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Interventional Embolization of Subarachnoid Haemorrhage Caused by Cerebral Aneurysm and Review of Relevant Literature

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Case Report

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ABSTRACT

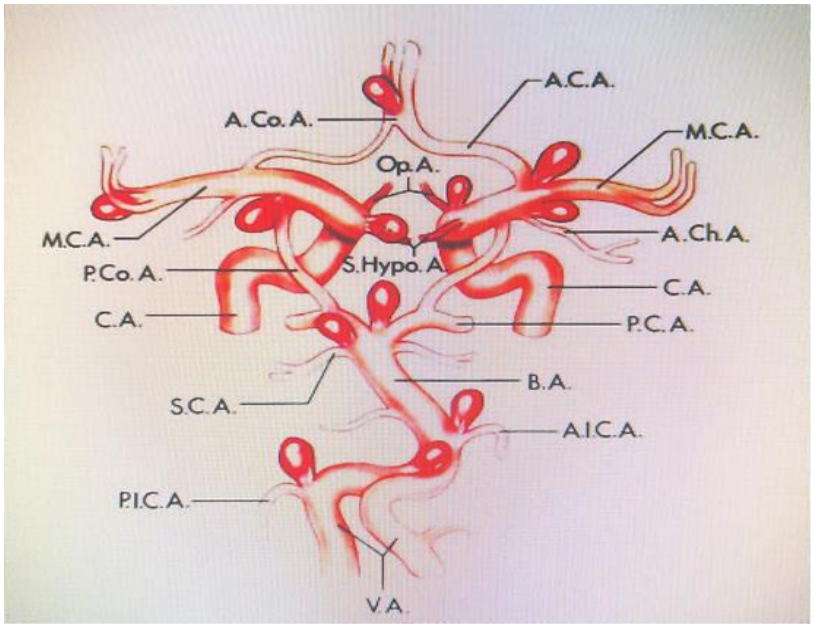
In recent years, the vast majority of cerebral aneurysm patients have been treated with one of two reconstructive methods: Craniotomy microsurgical occlusion of the tumour bearing artery for reconstruction, or intracapsular treatment, in which the detachable coil is placed into the aneurysm sac to generate thrombus, thereby excluding the aneurysm from the tumour bearing artery circulation. The Guglielmi Detachable Coil (GDC) was introduced in 1991 as the first product of the intracapsular spring coil platform and was approved by the Food and Drug Administration in 1995 for the treatment of aneurysms. However, this technique is not effective for wide-necked, dissected, or fusiform aneurysms. Advances in new technologies, such as three-dimensional spring rings, balloon assisted remodeling, polymer embolization, stents and flow-guiding devices, and Pipeline embolization devices, have allowed neurovascular surgeons to treat previously untreatable lesions. The International aneurysmal subarachnoid Haemorrhage compared the clipping of ruptured aneurysms with spring coil embolization, which proved the superiority of spring coil embolization and made spring coil treatment of ruptured and unruptured aneurysms more widely recognized. Moreover, the continuous innovation of spring coil design also increased the variety of geometric shapes and compliance. The bioactive coating helps to improve the filling effect and increase the cure rate. However, it should be noted that the object of International Subarachnoid Aneurysm Trial (ISAT) is aneurysms that can be clipped and coil embolized, but for some aneurysms that are not suitable for coil embolization, such as wide-neck aneurysms and very small aneurysms, clipping should be considered first. In addition, aneurysms with branches in the tumour body of the artery are partially embolized in order to preserve the branches, so they are not indications. For wide-necked aneurysms, consideration should be given to the need for stent-assisted treatment, which in turn requires long-term antiplatelet therapy.

Keywords: Aneurysmal coil; Subarachnoid haemorrhage; Craniotomy clamp

INTRODUCTION

Anterior Communicating Artery (Acom) is the most common site of anterior cerebral artery aneurysms, accounting for 35% of the total cerebral aneurysms, and its annual rupture rate is as high as 1.31%, which is about twice that of MCA [1,2]. Aneurysms often occur when the A1 segment on one side is stunted, and when the A1 segment on the opposite side is emitted by the bilateral A2 segment on the dominant side, the aneurysm occurs when the A1 segment on the dominant side bifurcates horizontally to form the left and right A2 on the anterior communicating artery, usually away from the dominant artery and pointing to the opposite side (Figure 1).

Figure 1. Aneurysms usually occur when the A1 segment on one side is stunted, and when the A1 segment on the opposite side is emitted by the bilateral A2 segment on the opposite side, the aneurysm occurs when the A1 segment on the dominant side is horizontally bifurcated to form the left and right A2 on the anterior communicating artery, usually away from the dominant artery and pointing to the opposite side.



