Two Distally Located Right SCA Aneurysms: Endovascular Treatment by Parent Artery Occlusion with GDC Coils and N-BCA Injection

Case Report and Review of the Literature

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Summary

Peripheral aneurysms of the superior cerebellar artery are considered difficult to treat surgically and endovascularly because of their inaccessibility. Parent artery occlusion is therefore frequently the preferred method. Embolic materials previously reported in this situation are either GDC coils or a polymerizing agent (n-BCA). We report a patient with two distally located, wide-neck aneurysms of the right superior cerebellar artery who presented with hemorrhage and was treated by endovascular embolization of the parent artery using a combination of GDC coils and n-BCA.

Introduction

Aneurysms of the distal part of superior cerebellar artery (SCA) are rare¹. Their reported incidence is 0,25–0,66% of all aneurysms of the posterior circulation^{1,2}. High quality digital subtraction angiography (DSA) study is required to distinguish peripheral aneurysms of the SCA from aneurysms of the posterior cerebral artery and to determine the anatomy local to the aneurysm³.

There are basically two treatment options for described SCA aneurysms: surgical and endovascular embolization either with use of detachable coils, or by an intra-aneurysmal injection of n-BCA^{3,4,5}.

We describe the case of a patient with two, probably dissecting, aneurysms of the SCA, which were treated simultaneously using both GDC coils and n-BCA injection with subsequent parent artery occlusion.

Case report

In June 2001, a 21-year-old man was admitted to our hospital after acute onset of headache and vomiting. A CT performed on the day of admission showed subarachnoid hemorrhage. The Hunt and Hess score was grade¹. The neurological examination also revealed nystagmus and hearing impairment which had been present since the patient had been operated on for resection of a medulloblastoma of the cerebellum in 1991. After this operation, he had been treated with one course of radiotherapy.

The day after admission, a DSA study showed two saccular aneurysms located in the distal part of the right SCA (figures 1 A-C). Both aneurysms were located on the main trunk of lateral SCA branch and appeared to have broad necks. The smaller lesion was 2,8 mm in diameter and was located proximally to a second aneurysm, 5.1 mm in diameter which arose from the SCA's lateral branch main trunk trifurcation and whose sac was incorporating normal branches.

Because of multiple aneurysms and their lo-

Figure 1 Left vertebral artery injection, A-P (A) and oblique (B) projections showing two aneurysms on the inferior branch of left superior cerebellar artery.

Figure 2 Selective angiogram – working projection before coil embolization and glue injection. Microcatheter tip placed in the sac of the aneurysm (A). Selective angiogram performed after two GDC 10 coils have been delivered shows that the parent artery is still open (B). At this point, the decision to use glue injection was made and the tip of microcatheter slightly withdrawn to gain better flow conditions.

cation, as well as the clinical findings and history of previous surgery, we decided to carry out endovascular treatment. The embolization procedure was performed under general anesthesia, via a right common femoral artery punc-

ture. A 6F guiding catheter (Envoy by Cordis Endovascular Systems, Miami Lakes, FL) was placed in left vertebral artery. A bolus of 5000 IU of heparin was administered, followed by an continuous infusion of 1000 IU/h. With the use

Figure 3 Lateral X ray view after treatment, showing GDC 10 coils in the sac of the proximal aneurysm, cast of glue in the parent artery and partially in the sac of the distal aneurysm where the stasis of the contrast is seen.

of “road-mapping”, a microcatheter (Tracker-10 by Target Therapeutics, San Jose, Calif) primed with an 0,014 inch guidewire (Transend-14 by Target Therapeutics, San Jose, Calif) was placed supraselectively in the proximal part of the right SCA. The supraselective angiographic study was performed at this stage in order to thoroughly evaluate the morphology of both aneurysms. Because of the small caliber of the parent vessel and the presence of wide necks of both aneurysms treatment by parent artery occlusion was performed. The microcatheter was used to place two GDC coils (Target Therapeutics, Fremont, CA - 3 mm helix/8 cm STD, 2 mm helix/6 cm Soft) in the proximal, smaller aneurysm (figure 2A). The coils were deployed in the sac and the parent artery in order to slow blood flow to allow better control of glue polymerization (figure 2B). Our goal was to avoid glue penetration in the peripheral part of lateral branch of the SCA, beyond the second aneurysm because it supplies the dentate nucleus and constitutes the collateral circulation with the PICA nad AICA, whose effectiveness was crucial for the good final result of the treatment.

