Anterior communicating artery aneurysm coiling

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Introduction

Coiling of an anterior communicating artery aneurysm is a minimally invasive endovascular procedure used to treat a cerebral aneurysm located in the anterior communicating artery of the brain. This procedure is commonly performed by neurointerventional radiologists and neurosurgeons. Here's how it works:

Diagnosis: The patient undergoes diagnostic imaging, such as cerebral angiography or CT angiography, to confirm the presence and location of the ACoA aneurysm. The size and shape of the aneurysm are also assessed.

Preparation: Before the procedure, the patient may receive general anesthesia or conscious sedation. The area near the aneurysm is cleaned and sterilized.

Access: A catheter (a thin, flexible tube) is inserted into an artery, typically in the groin area. This catheter is carefully guided through the arterial system and up into the arteries of the brain until it

reaches the ACoA.

Coiling: Using the catheter, the surgeon or radiologist advances a smaller, even thinner catheter to the location of the aneurysm. Through this smaller catheter, tiny metal coils (also known as detachable coils) are introduced directly into the aneurysm sac. The coils are made of materials like platinum or other metal alloys.

Coil Packing: The surgeon places the coils within the aneurysm to promote clotting and reduce blood flow into the aneurysm sac. This essentially seals off the aneurysm from the surrounding blood vessels.

Follow-Up: After the coils are in place, a final angiogram is usually performed to ensure the aneurysm is well occluded and there are no complications. If everything looks good, the catheters are withdrawn.

Recovery: Coiling is a minimally invasive procedure, and patients often experience a shorter recovery time compared to traditional open surgical approaches. After the procedure, patients are closely monitored for potential complications, and they may be prescribed antiplatelet or anticoagulant medications to prevent blood clots. They will be advised to avoid strenuous activities and may need to remain in the hospital for a few days.

The goal of coiling is to prevent the aneurysm from rupturing and causing a hemorrhagic stroke. This procedure is generally considered less invasive than surgical clipping, which involves open surgery to place a clip across the neck of the aneurysm. However, the choice between coiling and clipping depends on various factors, including the specific characteristics of the aneurysm and the patient's overall health. It's important for patients to discuss the available options and risks with their medical team to determine the best approach for their particular situation.

With regard to the endovascular technique, firstly, many Anterior communicating artery aneurysm (AcoA aneurysms) have very small sacs, which makes it difficult to distinguish between the aneurysm neck and the microcatheter selection, leading to a few disadvantages.

The standard aneurysm coiling technique is limited by its inability to occlude wide necked aneurysms. Stent deployment across the aneurysm neck supports the coil mass inside the aneurysmal sac, and furthermore, has an effect on local hemodynamic and biologic changes

In the cases of Choi et al., 17 of 112 aneurysms (15%) had very small sacs, and 15 of these patients (88%) were treated with surgical clipping [1].

The second disadvantage of endovascular treatment for AcoA aneurysms is poor controllability and track-ability due to arterial morphology and the acute angle during the endovascular procedure. Moret et al., [2] reported that the main causes of failure to embolize were loops in the cervical and intracranial vessels despite using the cervical approach when necessary and acute angle changes of the posterior projection of the aneurysm [3].

Furthermore, the lumen of the AcoA is relatively small, and remodeling neck techniques using balloons or stents is particularly difficult when treating wide neck or complex aneurysms Safe and complete endovascular occlusion of these aneurysms usually requires the assistance of combined approaches using balloons and stents in an individually tailored strategy [4].

The treatment modality of AcoA aneurysms is affected more by anatomic factors than other aneurysms. However, optimal treatment for AcoA aneurysms cannot be determined by any one anatomic characteristic; rather, all of the morphological features and clinical factors must be considered.

Many papers have emphasized the need for a collaborative approach to treatment strategies and have shown varying tendencies toward coiling or clipping [5)]

The decision-making process during recent years has become increasingly more based on collaboration. All patient cases are discussed by a team including at least one endovascular specialist, one neurosurgeon, and one neurologist. Those presenting acutely are always routinely reviewed by both a surgeon and an endovascular radiologist.

