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Clinical Study

Experiences and complications in endovascular treatment of paraclinoid aneurysms

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ABSTRACT

Endovascular treatment is a promising therapeutic alternative for paraclinoid aneurysms. The purpose of this study was to assess the feasibility and results of endovascular treatment for these lesions. We retrospectively reviewed the clinical data, results and complications of endovascular treatment of a series of 47 consecutive patients with paraclinoid aneurysms. Nineteen of these patients presented with acute subarachnoid hemorrhage, and 28 patients were treated for unruptured aneurysms. Endovascular treatment was performed for 50 aneurysms in 47 patients including stent-assisted coiling (19), balloon-assisted coiling (five), coiling without adjunctive techniques (25) and stent alone (one). Technical failures occurred in two patients (one stent deployment failure due to unsuccessful distal access across the aneurysm neck and one coiling failure due to unsuccessful microcatheter navigation through the stent). Periprocedural complications were observed in six patients (12.8%), with permanent morbidity in one patient resulting from a thromboembolic event. Immediate complete occlusion was achieved in 36 aneurysms (72%). During follow up, enlargement of a partially occluded giant aneurysm was observed in one patient, which was treated with parent artery occlusion. No delayed hemorrhagic complications were seen in the remaining patients. Endovascular treatment is technically feasible and safe in most patients with paraclinoid aneurysm, with a low rate of procedural complications.

1. Introduction

Paraclinoid aneurysms arise from the internal carotid artery (ICA) between the distal dural ring and the posterior communicating artery.[1] Surgical clipping of these aneurysms remains a technical challenge due to the particular features of their location, including the adjacent bony anatomy, dural attachment and close relationship with the optic nerves.[1] Because of the complexity and difficulty associated with direct surgical clipping, endovascular procedures have been increasingly used to treat these aneurysms.[2–7] However, endovascular treatment of paraclinoid aneurysms may also be technically difficult as they can project in various directions and occur in combination with the tortuous carotid siphon,[4,7] thus only a limited number of published studies concerning the results and complications of this treatment have been reported. The objective of the present study was to report our experience of the technical challenges and complications associated with endovascular treatment of paraclinoid aneurysms.

2. Methods

From January 2008 to October 2011, 47 consecutive patients with 51 paraclinoid aneurysms were included in this study. Our patient group consisted of 26 women and 21 men with a mean age of 46 years (range, 35–72 years). Most patients ($n = 28$) were treated for unruptured aneurysms, and the remaining 19 patients presented with acute subarachnoid hemorrhage. All unruptured aneurysms chosen for endovascular treatment were larger than 5 mm. Four patients had two paraclinoid aneurysms (located in three patients on the bilateral ICA and in one patient on the same side), and three patients were treated in the same session. In one patient with bilateral unruptured paraclinoid aneurysms, the aneurysm smaller than 3 mm was left untreated and closely followed up after the contralateral aneurysm was embolized. In the 50 treated aneurysms, four were very small (⩽3 mm), 28 were small (>3 mm to ⩽10 mm), 15 were large (>10 mm to ⩽25 mm), and three were giant (>25 mm).

Before the procedure, patients with wide-necked aneurysms received dual antiplatelet therapy. Patients with unruptured aneurysms were treated with aspirin (300 mg daily) and clopidogrel (75 mg daily) for three days, and patients with acutely ruptured aneurysms were treated with a loading dose of aspirin and clopidogrel orally or rectally (300 mg and 225 mg, each) about two hours