A single 0,5 ml injection of 25% mixture of

polymerizing agent (Histoacryl; Braun, Melsungen, Germany) and Lipiodol (Guerbet, Roissy, France) was then delivered via the same microcatheter positioned in front of aneurysmal neck, achieving partial filling of the sac of the distal aneurysm (figure 3). Subsequent control angiograms showed no filling of either aneurysm and occlusion of the SCA between the aneurysms (figures 4 A-C).

The patient was neurologically unchanged and experienced no immediate or delayed complications. He was discharged from hospital five days later.

Discussion

Usually, subarachnoid hemorrhage is the first symptom of a SCA aneurysm, but patients may present with isolated fourth nerve palsy⁶. The prognosis for patients with ruptured posterior circulation aneurysms is generally poor. Schevink et al. reported 48-hour survival rates for patients presenting with hemorrhage from ruptured SCA aneurysms to be only 32%, and the 30-day survival rate to be 11%. Emergency treatment is therefore indicated^{4,7}. In our case, the endovascular treatment was carried

Figure 4 A-B Post-treatment control angiograms of the left vertebral artery: A-P (A) and oblique (B) showing complete selective occlusion of the inferior branch of left superior cerebellar artery as well as two aneurysms.

out 48 hours after diagnosis of the aneurysms and 72 hours after hemorrhage.

Aneurysms arising from peripheral segments of cerebral arteries may be congenital, but they are often reported to be traumatic, mycotic or associated with presence of brain AVM^{8,9}. The SCA may be particularly vulnerable to injury caused by stretching of the artery against the edge of the tentorium¹⁰. We suspect that the aneurysms in our patient may have been a consequence of microsurgical removal of a cerebellar medulloblastoma ten years before, thus it allows us to assume that they both might have had a dissecting character.

Treatment strategies for peripherally located aneurysms depend on their relationship to the parent artery as well as their location (posterior or anterior circulation), size and morphology.

Surgical treatment of such aneurysms usually consists of parent artery occlusion by trapping, and is technically challenging with a relatively high morbidity/mortality rate^{3,11,12}.

Dissecting aneurysms, as well as those located in distal parts of the arteries, should usually be treated endovascularly as occlusion of the parent artery and the aneurysms at the level of the neck. It is supposed that, due to disruption of the arterial wall dissecting aneurysms may not be able to retain coils. We followed this indication treating our patient.

Therapeutic occlusion of SCA appears to be well tolerated^{8,13,14}. Collateral circulation between the distal branches of SCA and posterior or inferior cerebellar, anterior inferior cerebellar arteries via the vermician arcade is efficient and usually prevents infarction after proximal occlusion^{3,15}. The anterior pontine and lateromesencephalic portions of the SCA provide perforating branches, which anastomose with perforators arising from the basilar artery.

These anatomical conditions prevent occurrence of ischemia of the ventral brain stem when the proximal segments of the SCA are occluded. Nevertheless, the risk of an insult of the cerebellar cortex in addition to the dentate nucleus, and cerebellar peduncles in the region supplied by the distal branches of the superior cerebellar artery should always be taken into consideration, but this complication is rarely noted³.

The alternative treatment to surgery is endovascular embolization but may be difficult or impossible due to distal location and small size and tortuosity of the parent vessel⁴. The aneurysms are difficult to reach with a microcatheter. The occlusion of these aneurysm with detachable coils often results in coil protrusion and thrombosis of the parent vessel. Also, in these anatomical conditions, and when the

aneurysm has an irregular shape, it is quite difficult to obtain dense coil compaction¹⁶.

