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Contralateral clipping of bilateral middle cerebral artery aneurysms. Case report

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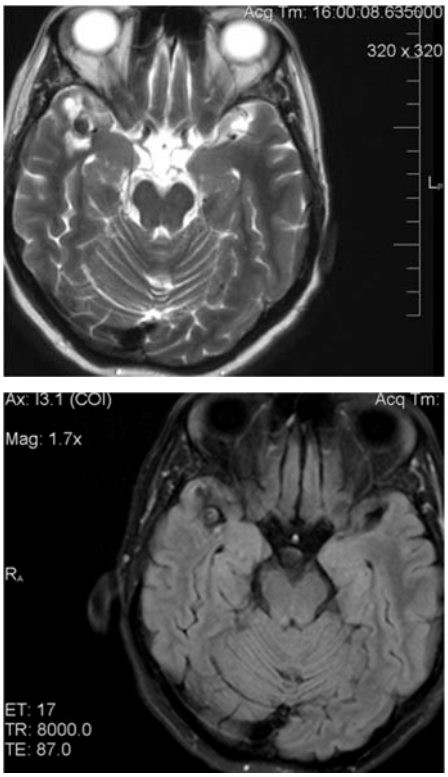
Introduction

Middle cerebral artery aneurysm represent 20% of all intracranial aneurysms, 20%-30% of patients with this pathology have multiple aneurysms. Bilateral middle cerebral artery aneurysm clipping can be done unilateral or bilateral, depending on a number of variables. A series of studies were conducted to determine the best method of treatment for this condition by comparing the surgical results of both approaches. Morphological features of the aneurysm can determine the choice of the best ways to approach.

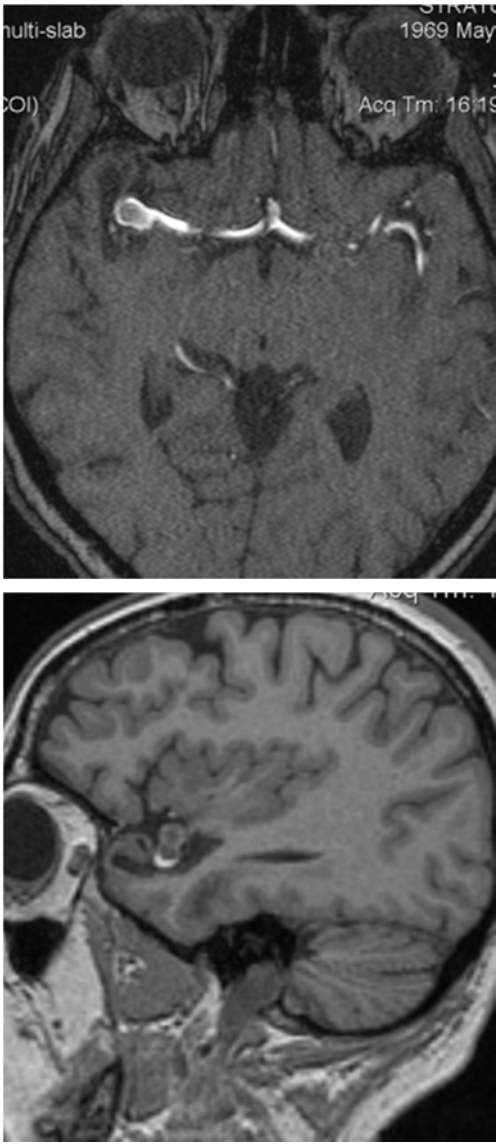
Case report

This is the case of a female patient of 47 years old who presented in Neurosurgery department for headache episodes and vertigo with onset of 2 years, but these episodes worsened by 2 month with a duration of 4 days. The patient is without significant associated pathology, except ventricular extrasystolic arrhythmia.

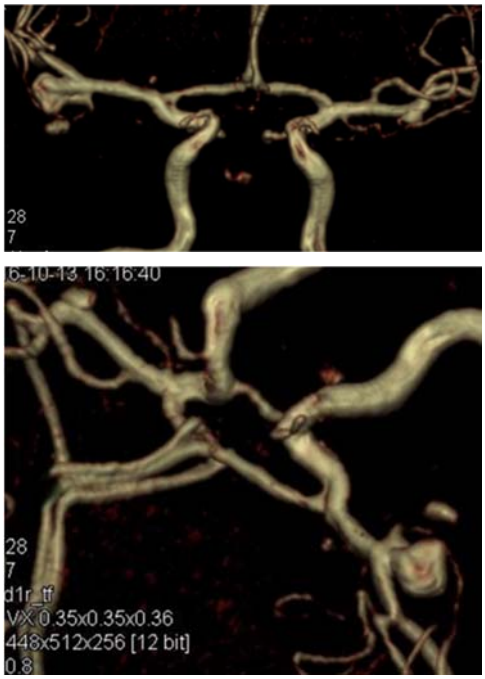
The cerebral MRI scan conducted pointed out two middle cerebral artery aneurysms of which the right one being partially thrombosed and larger with no signs of haemorrhage.



