

International Journal of Radiology and Diagnostic Imaging



E-ISSN: 2664-4444
P-ISSN: 2664-4436
www.radiologypaper.com
IJRDI 2022; 5(1): 28-31
Received: 18-11-2021
Accepted: 22-12-2021

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A case report: On middle cerebral artery aneurysm treated by coil embolization

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DOI: <http://dx.doi.org/10.33545/26644436.2022.v5.i1a.251>

Abstract

Introduction: Cerebral aneurysm is a common cause of intracranial hemorrhage, stroke, and death. It is treated with vascular surgeries, such as artery clipping and coil embolism. However, surgery itself is a risk factor that may cause rupture of aneurysm, and leads to irreversible brain damage, and even death.

Endovascular coiling is the procedure of choice to obliterate the aneurysm by a minimally invasive procedure.

Patient concerns: A 68-year-old female came to our hospital with thunderclap headache and sudden loss of consciousness.

Diagnosis: Non contrast CT, CT Angiography (CTA), Digital Subtraction Angiography (DSA) and 3D rotational angiography of the head shows a right Middle cerebral artery (MCA) bifurcation aneurysm arising and incorporating the origin of superior trunk of M2 and measuring 4.7 x 3.7 mm with the neck measuring 3.7 mm. There was also subarachnoid hemorrhage in the right Sylvain fissure with edema in the right temporo-parietal lobe.

Interventions: Considering the size and location of this MCA aneurysm, endovascular coil embolization was performed to obliterate the aneurysm.

Outcome: Post procedure, there was no abnormality detected. Six weeks after surgery, the patient's muscle tone in both upper and lower extremities were grade V. CTA confirmed no MCA aneurysm.

Lessons: Therefore endovascular coiling is a safe and effective method to obliterate the aneurysm and prevent recurrence of subarachnoid aneurysm.

Abbreviations: CT= Computed tomography, CTA = CT Angiography, DSA = Digital Subtraction Angiography, MCA = Middle Cerebral Artery.

Keywords: Case report, cerebral aneurysm, endovascular coil embolization

Introduction

Cerebral aneurysm is a common cause of intracranial hemorrhage, stroke, and death ^[1]. Rupture of aneurysm is a devastating event with a high mortality. Treatment of cerebral aneurysm is mainly by two procedures under current clinical practice ^[2]. The first procedure is coil embolism, in which platinum coil is inserted into the lumen of the aneurysm, and a local thrombus then forms around the coil, obliterating the aneurysmal sac ^[3]. The second one is surgical clipping which involves craniotomy and placement of a clip on the blood vessel to exclude the weakened area. Both procedures are associated with different complications. For example, coil embolism may lead to development of thrombo-embolism, ^[4] and intraprocedural aneurysmal rupture ^[5]. The complications of surgical clipping include new or worse neurologic deficits caused by brain retraction, temporary arterial occlusion, and intra-operative hemorrhage ^[6, 8]. Many studies have confirmed the safety and efficacy of endovascular embolization and have obtained comparable results to that of surgical clipping ^[9, 10, 11, 12]. Endovascular coil embolization of MCA aneurysms is a reliable technique to obliterate the aneurysm if the patient is too old, in a complicated condition to undergo craniotomy, is unwilling to undergo craniotomy, or is at a greater risk of bleeding 3 days after surgery. However this procedure requires careful evaluation of the angioarchitecture by using rotational 3D angiography, available in most new generation neurointerventional angiosuites, or 3D helical CT angiography might be helpful in the precise visualization of the aneurysm neck, shape, and size, supporting appropriate patient selection and further treatment planning ^[13].

Here we present a case report of a patient with Right MCA aneurysm. The risk of aneurysm rupture in this patient is relatively high due to its size and location. Endovascular coil embolization of MCA aneurysm is of great importance in this setting.