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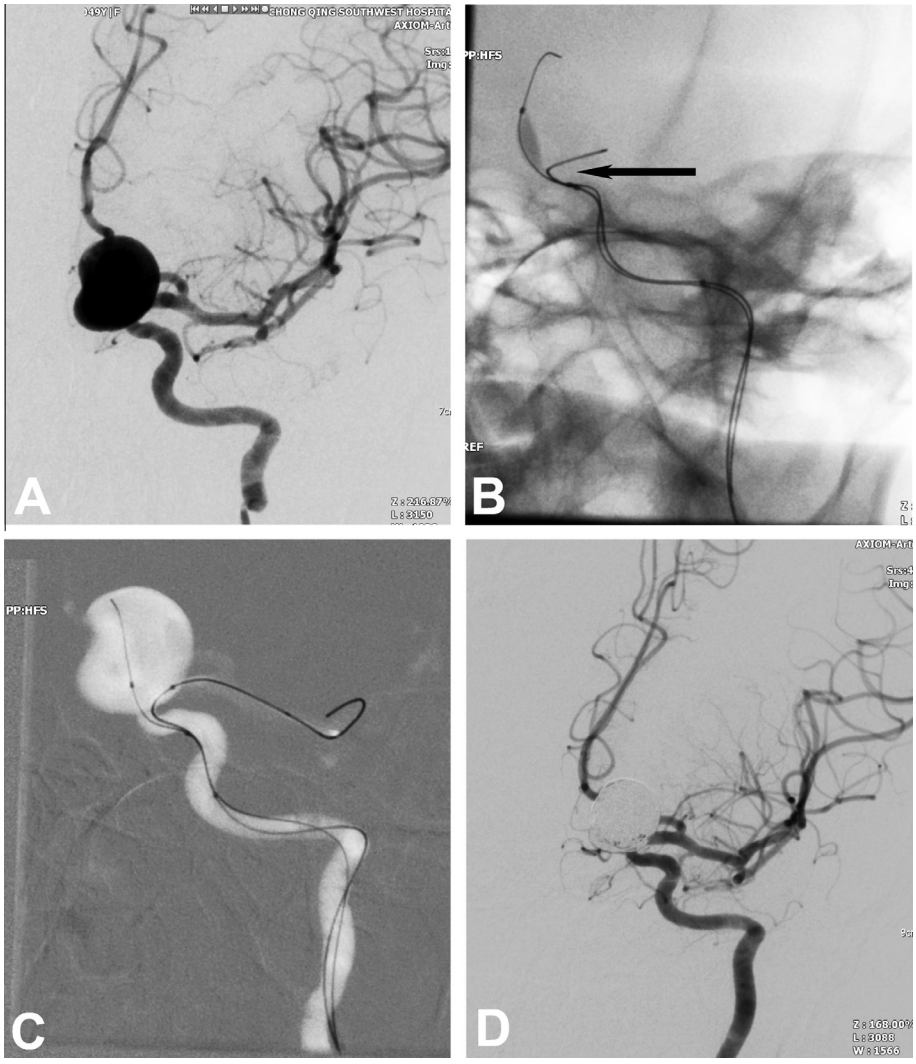

Fig. 1. (A) Digital subtraction angiogram of the left internal carotid artery at working position showing a large paraclinoid aneurysm. (B) Unsubtracted image at working position showing a balloon inflated at the proximal aneurysmal neck to facilitate the microwire navigation across the aneurysmal neck, note the acute angle of the microwire (arrow). (C) Road mapping image at working position showing the distal microcatheterization achieved. (D) Digital subtraction angiogram at working position obtained immediately after embolization showing total occlusion of the aneurysm.

before the procedure. Endovascular treatment was performed under general anesthesia and systemic heparinization. The therapeutic techniques included selective aneurysmal coiling, balloon-assisted coiling, and stent-assisted coiling.

Standard methods of aneurysm coiling, stent-assisted coiling, or balloon-assisted coiling were used as described in the literature.[3,4] When stent-assisted coiling was performed, three methods for catheterization and coiling were used: (i) through the stent struts: the coiling microcatheter was navigated through the struts of the deployed stent; (ii) stent-jailing technique: the stent was deployed after the coiling microcatheter was positioned into the aneurysmal neck or beside the aneurysmal neck; or (iii) bailout stent technique: bailout stent placement was performed when an unstable coil mass or coil loop protrusion was seen during coiling alone or during balloon-assisted coiling. MicroPlex coils (MicroVention, Aliso Viejo, CA, USA), the Hyperglide balloon (ev3, Irvine, CA, USA), the Enterprise stent (Cordis, Miami Lakes, FL, USA) and the Leo stent (Balt, Montmorency, France) were used for endovascular procedures. After endovascular treatment, patients with stent placement were given dual antiplatelet therapy (75 mg clopidogrel and 100 mg aspirin once a day) orally for at least 1 month, followed by aspirin alone for at least 3 months. The follow-up evaluation was based on physical examination and imaging studies, including conventional angiogram or magnetic resonance angiogram (MRA).

3. Results

Endovascular embolization was performed in all patients. Of the 50 treated aneurysms, 19 were treated with stent-assisted coiling, five were treated with balloon-assisted coiling, 25 were coiled without adjunctive techniques, and one was treated with stenting alone.

Technical failures were observed in two aneurysms that were intended to be treated with stent-assisted coiling. Technical difficulties of distal access through the aneurysms were encountered in three patients with large or giant aneurysms. In two of the three patients, microcatheter navigation and subsequent stent delivery was successfully obtained using a support balloon to facilitate guidewire navigation across the wide aneurysmal neck (Fig. 1). Stent delivery failed in the remaining patient with a giant aneurysm, and only incomplete occlusion of the aneurysm was obtained by coiling without adjunctive assistance. Subsequent coiling was not possible in one patient with an unruptured small