Case report

Contralateral approach for middle cerebral artery aneurysms with long M1 segment: report of 2 cases

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A R T I C L E  I N F O

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A B S T R A C T

Introduction: Contralateral clipping of middle cerebral artery (MCA) aneurysms is not practiced widely and has been reported only in case series. Some of the neurosurgeons proposing this approach have even postulated that a short M1 segment is a basic requirement for performing it.

Cases: We present our experience using a contralateral approach with 2 patients who had 3 MCA aneurysms located more than 2.5 cm from the carotid bifurcation. All 3 aneurysms were completely occluded, as demonstrated on postoperative CT angiography, and the patients' neurological evolution was uneventful.

Discussion: The contralateral approach can be regarded as a safe and effective technique for MCA aneurysm clipping. One contraindication frequently stated is the length of the MCA M1 segment; however, our experience proves that long distances can be reached if an adequate Sylvian fissure dissection is performed. We consider that the use of a contralateral approach requires fine technical skills and should be the choice only under judicious case-to-case planning, always bearing the preferences and experience of the neurosurgeon in mind.

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Abordaje contralateral en aneurismas de la arteria cerebral media con segmento M1 largo: a propósito de dos casos

R E S U M E N

Introducción: El abordaje contralateral en aneurismas de la arteria cerebral media (ACM) no es muy utilizado, debido a las dificultades técnicas que plantea la distancia de disección tan larga. Incluso se ha promulgado que, en los casos en los que el segmento M1 de la ACM sea muy largo, estaría contraindicado el uso de este abordaje contralateral.

Casos: Presentamos nuestra experiencia con tres aneurismas en dos pacientes a los que se realizó abordaje contralateral, pese a estar situados a más de 2.5 cm de la bifurcación carótida. En los tres aneurismas se comprobó el correcto pinzamiento mediante angiotomografía computarizada postoperatoria y la evolución neurológica de los dos pacientes cursó sin complicaciones.

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Introduction

Contralateral middle cerebral artery (MCA) aneurysm clipping has been well described and practiced for aneurysms near the Circle of Willis because of its central position. However, a long distance to the MCA bifurcation has been traditionally considered a challenge to reach this location. Hence, contralateral clipping of MCA is not widely advocated and has been only reported in case series. Among the neurosurgeons who have proposed this approach, a short length of the MCA M1 segment has been postulated as a basic requirement to perform it.

We present two patients harboring three MCA aneurysms located in a distance longer than 2.5 cm from the carotid bifurcation that have been approached contralaterally.

Cases

Case 1

A 56 years old male suffered a subarachnoid hemorrhage (SAH) three months earlier. He was admitted to our hospital in coma and the Angio-CT showed a left giant MCA as the cause of the bleeding. Another two incidental aneurysms on the contralateral MCA were diagnosed (Fig. 1) but, because of the brain swelling, only the ruptured left aneurysm was clipped. The two contralateral MCA aneurysms were located at the 23 mm and 29 mm from the internal carotid artery (ICA) bifurcation (Fig. 2). Three days later, the patient presented delayed cerebral ischemia in the left MCA territory with increased intracranial pressure and he underwent decompressive left hemicraniectomy. After his stabilization at the ICU he was transferred to a rehabilitation centre in which he evolved very well, strolling independently and recovering his speech. At this time, reposition of the bone flap was decided and we planned clipping of the contralateral two aneurysms in the same intervention.

The patient was positioned with the head turned 30-45° to the right with the purpose to create a corridor to the contralateral MCA, instead of the neutral position of the head that we usually use in ipsilateral MCA aneurysms. The ipsilateral (ICA) bifurcation was dissected and A1 anterior cerebral artery (ACA)
was identified and followed to the anterior communicating artery complex. The chiasmatic and lamina terminalis cisterns were opened, and the contralateral A1 ACA was followed to the contralateral ICA bifurcation (Fig. 3). The contralateral carotid cistern was opened to visualize the origin of M1 MCA and the Sylvian cistern arachnoid was opened widely to enter the Sylvian fissure. Dissection proceeded distally along the M1 MCA visualizing the two aneurysms and the two M2 MCA branches (Fig. 4). The aneurysms were clipped without temporal clipping of the M1 MCA. Finally the left bone flap was repositioned.

Surgery was uneventful with no complications following the procedure and the neurologic state of the patient showed no deterioration. Post-operative Angio-CT confirmed good occlusion of the two contralateral aneurysms (Fig. 3).