In the study of Choi et al., correlated 5 clinical factors and 5 anatomical factors related to determining treatment modality with clinical and anatomical outcomes. Of the 5 clinical factors, age was the important factor in both uni and multivariate analysis. Older patients (age, >65 years) had significantly higher odds of being treated with coil embolization vs. clipping (adjusted OR, 3.78; 95% CI, 1.39-10.3; p=0.0093). The anatomical factors that affected initial treatment modality decision included aneurysm size (small or large vs. medium), neck size (<4 vs. ≥4) dome-to-neck ratio (<2 vs. ≥2), vessel incorporation, multiple lobulation, and morphologic score. Among these 5 anatomical factors, small or large size, dome-to-neck ratio <2, vessel incorporation, and morphologic score ≥2 were statistically significant in univariate analysis. In multivariate analysis, only morphologic score was statistically significant.

Patients with more than 2 unfavorable factors were treated with surgical clipping 4.34 times more often than with coil embolization. Furthermore, higher scoring patients had a higher tendency to be treated with surgical clipping

Case series

Between June 1999 and December 2009, 103 Acom A aneurysms were treated with endovascular coiling. All the patients underwent digital subtraction angiography (DSA) and a diagnostic 3D rotational angiogram (3D-RA), followed by coiling using dedicated intracranial coils.

Of the 103 patients coiled, 52% presented in Fischer grade 3/4 SAH and 13.5% in Hunt and Hess grade 4/5. Technical success was 98%. Complete obliteration of the aneurysm was achieved in 97 (94%) patients. Only one patient died of direct procedure-related complication due to coil prolapse. None of the patients had rebleeds. Six-month check angiogram performed in 34 patients showed significant recanalization in one patient.

Ruptured Acom A aneurysms are implicated in majority of cases of SAH. The results support the latest guideline “that endovascular coil occlusion of the aneurysm is appropriate for patients with a ruptured cerebral artery aneurysm that is deemed treatable either by endovascular coiling or by surgical clipping.” [6)].

Notable findings include a high rate of technical success (98%) and a substantial percentage of patients achieving complete obliteration of the aneurysm (94%). Only one patient experienced a procedure-related death due to coil prolapse, and no rebleeding occurred in any patient. The study

supports the appropriateness of endovascular coiling for treating ruptured cerebral artery aneurysms, in line with current guidelines. However, the study is limited by its single-center retrospective design and a lack of long-term follow-up data. Despite these limitations, the results suggest that endovascular coiling is a viable and minimally invasive treatment option for Acom A aneurysms.

Case reports from the HGUA

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A 47-year-old male with vascular risk factors but of dyslipidemia, dilated cardiomyopathy, and ongoing investigation for chronic diarrhea by Gastroenterology. The patient was admitted for spontaneous subarachnoid hemorrhage, presenting with symptoms of myoclonus in the right hemibody, tonic deviation of the gaze, and jaw stiffness while asleep.

Upon emergency evaluation, a Glasgow Coma Scale (GCS) of 14 points was noted. Initial studies revealed aneurysms in the anterior communicating artery and the right middle cerebral artery. Urgent endovascular treatment was performed for the anterior communicating artery aneurysm, followed by craniotomy and clipping for the right middle cerebral artery aneurysm.

The patient was monitored with follow-up exams, demonstrating post-surgical changes in a cranial CT, normalization of intracranial hemodynamic parameters, and aneurysm exclusion in a follow-up angiogram. Around the 26th day of admission, the patient presented in good general condition, without headache, ambulating without incidents, and with adequate oral tolerance. Afebrile with stable vital signs and no focal deficits were noted. The surgical wound was in the process of healing, with staples already removed.

Complete antibiotic treatment was administered for bacteremia. The Doppler control indicated normalization of intracranial hemodynamic parameters. A follow-up angiography confirmed aneurysm exclusion.

In summary, the patient experienced spontaneous subarachnoid hemorrhage due to the rupture of a right middle cerebral artery aneurysm, successfully treated with both endovascular and surgical procedures. The patient showed favorable progress in subsequent check-ups.

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