MRI scan T2, Flair, TOF, T1



The 3D reconstruction from the TOF acquisitions helped us to better visualize the aneurysm configuration and the branches additional to the aneurysm and confirming the supposition of a partially thrombosed aneurysm.



The next step was the digital subtraction angiography for a meticulous viewing of the vascular architecture and to evaluate the possibility of an endovascular treatment.

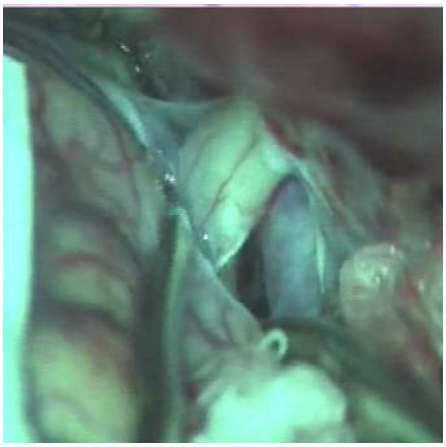
DSA- left ICA, right ICA

Considering the fact that the right bifurcation MCA aneurysm is partially thrombosed and the contralateral MCA aneurysm has a large neck at the origin of a lateral lentriculostriate artery, then the best treatment option was bilateral clipping via a unilateral craniotomy.

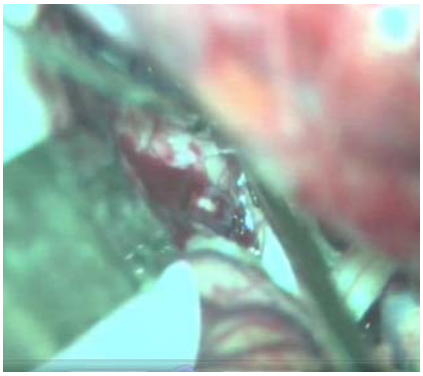
The aneurysms were clipped by a right frontotemporal craniotomy. Patient was seated in supination, with the head in an easy extension and slightly rotated to the left. A curvilinear skin incision was made starting at the zigomatic arch and extending to the midline behind the hairline. The skin flap was retracted anteriorly and the temporal muscle was retracted laterally. A frontotemporal craniotomy was performed of about 4cm/4cm in two burr holes, one at the pterion and another at the level of the superior temporal line. A part of the lesser wing of the sphenoid bone was removed using a rongeur. The dura was incised in a curvilinear manner and suspended anterior. Dissection of the sylvian fissure was performed under the magnification of the microscope.

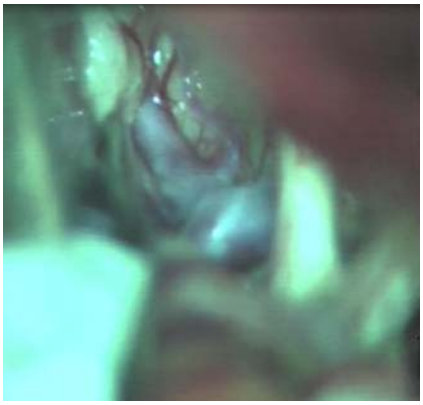
Steps:

1. Proximal ipsilateral sylvian fissure dissection and retraction of the frontal lobe with visualization of the ipsilateral optic nerve, supraclinoid ICA up to the bifurcation after dissection and opening the carotid and optic cisterns.

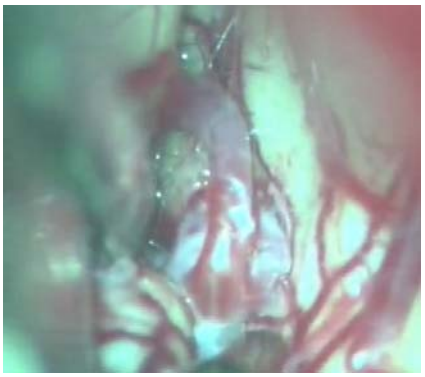


2. Contralateral opticocarotid space dissection and identification of the middle cerebral artery after dissection proximal of the left sylvian fissure. Progressive elevation of the medial frontal lobe helped to uncover the left M1 segment.

