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Stent-Assisted Aneurysm Embolization and Some Literature Review

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Abstract

Aneurysm formation is multifactorial, and specific risk factors are associated with the incidence and rupture of aneurysms. The prevalence of aneurysms in people without comorbidities was 2%, the mean age was 50 years, and 33% were male [1], while several other literature showed that the risk of aneurysm rupture was 1%-2.3% [2-3]. In addition to common smoking, alcohol consumption, hypertension, etc. [4-6], autosomal genetic diseases, polycystic kidney, Ehler-Danlos syndrome, myofibrodysplasia, Finnish and Japanese people, and female patients are generally at higher risk for aneurysm incidence, growth, and rupture [7]. Our research group recently admitted a patient with multiple intracranial aneurysms, and after evaluation, it was considered that the patient had a high rupture rate, so we adopted endovascular embolization therapy, that is, the spring coil filled with baskets.

Keywords: Aneurysm interventional therapy; Polycystic kidney

Introduction

In recent years, the vast majority of cerebral aneurysm patients have been treated with one of two reconstruction methods: craniotomy microsurgical occlusion of the tumor bearing artery reconstruction, or intracapsular treatment, in which the detachable spring coil is placed into the aneurysm sac to generate thrombus, so that the aneurysm can be excluded from the intravascular treatment outside the tumor bearing artery circulation. However, endovascular techniques for the treatment of brain aneurysms offer a less invasive option than surgical clamping. Coil embolization of aneurysms at specific sites has fewer complications. In particular, after the Guglielmi detachable coil (GDC) was approved by the U.S. Food and Drug Administration (FDA) in 1995, the results of the International aneurysmal Subarachnoid Hemorrhage Test (ISAT) gave coil a wide acceptance for the treatment of ruptured and unruptured aneurysms [8-9].

Case Description

A 67-year-old female patient visited the cerebrovascular clinic with "headache for 10 days". The patient had episodic dizziness 10 days ago without obvious inducement, and could improve after rest. Not accompanied by nausea, vomiting, no limb movement disorders, blind objects, ptosis. She was admitted to a local hospital 10 days ago. CTA indicated anterior communicating aneurysm and left internal carotid artery C7 aneurysm, and no special treatment was given in the hospital (Figure 1). In order to further diagnose and treat the cause of aneurysms, he was treated in our department, and "intracranial aneurysms" was included in the ward in the outpatient department. The patient had severe hypertension with a blood pressure of up to 170/100mHg on oral medication. The physical examination showed no obvious abnormal signs. However, CTA indicated anterior communicating aneurysms and left internal carotid artery C7 aneurysm (Figure 1). In order to further clarify the aneurysm morphology, we completed the evaluation and performed DSA angiography under local anesthesia. DSA indicated that the left internal carotid artery C7 segment aneurysm, anterior communicating artery aneurysm, tortuous vertebral artery (Figure 2). Two days later, after rigorous adaptation evaluation, we performed "stent-assisted aneurysm embolization with spring coil". The surgical records are as follows: The anesthesiologist gave the patient general anesthesia, the patient was supine, the inguinal area was disinfected, the sheet was laid, left femoral artery puncture was performed, 8F arterial sheath was implanted, 6F long sheath with 0.035 guide wire was sent into 5F multifunctional catheter, left internal carotid artery angiography showed cystic aneurysm at the anterior communicating artery, C7 segment of the internal carotid artery cystic aneurysm (Figure 2).