Chaloupka et Al. reported two cases of SCA aneurysm embolizations with the use of GDCs, both requiring the parent artery occlusion. The therapy was well tolerated by both patients, without any change in their neurological status after the procedure³.

Eckard and al. described four cases of aneurysms arising from distal cerebellar arteries (two on the right posterior inferior cerebellar artery, one on the right superior cerebellar artery, one on the right anterior inferior cerebellar artery). All these aneurysms were treated by parent vessel occlusion using GDC coils placed proximally to the aneurysms, after performing test injection of Amytal to predict the occurrence of possible neurological deficits. They reported good immediate technical and clinical outcomes but one patient developed minimal nondisabling dysmetria during follow-up. Follow-up angiograms were performed at two to 12 months and showed no residual filling of the aneurysms¹⁷.

The use of n-BCA for treatment of the aneurysms located distally on posterior circulation arteries of has previously been reported in three cases by Cognard et Al. and in one case by Leonardi et Al.^{4,16}. Both reports state that the decision to use n-BCA was made because of inaccessibility of the tortuous parent vessel with the microcatheter or because of a wide aneurysmal neck would prevent good endosaccular packing. Techniques of embolization described by both authors were similar. In every case, the tip of the flow-guided microcatheter was placed inside the aneurysm and Histoacryl and Lipiodol were slowly injected into the aneurysm. Using this technique, Cognard et al. managed to preserve the parent artery in two patients. The patient treated by parent artery occlusion had a distal SCA aneurysm and developed slight left-sided hemiparesis eight hours after the procedure. In the case treated by Leonardi et al. the parent vessel was also preserved with no early complications. They believed that the risk of rupture of the aneurysm during this procedure is extremely low, because the n-BCA is injected very slowly into the aneurysm and, contrary to the coiling technique, there is no manipulation inside a previously ruptured aneurysmal sac^{4,16}.

In our case, we believe that, as long as both aneurysms were of dissecting character, located distally, parent artery occlusion was the indicated treatment. As a site of occlusion we chose the small, proximal aneurysm with its wide neck, because at the same time we could achieve two goals: occlusion of the aneurysm and the parent artery at the level of its neck. We also speculated that it was the larger, distal aneurysm which bled because it was irregular in shape and after CT image analysis. The parent artery occlusion at the level of the neck of the proximal aneurysm would have left the distal aneurysm unprotected and risked it being retrogradely vascularized via collateral blood-flow.

The technical problem we faced was how to reach the distal aneurysm with n-BCA and to avoid injecting the mixture into the peripheral SCA branches. In order to gain better control over polymerization of n-BCA, we deployed two coils in the sac of the proximal aneurysm and in the parent artery. The glue injection was then performed with the tip of the microcatheter slightly withdrawn from the aneurysmal sac, in a proximal portion of the mesh of coils.

There are several potential complications that may occur during this kind of procedure: namely occlusion of parent artery's peripheral branches, reflux of glue in the normal branch and glueing of the microcatheter tip. Cognard et Al. and Leonardi et Al. consider the catheterisation of an aneurysm sac with flow-guided microcatheter and subsequent glue injection directly into the aneurysm safe with a low risk of re-rupture. In our opinion, the technique of glue injection in such circumstances is very challenging and requires skill and experience on the part of the performing neuroradiologist. Our case may serve as an example of combined treatment which was carefully planned and used in quite unusual pathological conditions. It reveals the wide range of endovascular therapeutic possibilities arising from the use of different techniques and embolic materials.

Conclusion

Our case with two, distally located right SCA aneurysms treated by the combined use of GDCs and n-BCA illustrates the therapeutic possi-

bilities of endovascular techniques. At the moment, embolization of distally located aneurysms of cerebellar arteries using either coils or n-BCA, or both in a combination, may be considered a valuable and effective alternative treatment to surgery.

More information on endovascular techniques and the use of embolic materials and

treatment options is needed to establish a standard therapeutic approach.

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