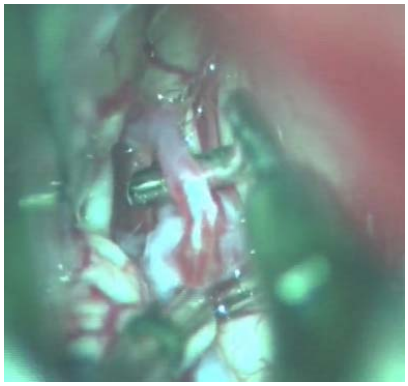


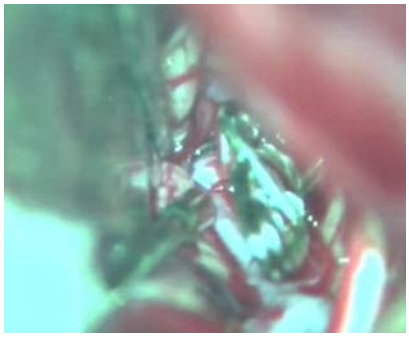


3. Exposure of the contralateral MCA bifurcation by progressively increased retraction of the contralateral frontal lobe and dissection of the arachnoid adhesions along the inferior surface of the MCA and identification of the aneurysm.



4. Aneurysm clipping

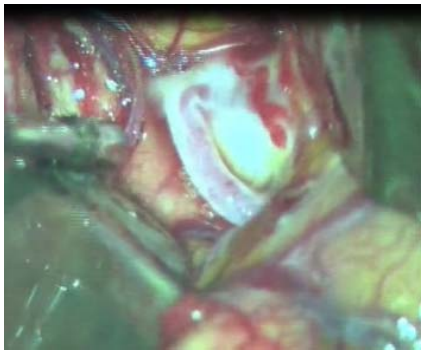


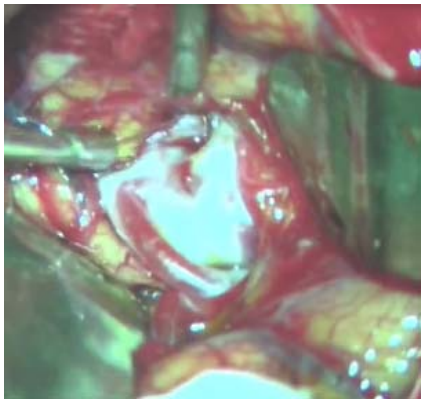


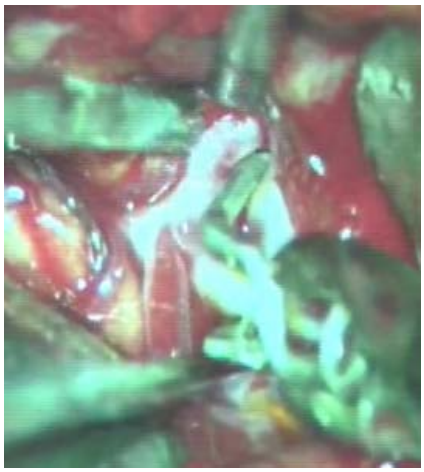
5. Ipsilateral aneurysm clipping using ultrasound guidance and focused sylvian opening.

6. Identification of the bifurcation right MCA aneurysm and first clip application after

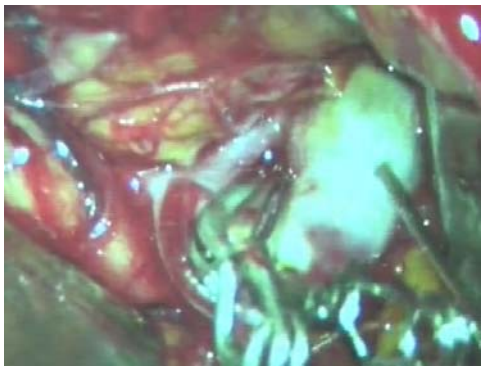
visualization of the distal M1 segment, M2 frontal, M2 temporal branches.