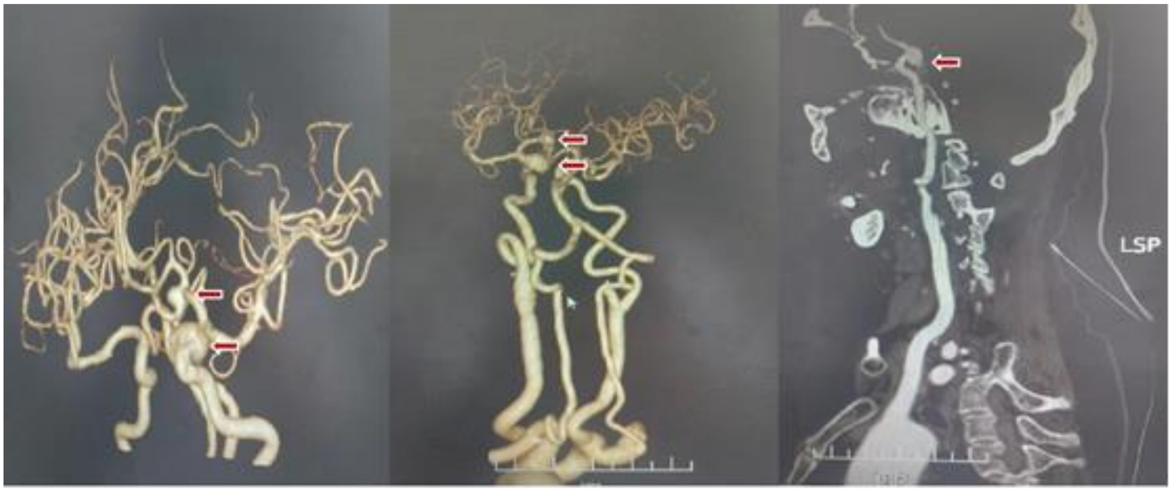

Figure 1: *CTA indicated anterior communicating aneurysm and left internal carotid artery C7 aneurysm (Red arrow).*

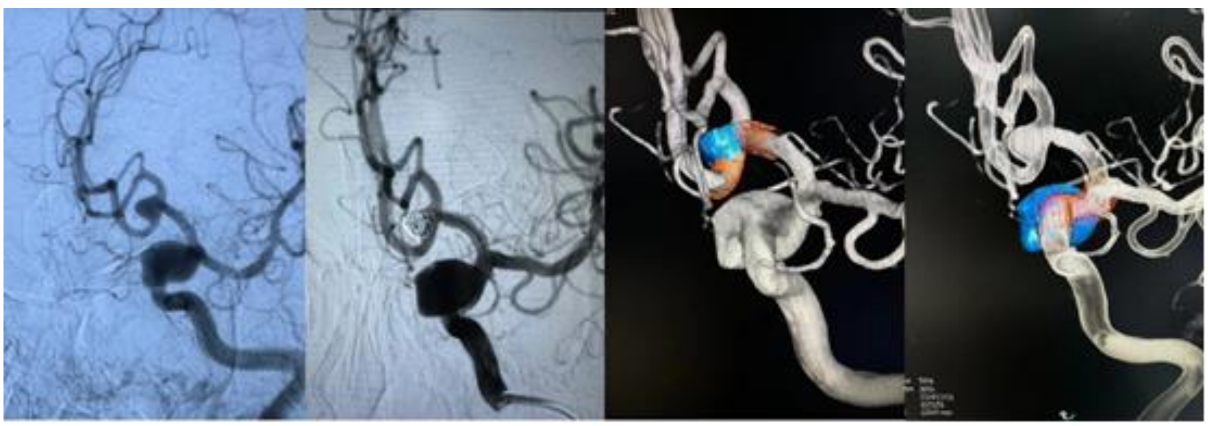

Figure 2: *DSA indicated the anterior communicating aneurysm was a 4×5mm cystic aneurysm, and the internal carotid artery C7 segment showed a 13×14mm aneurysm with multiple ascus.*

The anterior communicating aneurysm was a 4×5mm cystic aneurysm, and the internal carotid artery C7 segment showed a 13×14mm aneurysm with multiple ascus. 6F intermediate catheter was sent to the left internal carotid artery petrosal segment, Y valve and double tee were connected, contrast agent and heparin saline were connected respectively, cerebral angiography and 3D-DSA were performed, and the working Angle was selected. Stent-assisted embolization was performed. Guided by a microguide wire (Synchro200), a SL-10 microcatheter was sent to the A2 segment of the contralatory anterior cerebral artery and the microguide wire was withdrawn. The Echelon10 microcatheter is sent into the aneurysm cavity under the guidance of the microguide wire, and the Echelon10 microcatheter is inserted into the 3D spring ring, which shows that the spring ring is unstable, and the Echelon10 microcatheter is partially released by the Atlas 3.0×21mm stent covering the tumor neck, and the spring ring is continued to be inserted until the angiography indicates that the aneurysm has not developed. The Echelon10 microcatheter was withdrawn and routine anterolateral and lateral angiography was performed, indicating that the aneurysm was no longer visible. The right internal carotid artery, posterior communicating artery and branch were well developed, and all major vessels were well developed. A SL-10 microcatheter is sent to the M2 segment of middle cerebral artery in the left C7 segment assisted by stent embolization, and then the microguide wire is withdrawn. Echelon 10 microcatheter is sent into the aneurysm cavity under the guidance of the microguide wire, and Echelon10 microcatheter is placed at 12-40 3D. It can be seen that the spring

