the sharp dissection of aneurysm's neck, hypotension was induced. When we dissected the aneurysm dome, it started to bleed and the temporary clip on M1 before the junction was necessary.

The sharp dissection continued and the dimension of the aneurysm was diminished by bipolar coagulation. Finally we clipped the aneurysm's neck with a permanent curved Yasargil clip, it was verified by puncture of aneurysm's sac, and we suspended the temporary clip. It was easier to dissect the M2 segment of ACM, because no adherences occurred and the second aneurysm was more easily found between the two branches of M2 segment. The neck of the distal aneurysm was clipped safety. No other supplementary branches occurred, except that two. The puncture of the aneurismal sac was negative.

No complications appeared when the anesthetist increased the TA tilt 140/80 mm Hg occurred.

After 80 mg papaverinum in situ, we sutured the dura watertight (3.0 silk), and suspended it, the bone was fixed in four points, left a subgaleal drenage and finally, the muscular and subcutaneous and then the skin were close with interrupted sutures. 24 hours later the patient was in good condition with a Glasgow Coma Scale of 15 and begun mobilization with kinetotherapist.

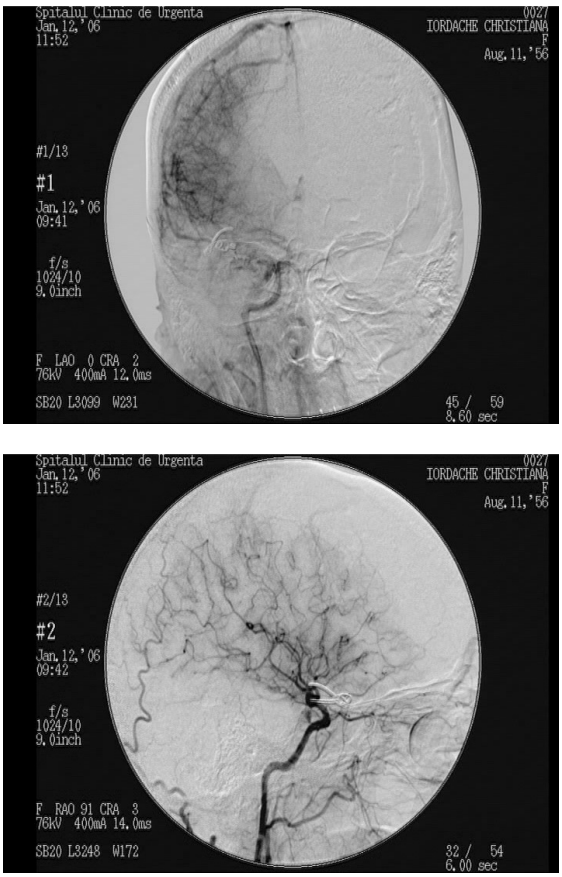

Figure 3 A, B Control angiography one month after the operation, shown the efficient position on the clips and the absence of both aneurysms. She was return to work and drive immediately after angiography

Discussion

The modern era of aneurysm surgery emerged in 1933, when Egas Monitz demonstrated, an aneurysm with the technique of cerebral angiography, which he discovered (11).

The first malleable hemostatic clips in neurosurgery were introduced by Cushing in 1911, but they are not appropriate to the standards of aneurysms clipping. (19)

The first planned intracranial operation for a saccular aneurysm was performed by Dott in 1933 by wrapping technique (9).

In 1937 Dandy clipped the neck of an aneurysm with a thiny metal clip and shriveled the sac with electrocautery.

Aided by technical advances and general progress in radiology, anesthesia, and intensive care, many neurosurgeons achieved progressively lower postoperative mortality rates after operations for

intracranial aneurysms like Yasargil and Drake in the 1960s-1970s (5).

It is generally agreed that multiple aneurysms should be treated medically unless there is evidence of rupture, or persistence or enlargement during or after treatment. If surgery is considered, all aneurysms easily approached ad the time of surgery should be clipped.