Patient information and clinical findings

The patient a 68 year old female came to our hospital with thunderclap headache and sudden loss of consciousness. Physical examination found sensory loss in left upper and lower extremities. The patient had reduced muscle tone and deep tendon reflex. Non contrast CT and CT Angiography of the head shows a saccular aneurysm in the M2 segment of the right middle cerebral artery with subarachnoid hemorrhage in the right Sylvain fissure (Fig. 1). Digital subtraction angiography (DSA) and 3D rotational angiography confirmed the diagnosis of a right Middle cerebral artery (MCA) bifurcation aneurysm arising and incorporating the origin of superior trunk of M2 and measuring 4.7 x 3.7 mm with the neck measuring 3.7 mm. (Fig. 2, 3)

The patient had history of hypertension, no history of diabetic mellitus, and coronary artery disease. New York Heart Association (NYHA) classification was grade I, and American Society of Anesthesiologists (ASA) classification was grade I. The patient had normal ECG, pulmonary function, echocardiography, Holter, and coronary CT angiography (CCTA) tests.

Considering the size and location of this MCA aneurysm endovascular management was planned and the patient was undertaken for coiling immediately after informed consent.

Therapeutic intervention

Surgical procedure

The patient was positioned supine on the operating table in the angi suite and administered general anesthesia. The head was held in position with a radiolucent carbon fiber support. A 7 fr (Penumbra) guiding catheter was navigated under fluoroscope control through a right femoral puncture placed in the right ICA, with the help of 8 fr short sheath placed in right femoral artery. The micro catheter echelon and traxus micro wire were positioned alongside the aneurysm neck through the guiding catheter. Two platinum coils were deployed in the aneurysm measuring 2.5mm in diameter and 6cm in length and the second coil was 2mm diameter and 4cm in length. In order to diminish the risk of embolism without increasing hemorrhaging unduly and prevent vasospasm, a 0.9% saline solution containing heparin (1000 U/L) was delivered at a continuous flow of 30 mL/h through the microcatheter and 15ml Nimodipine diluted in one litre 0.9% saline solution were administered through the guiding catheter respectively.

Cerebral DSA was performed demonstrated the complete exclusion of the aneurysm and preservation of the parent blood vessel without signs of stenosis (Fig. 4). The guide catheter were then removed, and hemostasis achieved by direct compression of the right femoral artery.

Follow-up and outcomes

Immediately after recovering from general anesthesia, the patient presented no neurological signs or symptoms. She was discharged from the intensive care unit on the first postoperative day and was discharged from the hospital on the third day. In the second week after surgery, the patient complained of headache, but improved after medication with oral analgesics. On the fourth week after surgery, she was totally asymptomatic.

Discussion

The successful management of a MCA aneurysm requires considerable expertise on the part of the interventional neuroradiologist together with the use of state-of-the-art techniques and equipment [14].

The morphology of the neck of the aneurysm is the most important feature of an aneurysm in terms of achieving the complete exclusion of the lesion without damaging brain blood flow [15-22]. Sometimes the presence of a wide and/or undefined neck, linked to the impaired circumference of the parent artery or efferent artery arising from the aneurysm, requires the use of techniques that are more complicated than simple endovascular coiling or surgical aneurysm clipping. In addition, since each case demands a particular solution employing patient-specific instrumentation and techniques, it is important to maintain a multidisciplinary perspective in order to maximize the effectiveness of the treatment and the safety of the patient.

In our case the aneurysm was obliterated with endovascular coiling. Stent assisted Endovascular aneurysm coiling, is associated with increased morbidity and mortality [23, 24]. Moreover, the use of a flow-diverting stent was rejected because of the risk of damaging perforator arteries, especially the lenticulostriate branches [25], and the high cost of such devices that renders them unavailable within the Indian public health service. Similarly, the use of surgical techniques would have elevated risk of morbidity and mortality [26].

While comparison of the various techniques is certainly of value, we believe that the benefits of a multidisciplinary approach are more significant in terms of effectiveness and safety. In our opinion, the endovascular techniques are minimally invasive with excellent outcome even in such complex neurovascular condition.