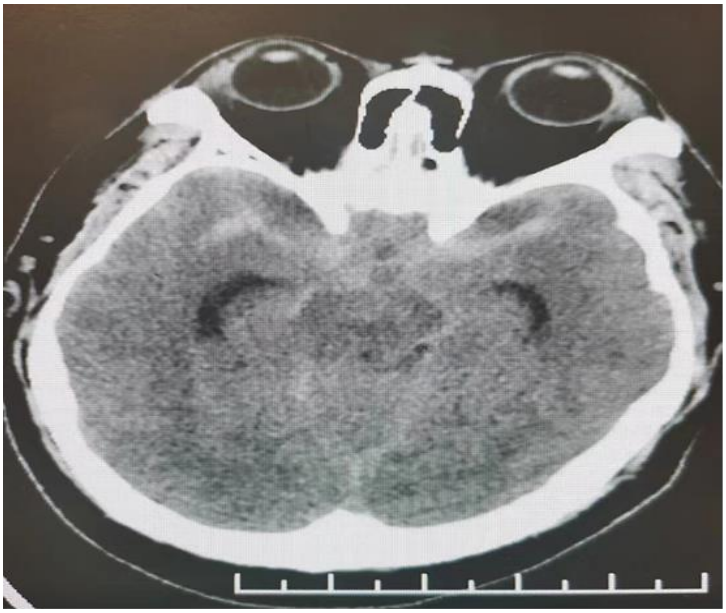
It is worth noting that the recurrent artery emanates from the A1 segment and the A2 proximal end of the anterior cerebral artery. The recurrent artery is the largest and longest branch of the anterior cerebral artery that reaches the anterior perforator. With the middle cerebral artery entering the lateral fissure over the internal carotid artery bifurcation, the recurrent artery may be located in any direction of the A1 segment, and its starting point may be attached to the anterior communicating aneurysm wall. The return artery mainly supplies the forelimb of the internal capsule, and ischemia in the supply area of the return artery can lead to hemiplegia mainly in the face and

upper limb, and the dominant hemisphere may have aphasia [3].The occlusion of Acom tumor is difficult, and the number of cases of intravascular therapy has increased in recent years.

CASE PRESENTATION

A 32-year-old man (Hunt-Hess) with severe headache onset and rapid deterioration came to the hospital at 1:00 am on the day of onset. According to the self-report, the male patient had a sudden headache 7 hours ago with no obvious cause and persistent distending pain, accompanied by nausea and vomiting, and vomiting was stomach contents. No convulsions, fever, or blurry vision. CT examination in the emergency room of Inner Mongolia Hospital revealed subarachnoid haemorrhage (Figure 2).

Figure 2. CT indicated subarachnoid haemorrhage.



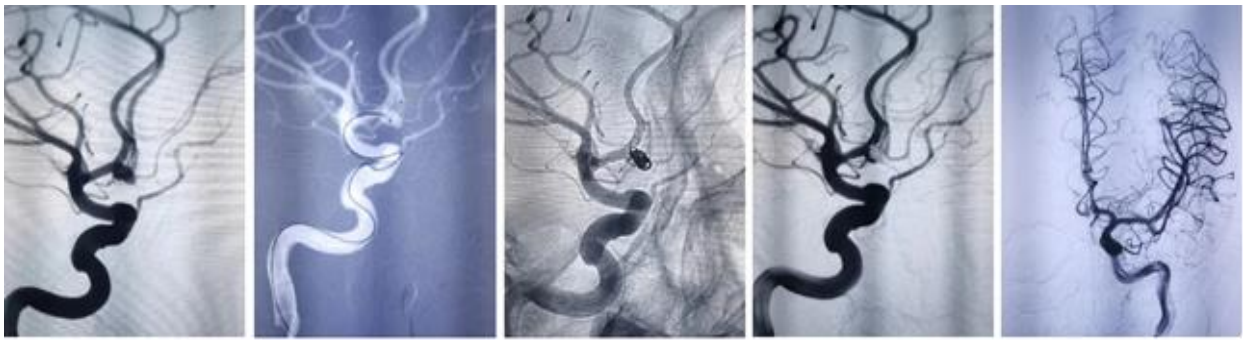
The CTA indicated an anterior communicating aneurysm (5 × 3 mm), with the right anterior cerebral artery A1 segment undemonstrated (congenital variation) (Figure 3).

Figure 3. CTA indicates anterior communicating aneurysm (5 × 3 mm), right anterior cerebral artery A1 segment not visible (congenital variation).