In Suzuki's personal series of 1080 cases, single aneurysms constituted 85% of the series, and multiple aneurysms 15 %. He reviewed seven other clinical series, totaling 10,795 cases, in witch the incidence of multiple aneurysms was 14.1% overall, with the range of 7.7 to 29,8%. He similarly reviewed six autopsy series in which 1404 cases were studied to reveal multiple aneurysms cases in 23.5% (range 18.9 to 50%) (22).

In two cooperative studies involving 6842 patients, 19 % of patients had more than one aneurysm (8,20).

At autopsy, 22% of patients in the study had multiple aneurysms (20). The lower rate of clinical detection probably reflects the fact that four-vessels angiography was not routinely carried out in 1969.

In the multiple aneurysms cases of the conservatively managed patients in the cooperative study and in Suzuki's personal series, patients having two aneurysms constituted 71 and 77%; three aneurysms, 23 and 15%; and four or more aneurysms, 7 and 6% of multiple aneurysms cases, respectively. Multiple aneurysms are relatively more common in females (74%) than males (20). The same study showed that 47 % of multiple aneurysms are on opposite sides. 21% are on the some side. 29% have one in the midline and one on the side, and 3% have both in the midline. When two internal carotid aneurysms coexist, the chance of their being "mirror" aneurysms is three times greater than that of their both being on the same side.

Similarly, with two middle cerebral aneurysms the chance is four times greater. When an aneurysm of anterior circulation is found, the chance of second aneurysm existing on the posterior circulation is between 3 and 5%.

With internal carotid and middle cerebral aneurysms, there is a tendency toward either symmetric aneurysms or a second aneurysm on the same vessel.

How it is possible to tell which aneurysm has ruptured? No clinical method predicts with 100% accuracy which aneurysm has bled. Traditionally, the largest of the aneurysm has ruptured (11).

Other angiographic signs of rupture are a local mass or vasospasm, irregular aneurysm shape, or intra-aneurysmal clot. When two aneurysms are on the same vessel, unless the proximal aneurysm is thrombosed, the proximal aneurysm has ruptured (2).

Clinical signs and usually not helpful, although a third nerve palsy or unilateral retro-orbital pain, for example, would suggest that an aneurysm had ruptured at the origin of the posterior communicating artery. Localized collections of subarachnoid blood on the CT-scan may point to the offending lesion. An algorithm for identifying the ruptured aneurysm (12), was as follows: exclude extradural aneurysms, look for focal blood on the CT-scan, check for focal mass or vasospasm on angiogram, observe size and shape(the larger aneurysms is more likely to bleed; if they are of similar size, look for irregularity of the sac or daughter loculus), use clinical signs, repeat the angiogram later and look for changes in the aneurysms, and finally

choose the aneurysms site with the highest probability of rupture (11, 25).

Subtle local changes may appear on MRI and angio-MRI (Figure 1, 2)

A new study in USA reveled the trends in the treatment of cerebral aneurysms (1).

The unruptured aneurysms are treated by endovascular therapy and the ruptured aneurysms are treated with clip placement. Surgical clipping procedures remained stable while the number of aneurysms treated by means of endovascular therapy procedures doubled (1).

In our case, the patient had two aneurysms of MCA from the same side: first was ruptured and the second was unruptured. Because in our clinic we don't use the endovascular procedures yet, we clipped both aneurysms in the same session.

Conclusion

The risk factors of multiple aneurysms, in order of importance are: cigarette smoking, high blood pressue, family history of cerebrovascular disease and stress, especially on the female in work age (15-60 years). The prognosis for subarachnoid hemorrhage remains reserved frequently despite the very good improvement of medical and neurosurgical treatment.

Multiple intracranial aneurysms are discovered in 15% to 35% of patients with aneurysm who present with subarachnoid hemorrhage. These aneurisms have the tendency to appear bilaterally at bifurcations but the author presents a case with multiple aneurisms situated unilaterally. The second particularity of the case is that the aneurisms were clipped in the same intervention.

Whether the prognosis for subarachnoid hemorrhage patients with multiple aneurysms is less favorable than that for subarachnoid hemorrhage patients with a single aneurysm is also not well established. It also remains controversial whether surgical outcome in subarachnoid hemorrhage in patients with multiple intracranial aneurysms is actually worse than that in subarachnoid hemorrhage to patients with a single aneurysm.

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