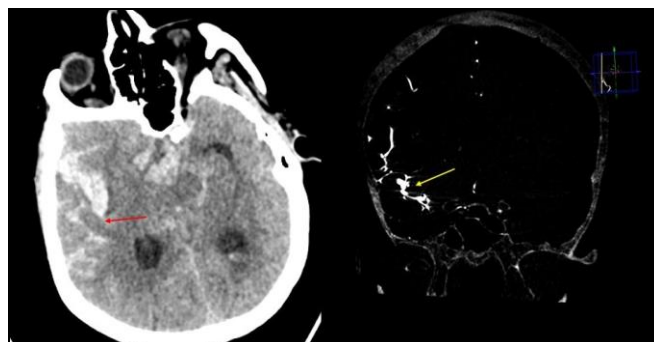


Fig 1: Non contrast CT and CT angiography of the brain shows subarachnoid hemorrhage (Red arrow) in the right Sylvain fissure with shows a saccular aneurysm in the M2 segment of the right middle cerebral artery (Yellow arrow)

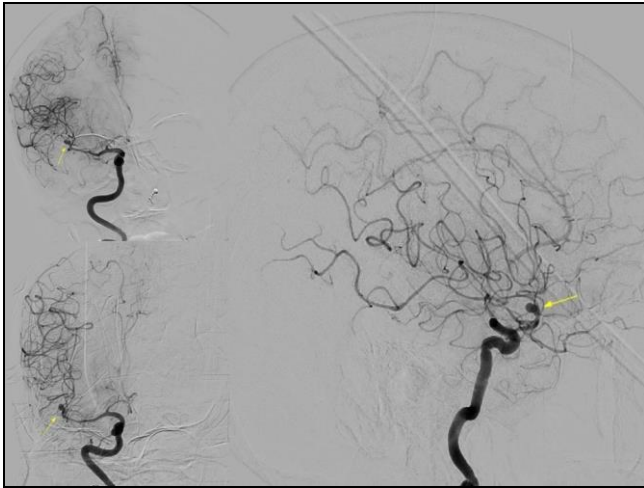


Fig 2: Digital subtraction angiography (DSA) and 3D angiography confirmed the diagnosis of a right Middle cerebral artery (MCA) bifurcation aneurysm arising and incorporating the origin of superior trunk of M2 and measuring 4.7 x 3.7 mm with the neck measuring 3.7 mm. (Images in Antero- Posterior, Lateral and Oblique views)

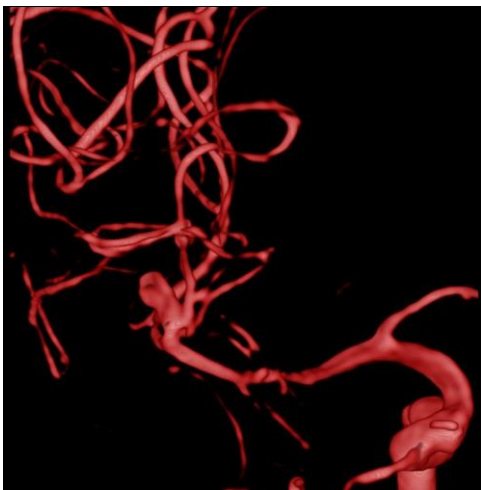


Fig 3: 3D rotational angiography demonstrating the morphology of the aneurysm.

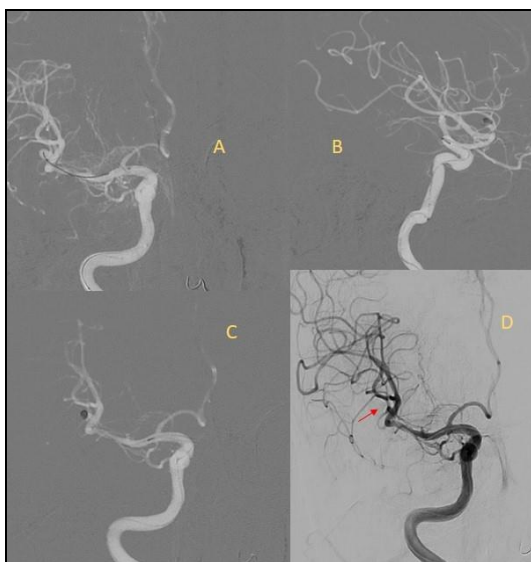


Fig 4: Digital subtraction angiography (DSA) demonstrating the coil being inserted in image A, first coil deployed in image B, second coil in image C and complete obliteration of the aneurysm in image D (Arrow).

Conclusion

An endovascular approach has been increasingly adopted as an alternative to surgical approach in MCA aneurysm management during the past decade. Since appropriate patient selection is paramount to optimize outcomes, an endovascular approach should be considered as the preferred strategy in definitive MCA aneurysm management.

Financial support and sponsorship: Nil.

Conflicts of interest: There are no conflicts of interest.

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