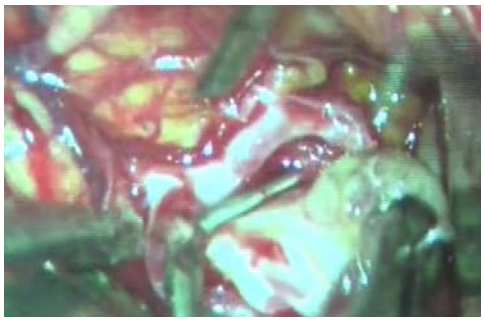




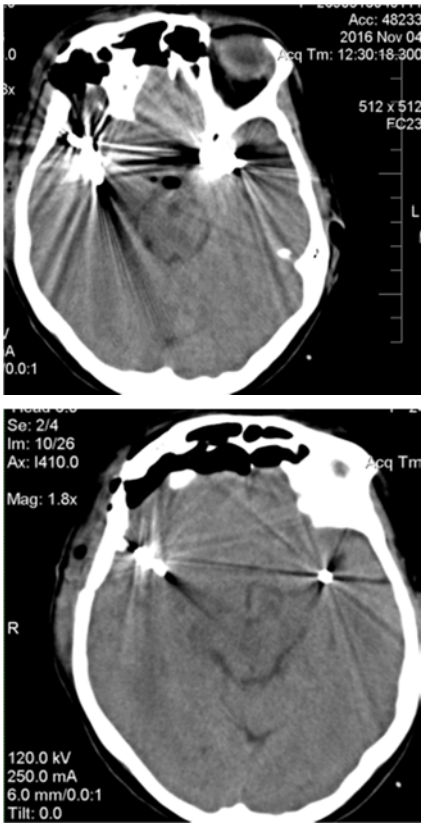


7. Dissection of the dome from the M2 branches and adhesions, application of the second clip and sectioning the aneurysm.





Postoperatively patient had a good outcome, with no neurological sequelae and was released after 6 days.



Postoperatively CT scan

Discussion

Microsurgical clipping of the middle cerebral artery aneurysm is still the method of choice for the treatment of these. Some advantages it would be efficient and sustainable exclusion from circulation of the aneurysm and the treatment of the complications like intracerebral hematoma associated or the treatment of intracerebral hypertension. Location of the aneurysm is very important for preoperative planning especially for aneurysms in the mirror. For aneurysms located at the bifurcation of the MCA is mandatory to dissect the aneurysm and both the M2 segments for a good application of the clip with complete occlusion of the aneurysm neck. If this theory is not possible, the best choice is to leave a part of the neck unclipped in order to keep both M2 permeable. Another notion that we must take into account is that the lateral lenticulostriate arteries may arise at the bifurcation or even distal. Additional steps are required when intraluminal thrombosis, calcifications or giant or a more complex configuration appear. Especially in cases when the aneurysm in unruptured, a less invasive approach is chosen like minimizing the craniotomy size, the brain and vessels manipulation and a focused opening of the sylvian fissure. This management may be helped by intraoperatory neuronavigation or ultrasound.

Classically the proximal sylvian approach is used, when the sylvian fissure is dissected from medial to lateral, this allowing an early proximal control and the neck of the aneurysm is exposed before the dome, but with the risk of injury of vessels of sylvian fissure by extensive dissection. The distal sylvian approach that requires less dissection or superior temporal gyrus approach are less used.

New less invasive methods like focused sylvian opening with or without using neuronavigation or ultrasound are more effective by avoiding extensive dissection and minimizing the risk of vasospasm. This method allows viewing the M1 segment proximal to the neck and also the dome and the M2 branches around the aneurysm. Among the disadvantages include anatomical

disorientation or there may not be sufficient surgical field to apply more clips.

Regarding contralateral clipping of MCA aneurysm through a unilateral approach is needed for a careful review of the local vascular anatomy. Classical theory says that the optimal aneurysm that can be clipped via a contralateral approach is an unruptured MCA-M1 segment aneurysm that is projected interior or anterior. In cases when the aneurysm is located at the MCA bifurcation, the contralateral approach is feasible if the M1 segment is short, if there is no brain edema after SAH, hydrocephalus, or arachnoid adhesions and the aneurysm projection is advantageous.

The contralateral frontotemporal approach for anterior circulations aneurysms was described in some series with success, but a microsurgical anatomical corridors for approaching these aneurysms were not determined. From studies published the length of the M1 segment for a safe approach is 14 mm.

The rate of obliteration after surgical clipping in between 97%-99% the rest consisting of some cases with residual neck or incomplete obliteration of the aneurysm dome.

Conclusion

A single craniotomy with a contralateral microsurgical approach has a good postoperative outcome with a shorter surgical time but requires a preoperative meticulous analysis of the local anatomy, the distance to the contralateral corridor and aneurysm configuration.

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