Stent-Assisted Coil Embolization for a Complex Small-Remnant of Anterior Communicating Artery Aneurysm After Surgical Clipping

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A 51-year-old male was admitted to our hospital with no clinical symptoms. He had previously undergone surgical clipping of an unruptured, anterior communicating aneurysm (AComA) using an interhemispheric approach. Post operative angiography revealed a small remnant AComA with a narrow neck. To prevent rebleeding, the patient underwent endovascular coil embolization for the complex remnant aneurysm, our skills and experiences allowed us to treat this complex case via an endovascular procedure. We conclude that endovascular coil embolization can efficiently treat a small remnant aneurysm after clipping.

Key words: coil embolization, anterior communicating artery aneurysm, surgical clipping

Introduction

Clipping of intracranial aneurysms affords a high rate of complete obliteration and a low rate of recurrence1)-3), and is regarded as the best treatment option. Although clipping certainly affords durable results, aneurysm recurrence following clipping is associated with a substantial hemorrhage rate (50%)4). To decrease the risk of rebleeding, retreatment of most recurrent aneurysms is required.

With developments in endovascular techniques and technology, endovascular treatment has superseded surgical clipping over the past few decades. However, endovascular embolization of AComAs is not always possible or definitive. Some small aneurysms, especially recurrent aneurysms, accept coils poorly; operators must be both skilled and experienced. Here we present a case with a small remnant AComA that had previously been clipped, and that successfully underwent endovascular coil embolization.

Case presentation

A 51-year-old male complained of headache and was admitted to another hospital. Digital subtraction angiography (DSA) revealed an AComA (Figure-1), which was clipped via an interhemispheric approach. He recovered well, and was discharged without any neurological deficit. However, postoperative digital subtraction angiography revealed a remnant AComA (Figure-2) and he was told to approach us. He underwent endovascular therapy. After general anesthesia was established, a guiding sheath (Axcelguide 6-F 95 cm STA; Medikit, Tokyo, Japan) was placed in the common carotid artery via a transfemoral route. After systemic heparinization, an intermediate support catheter (Cerulean G 6-F 115 cm STA; Medikit, Tokyo, Japan) was placed in the carotid artery via a transfemoral route. After systemic heparinization, an intermediate support catheter (Cerulean G 6-F 115 cm STA; Medikit, Tokyo, Japan) was inserted into the petrous
Figure 1  The pre-operative DSA show an anterior communicating artery aneurysm
A. anteroposterior projection angiography image, B. lateral projection angiography image.

Figure 2  Left oblique angiography show a narrow small remnant of anterior communi-
cating artery aneurysm, three clips incompletely applied to the neck
A. three–dimension reconstruction of angiography image, B. left oblique angiography image.

Figure 3  The microcatheter successfully access to the aneurysm neck, the LVIS JR stent (black arrow) had been deployed
A. the first coil for embolization, B. the second coil for embolization, C. the third coil for embolization.
segment of the internal carotid artery. Selective examination through the intermediate support catheter showed a small aneurysm arising from the left A1/2 junction, the very narrow neck of which was incompletely clipped with three clips (Figure-2A). We employed a double microcatheter technique; one microcatheter (Excelsior SL-10 2M; Stryker, Fremont, CA, USA) was advanced into the aneurysm with the assistance of a microguidewire (GT 0.012-in, double-angle; Terumo, Tokyo, Japan) and another microcatheter (Headway 17 STR 2M; Terumo, Tokyo, Japan) was positioned in parallel into the left A2 segment with the assistance of a microguidewire (CHIKAI 0.014-in, 200-cm; Asahi-Intec, Aichi, Japan). Next, a low-profile visualized intraluminal support junior stent (LVIS-JR 2.5 Å~13 mm; Terumo, Tokyo, Japan) was implanted in the left A1/2 junction. After the neck of the aneurysm was covered by the stent, coil embolization was performed. Three separate coils were gently and sequentially packed into the aneurysm (Target 360 Nano-Coil 1.5 mm/2 cm; Target 360 Nano-Coil 1 mm/2 cm; Target 360 Nano-Coil 1 mm/2 cm; all from Stryker Neurovascular, Fremont, CA, USA) (Figure-3). Immediate postoperative angiography showed that the aneurysm was completely occluded, using the criteria of Raymond et al.\(^5\). The patient was discharged 2 days later with no new neurological deficit.

**Discussion**

If the rebleeding risk is high\(^4\), retreatment of previously clipped aneurysms is reasonable. If recclipping is planned, neurosurgeons face several difficulties, such as serious adhesions surrounding the aneurysm. Endovascular therapy of remnant aneurysms is also challenging principally because of morphological concerns. Generally, small narrow-necked aneurysms can be completely obliterated\(^6,7\). Pierot\(^8\) and Schuette\(^9\) found that such aneurysms were associated with a higher rate of intra procedural rupture; meticulous technique was required. We share the same view\(^10\). Unfortunately, endovascular procedures accessing AComAs are difficult; the vessel architecture is complex, possibly triggering microguidewire jumping and aneurysm rupture.

Proust et al.\(^11\) concluded that the inferior directed dome had better overcome than aneurysms with superior dome. Songsaeng et al.\(^12\) also had a similar conclusions. For most of the A1 segment of the anterior cerebral artery runs downward, aneurysms with a superior dome projection have difficulties in properly and safely navigating and stabilizing the microcatheter in them. Our present case exhibited some negative indications for endovascular treatment (1. the size of aneurysm was too small, 2. the dome of aneurysm was superior dome). In addition, the initial operation featured placement of three clips on the neck of the AComA compromising aneurysm visualization and rendering the vessel inflexible; this might result in poor microcatheter controllability.

In our operation, first, we advanced an intermediate support catheter into the distal ICA to the position as high as possible to provide robust

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**Figure-4** The immediately post-operative angiography testified
The aneurysm was confirmed to be completely occluded.
A. angiography image, B. 3-D reconstruction image from CT scan.
support for a microcatheter. Second, we shaped the microcatheter tip into “S” (Figure-3A) to allow access to the aneurysm. Third, we used soft, small, and manageable coils (Target 360 Nano) for embolization. Fourth, we employed stent-assisted coil embolization (SAC). Chalouhi et al.\textsuperscript{13} considered that SAC of intracranial aneurysms was safe and effective, and that aneurysm closure was durable. Stent delivery prior to coil deployment is less risky than stent deployment after embolization. Closed-cell stents exhibit significantly lower recanalization rates than other stents. Thus, we deployed a closed-cell LVIS-JR stent before embolization; this has been shown to be safe and effective when treating complex intracranial aneurysms\textsuperscript{12, 13}; the occlusion outcomes were durable and the morbidity and mortality rates acceptable. Santillan\textsuperscript{14} reported about the LVIS-JR stent for treatment of aneurysms that mortality rate was 0% and neurological morbidity was 2.9%, compare to Neuroform stent\textsuperscript{15}; that mortality rate was 0% and mortality rate was 2.4%. We often push the stent forward to the neck of the aneurysm to afford better coverage after stent release; the stent then attains a position just past the neck of the aneurysm.

Reference