Later, he was admitted to the ward with "subarachnoid haemorrhage". The man had high blood pressure for 3 years with a maximum blood pressure of 180 mm/90 mm Hg and irregular oral antihypertensive medication. Denied

diabetes, coronary heart disease and other chronic history. After admission to the ward, the specialist on duty gave a nervous system physical examination and found meningeal irritation sign (+), muscle strength of the right upper and lower limbs level IV, no other positive signs. The doctor on duty urgently issued a critical notice to the patient's family, and gave mannitol to reduce intracranial pressure, oxacetam to improve brain function, valproate sodium to prevent seizures, and nimodipine to prevent cerebral vasospasm treatment. On the next day, the doctor on duty reported the case, applied the patient's condition to the general department for discussion, and decided to perform transcatheter stent assisted embolization therapy for intracranial aneurysm. General procedure: After successful general anesthesia, Seldinger puncture was performed on the right femoral artery, 6F arterial sheath was inserted, cerebrovascular angiography was performed with 6F guided catheter and 3D-DSA was performed, indicating a cystic aneurysm about 4*3 mm in the anterior communication segment of the left internal carotid artery (Figure 4).

Figure 4. An illustration of the procedure.



After the 6F Guide Catheter was delivered to the C2 segment of the left internal carotid artery, double Y valves and double tees were applied, one three-way was subjected to contrast agent, and one three-way was subjected to a pressure injection bag for continuous infusion of heparin saline (1000 u:500 u). When the working Angle is selected, SL-10 microcatheter is sent to the distal end of the right anterior cerebral artery A2 under the guidance of the microcatheter, obvious microtubule curvature can be seen, the microcatheter pressure is reduced, and the microcatheter is withdrawn. Echelon-10 microcatheter is shaped and sent into the aneurysm cavity under the guidance of the microcatheter, and the microcatheter is withdrawn. Echelon-10 microcatheter is inserted into 4-8-3D, 3-6-3D, 2-4-3D in sequence with a total of 3 spring rings, and is given intravenous heparin 3000 u for full heparinization. The angiography showed that the aneurysm was no longer developing, and a few protrusion springs could be seen in the neck of the tumour. The SL-10 microcatheter was implanted into the Neuroform Atlas 4.0*21 mm stent to cover the neck of the tumour. The angiography showed that the aneurysm was no longer developing, the left internal carotid artery, the posterior communicating artery and the branch were well developed, and all major vessels were well developed. Femoral artery was closed, operation was successful, tracheal intubation was removed after operation, conscious, able to speak, and able to move limbs. After surgery, controlling blood pressure is critical. Due to stent placement to prevent thrombosis, Tirofiban hydrochloride was administered with continuous hourly dose pumping, and bimab and atorvastatin were administered orally. The next day, cerebral CT examination revealed postoperative images of anterior communicating aneurysm.

RESULTS AND DISCUSSION

Henkes et al., reached a conclusion about whether unruptured aneurysms should be treated or not, and whether craniotomy or endovascular embolization should be chosen as the treatment method [4]. At present, intracranial aneurysm occlusion with platinum coil is an effective method for intracranial aneurysms. Endovascular treatment is more practical for vertebrobasilar artery system, internal carotid artery paraspidoid, and anterior communicating

artery region intuitively, narrow neck aneurysms have more appropriate geometric morphology, and patients with arterio-to-carotid ratio greater than 2 are suitable for filling with spring coil basket. In contrast, in wide-necked aneurysms, the spring-loop loop is more likely to burst into the vessel [5]. Aneurysms with a neck greater than 4mm or a body neck ratio less than 2 are considered to have inappropriate morphology. In addition, aneurysms with neck involving branches cannot be defined by three-dimensional angiography [6].in this case, occlusion of the tumor bearing vessel or branch may cause unacceptable surgical risks [7]. Endovascular embolization of aneurysms is usually performed under general anesthesia and is usually initiated after systemic heparinization in cases of unruptured aneurysms. After the guide catheter was placed in the appropriate location of the tumor carrier artery, heparin was given intravenously for 3000 u-5000 u, and during the operation, heparin was given intravenously for 1000 u every 1 hour to maintain the Active Coagulation Time (ACT) within 250-300 s. For ruptured aneurysms, for safety reasons, intravenous heparinization is performed after the first spring coil is inserted into the arterial tumor. It is worth mentioning that the arterial sheath, guiding catheter and micro catheter were continuously irrigated with heparin saline to prevent blood clot formation in the catheter system.

CONCLUSION

Intracranial aneurysm embolization was initially used only for the treatment of aneurysms that were not suitable for surgery. With convincing evidence showing that for selected cases, coil embolization is a safe and effective alternative to traditional craniotomy surgical clamping, the application of this technique has been increasing. In addition, the aneurysm and neck size should be carefully measured before surgery, so as to select the appropriate first spring coil, which is crucial for the success and long-term stability of the spring coil mass. In principle, the size of the first spring should be selected to be slightly larger than the maximum aneurysm diameter by 1-2 mm, and the head end of the micro catheter should be kept in the center of the arterial tumor body by appropriate means. The application of 3D spring coil will help stabilize the basket.

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