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ring is unstable. Atlas 4.5×30mm stent is given to cover the neck of the tumor for semi-release, and the spring ring is continued to be placed until the aneurysm is not developed. The Echelon10 microcatheter was withdrawn, and conventional anterior-lateral angiography showed that the aneurysm was no longer developed, and the main vessels were developed well. The catheter was pulled out, the femoral artery was sutured, the operation was successful, the tracheal intubation was pulled out after the operation, the patient was conscious, able to speak, acted as instructed, and returned to the ward safely.

Discussion

Intracranial aneurysm is one of the major public health problems at present. The annual incidence of subarachnoid hemorrhage caused by spontaneous aneurysm rupture is high, and about 10% of patients die before arriving at the hospital, while the main factors affecting the disability rate and mortality of survivors of primary rupture are the risk of rebleeding and cerebrovascular spasm [10-11]. Since up to 50% of patients with subarachnoid hemorrhage eventually die from hemorrhage, it is urgent to develop a set of scientific bleeding risk assessment methods and active intervention measures. In terms of patient selection, unless a large number of intracerebral hematoma or inappropriate geometry are involved, embolization of ruptured aneurysms should be considered. In this regard, surgical splinting or endovascular treatment should be decided in a multidisciplinary and multi-professional collaborative manner. Generally speaking, narrow-neck aneurysms have more suitable geometric shapes, such as patients with arterio-to-neck ratio greater than 2 are also suitable for filling with spring rings. These cases are placed in each loop in the lumen sequentially, and are more likely to stay in the lumen. In contrast, in a wide-necked aneurysm, the spring loop is more likely to burst into the vessel. Aneurysms with a neck greater than 4mm or a body neck ratio less than 2 are considered to have an inappropriate shape. In addition, the types of aneurysms that are not suitable for embolization include aneurysms involving branch points in the neck of the tumor, and aneurysms whose anatomical structure is still not defined by 3D angiography (such as aneurysms involving bifurcated or tripartite segments of the middle cerebral artery). If an aneurysm embolization is performed under these conditions, the surgical consequences can be catastrophic. Fortunately, in this case, embolization can be performed with auxiliary means such as blood flow reconstruction devices [12]. In this case, the patient underwent prophylactic surgery for an unruptured aneurysm. In view of the high incidence of aneurysm rupture, our team carefully evaluated the results and decided to intervene the patient's aneurysm in advance to prevent the catastrophic consequences caused by rupture and bleeding. For unruptured aneurysms, we first administer systemic heparinization and monitor active coagulation time (ACT) at 250-300s. When the guide catheter is placed in the appropriate position of the tumor carrier artery, a one-time mass injection of 3000-5000U heparin is given, and 1000U heparin is supplemented every hour during the operation. But, for ruptured aneurysms. To be on the safe side, we usually start the whole body heparinization after the first spring is inserted in the body. If the aneurysm ruptures during surgery, protamine or platelets and depressing acetate neutralizing heparin or antiplatelet agents are given, respectively, and the aneurysm is embolized until complete occlusion occurs. If thromboembolic events occur, additional heparinization or transarterial thrombolysis is required.

Conclusion

Intracranial aneurysm embolization was initially only used for the treatment of aneurysms that were not suitable for surgical clamping. With the conclusion of doctors all over the world, some convincing evidence gradually suggested that coil embolization was a safe and effective treatment method to replace traditional craniotomy clamping for suitable selected cases, and the application opportunity of this technology was increasing. Endovascular therapy is a feasible alternative treatment for ruptured or unruptured aneurysms that are difficult or impossible to be treated surgically due to their size, shape and location.

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