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Original research article

Stent-assisted embolization of wide-neck anterior communicating artery aneurysms: Review of consecutive 34 cases

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ABSTRACT

Objective: We report our experience with stent-assisted coiling of anterior communicating artery aneurysms with special consideration of angiographic and clinical outcomes, retreatment rate and periprocedural complications.

Materials and methods: The analysis included 34 consecutive ruptured and unruptured wide-neck aneurysms. The aneurysm size ranged from 2 to 18 mm (mean 5.47). Clinical examinations with the use of modified Rankin Score and angiographic outcomes were evaluated initially post-embolization and at a minimum follow-up of 6 months.

Results: Initial post-treatment complete and near-complete aneurysm occlusion was achieved in 32 (94%) and 2 (6%) cases, respectively. Imaging follow-up, performed in 28 (82%) patients, showed no change in the degree of occlusion in 25 (89%) cases and coil compaction in 3 (11%) patients. Of these, one (3.6%) patient underwent a second coil embolization. The periprocedural severe complication rate was 2.9% (1/35) and was associated with prolonged attempt of retrieval of migrated coil resulting in anterior cerebral artery infarct with serious clinical consequences. In another 3 patients periprocedural adverse events without delayed clinical consequences were noticed. The clinical follow-up evaluation achieved in 33 (97%) patients showed no change in 30 (91%) cases, one patient (3%) with clinical improvement and two (6%) cases of neurological deterioration.

Conclusions: The use of stent is feasible and effective for coil embolization of wide-necked anterior communicating artery aneurysms. Although periprocedural complications resulting in severe morbidity are rare, they should be noted, since in terms of thromboembolic events some of them presumably have a potential to be avoidable.

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1. Introduction

The anterior communicating artery (AcomA) is reported to be one of the most common site for intracranial aneurysms and this location of aneurysms is associated with subarachnoid hemorrhage (SAH) in up to 40% [1–4]. The complex arterial relationship in this region include the anterior communicating artery, bilateral anterior cerebral arteries, the recurrent artery of Heubner, hypothalamic and infundibular perforators, orbitofrontal and frontopolar branches and sometimes large precallosal or subcallosal artery [1,2,5]. The microsurgical clip ligation of the AcomA aneurysms is challenging and may result, inter alia, in postoperative cognitive and memory deficits related to the AcomA branches impairment and the frontal lobe retraction [5,6]. Less invasive endovascular approach is an effective treatment technique and remains an acceptable alternative to the traditional open surgery [2,3,6,7]. However, AcomA aneurysms in comparison with the other locations tend to be small in size with the narrow parent vessels and the acute angles between surrounding arteries [5,8]. Moreover, the main limitation of the AcomA aneurysms coil embolization is an unfavorable dome-to-neck ratio and a wide neck of an aneurysm [1,4,5,8,9]. The introduction of adjuvant devices such as multiple microcatheters, three-dimensional (3D) coils, balloon remodeling technique and intracranial stents has progressively allowed these aneurysms to be successfully repaired [3,8,10,11]. Moreover, the standard coil embolization (stand-alone coiling) applied for wide neck aneurysms harbors a higher risk of coil prolapse into the parent artery and the higher rate of recanalization in comparison with stent-assisted coiling [8,12,13]. There is a limited number of studies entirely dedicated to stent-assisted coiling of AcomA aneurysms and hence, this form of endovascular therapy in AcomA aneurysms is not yet well characterized [1,3–5]. The purpose of the current study is to present immediate and long-term clinical and angiographic results, procedure-related complications, and retreatment rate of the stent-assisted endovascular management of 34 patients harboring wide-neck AcomA aneurysms treated at our institution within the last 6 years.

2. Materials and methods

2.1. Patient population

Between April 2008 and December 2014, 71 patients harboring anterior communicating artery (AcomA) aneurysms were treated at our center via endovascular approach. Of these, 34 patients underwent stent-assisted coiling. Overall, there were 19 (56%) females and 15 (44%) males. The patients' ages ranged from 32 to 70 years (mean 54.7, SD 12.4).

Twenty-nine (85%) aneurysms were unruptured and five (15%) patients presented with SAH. All of them were categorized in Hunt and Hess Grade 3 at time of treatment.

Regarding the patients with SAH, two of them were treated within 3 days of rupture. In the remaining three patients treatment was postponed to 14–49 days after hemorrhage due to delayed diagnosis in two cases and acute respiratory failure in one case.

Except for 4 patients in whom microsurgical wrapping or incomplete clip ligation was previously performed beyond our institution, the remaining patients included in the current study were treated for the first time via endovascular approach, which is preferred to be the first-line treatment method for intracerebral aneurysms at our department.

2.2. Aneurysm characteristics

The aneurysm size ranged from 2 to 18 mm (mean 5.47, SD 3.07). Patient selection for treatment with stents was based only on the angioarchitectural characteristics of the each aneurysm. Thus, only the wide-neck AcomA aneurysms, defined as these with the aneurysm neck diameter ≥4 mm and/or these with the dome-to-neck ratio <1.5 were considered for this treatment.

2.3. Endovascular technique

All the procedures were performed by the same two extensively experienced interventional radiologists always after neurosurgical consultations. The patients were treated under general anesthesia. Anti-platelet premedication consisting of a 75 mg loading dose of acetylsalicylic acid and an additional 75 mg clopidogrel was performed several hours before endovascular procedure in patients after SAH and every single day for five days before treatment in case of patients harboring unruptured aneurysms. Both conventional and rotational digital subtraction angiographies (DSA) were performed for 3D reconstruction. A complete evaluation of the aneurysmal configuration, a neck size, an aneurysm width and height was done. A guiding catheter (Envoy; Cordis, Miami Lakes, Fla) was navigated into the target artery. Then, a microcatheter was inserted into the aneurysm lumen. For a stent deployment another microcatheter was placed distally in the ipsilateral or contralateral A2 segment depending on the aneurysm location and the surrounding vascular anatomy. The Neuroform stent (Boston Scientific) was advanced over the microguidewire and deployed when the precisely targeted location was confirmed. Then, the aneurysm was coiled using GDC Boston Scientific Detachable Coils in the same session with the help of the previously deployed microcatheter. The procedures were usually performed in a bi-plane angiography suite. Multiple stent placement was performed only in a case of coil protrusion. At the end of coiling an image was acquired to assess immediate angiographic results. Once it was technically feasible, an attempt was made to achieve complete occlusion in the first treatment session.

During the procedures heparinized saline was continuously infused into the arterial line. In the setting of intraprocedural thrombosis abciximab was administered locally. After embolization, the patient was transferred to the intensive care unit for clinical observation and monitoring of medical parameters. At that time, systemic heparin 15,000 IU for the next 24 h was administered intravenously to raise the activated partial thromboplastin time 2–3 times above normal values. Patients with unruptured aneurysms after uncomplicated treatment were typically discharged from hospital on postoperative day 3. Dual antiplatelet treatment consisting of 75 mg clopidogrel and 75 mg acetylsalicylic acid

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