**Case 2**

This 64 years old female was admitted to our hospital intubated and in coma. She had suffered a hemorrhagic stroke 18 years before and a right pterional craniotomy was performed with no aneurysm found or clipped at that time. The current non contrast CT revealed a Fisher grade IV SAH with right temporal hematoma and intraventricular blood. Two mirror MCA bifurcation aneurysms were observed on the diagnostic Angio-CT (Fig. 5, A). The right one was considered the ruptured one because of the bleeding distribution on CT. The contralateral aneurysm was located more than 25 mm away from the left ICA bifurcation (Fig. 5, B).

Surgery was performed emergently. The patient was positioned with the head turned 30° to the left in a similar manner.

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**Fig. 3** – Operative sight of the contralateral approach. A, intraoperative picture at the beginning of the right ICA dissection; B, contralateral progression of the dissection up to the right ICA bifurcation. C, Postoperative axial CT showing the right Sylvian approach and clipping of the 2 right MCA aneurysms from the left sided craniotomy performed for the giant left ruptured MCA aneurysm treatment. A1: anterior cerebral artery; C: internal carotid; M1: middle cerebral artery segment M1; O: optic nerve; T: temporal lobe.

**Fig. 4** – Intraoperative pictures: (A) clipping of the more proximal right M1 aneurysm. (B) approaching the more distal right MCA bifurcation aneurysm and later (C) clipping it. M2f: frontal MCA branch; M2t: temporal MCA branch; *: aneurysm.
as described in case 1. We found a tight brain because of the acute stage of SAH and the amount of blood and hematoma. After clipping the ipsilateral right MCA bifurcation aneurysm and evacuation of the temporal hematoma, the same procedure described above for case 1, including fenestration of the lamina terminalis to obtain a better brain relaxation, was employed to reach and clip the contralateral aneurysm (Fig. 6).

The postoperative Angio-CT confirmed good occlusion of both aneurysms (Fig. 7). The patient's postoperative course was uneventful and she did not suffer any ischemic complications. After her stay in the ICU she was discharged to our neurosurgical floor in good neurological condition.

**Discussion**

The contralateral approach can be considered as a safe and effective technique to clip MCA aneurysms. Its use is not widely spread because of the fear caused by its hypothetical technical difficulty. The long dissection distance, limited view and impaired maneuverability of the brain have discouraged most neurosurgeons from employing this approach in one stage. Instead, clipping of the contralateral aneurysms in a second stage is usually preferred. However, this technique can be defended because of its evident advantage in avoiding a second intervention.

This complex technique implies some requirements to be commented. First, the contralateral MCA aneurysm should never be approached if it is the ruptured one because of its high risk of intraoperative bleeding. Although the excellent proximal control of the M1 MCA segment, the limited view of the surgical field blocks a good control of M2 MCA segments and, in case the aneurysm bleeds, it can not be optimally managed. Second, the limited maneuverability of the brain prevents the use of remodelling techniques. Therefore, only saccular aneurysms that can be clipped in a simple manner should be considered for this approach.

Since Oshiro et al. reported their study in cadaveric specimens⁷, a frequently stated contraindication is the length of the M1 MCA segment⁶, considering that aneurysms located more than 14 mm away from the ICA bifurcation are unclippable. Our experience, however, proves that distances much longer than that can be reached if an adequate Sylvian fissure dissection is performed. Therefore, we think that only extremely long M1 MCA segments or aneurysms located distally to the MCA bifurcation should be considered as contralaterally unapproachable.

Severe SAH can make tremendously difficult the contralateral MCA aneurysm clipping because of the brain swelling that diminishes the subfrontal corridor. In our first case, although fenestration of the lamina terminalis was performed, the pressure of the contralateral frontal lobe prevented us from attempting the contralateral MCA aneurysm clipping in the
acute stage. Alternatively, in our second case, in which the clinical state of the patient was also bad, the dissection was not difficult. This points out that aprioristic ideas should not be supported only on clinical conditions, but rather decided depending on the behaviour of the brain during the surgery. Of course, the neurosurgeon must be judicious and realize that if the retraction of the cerebral tissue has to be forced too much, he or she should not continue fighting and better wait for a second delayed craniotomy.

If the election of a contralateral approach is supported by the benefit of avoiding a second surgical intervention, we should weigh if the risk of a surgically more demanding technique is or not beyond the risk of a second contralateral craniotomy procedure. In this regard, a study by Rodríguez-Hernández et al., comparing the results of MCA aneurysms clipped by Dr. Lawton in two staged craniotomies against one staged craniotomy using the contralateral approach, concludes not only that the second practice is safe but also that the costs are lower. In our experience, the contralateral approach for MCA aneurysms, in a case by case judicious selection basis, is feasible and safe if you can accomplish the fine technical skills that it demands attending to the preferences and experience of the neurosurgeon.

REFERENCES


