

Anterior-wall aneurysm of the internal carotid artery successfully treated solely by stenting: With special reference to etiology

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In this case, a ruptured anterior wall aneurysm of the internal carotid artery disappeared on angiography immediately after stent placement. We focus on the underlying nature of the lesion and this possible alternative treatment.

Introduction

Aneurysms arising from the anterior wall of the internal carotid artery (ICA), reportedly composing 0.3% to 1% of all intracranial aneurysms or 0.9% to 6.5% of those involving the ICA (1, 2), are usually not related to arterial division and vary widely in shape. In many patients with this particular type of aneurysm, soon after subarachnoid hemorrhage the initial angiogram shows only a small bulge, which may progress to a saccular appearance within a few weeks (3). An earlier postmortem study demonstrated disappearance of internal elastic lamina and media at the border between the eccentrically sclerotic and normal carotid wall, indicating laceration due to degeneration of the internal elastic lamina and media as the pathogenesis (4).

Case report

A 63-year-old woman suffered from a subarachnoid hemorrhage, and was admitted to another hospital. 3D CT

angiography (CTA) and angiography showed a tiny bulge (a “blood blister-like” aneurysm) on the surface of the anterior wall of the distal right ICA (Fig. 1A). Fourteen days later, re-rupture of the aneurysm occurred. 3D-CTA and conventional angiography demonstrated that the blister-like aneurysm had progressed to a saccular type (Figs. 1B and

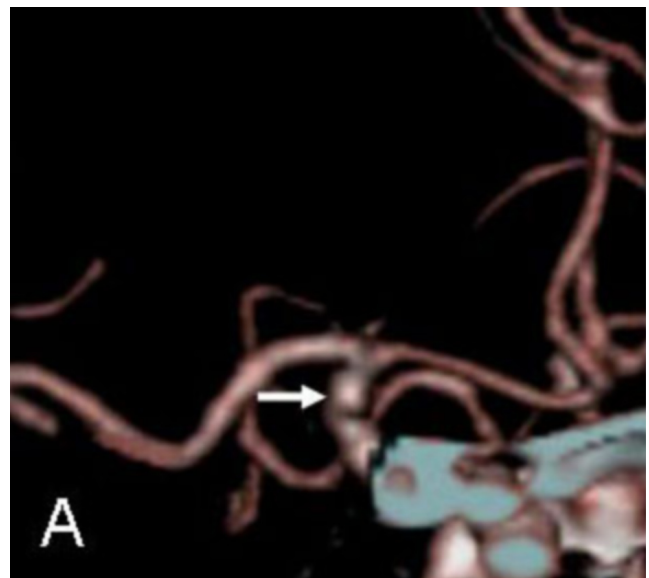


Figure 1A. 63-year-old female with anterior-wall aneurysm of the ICA. 3D CTA delineates a tiny bulge (“blood blister-like” aneurysm) on the surface of the anterior wall of the distal right ICA (arrow).

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IC). On transfer to our institute for treatment of a life-threatening aneurysm, neurological status was grade II on the H&H grading scale. Endovascular surgery using a stent-in-stent without coil embolization (because of the danger of re-rupture) was initially intended. A 7F sheath was introduced into the right femoral artery; then a 7F catheter (Launcher Peripheral guide catheter, Medtronic Vascular,

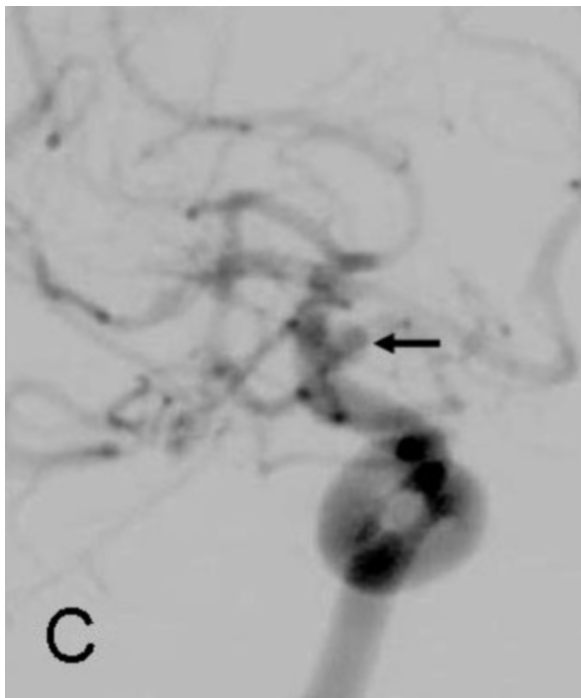
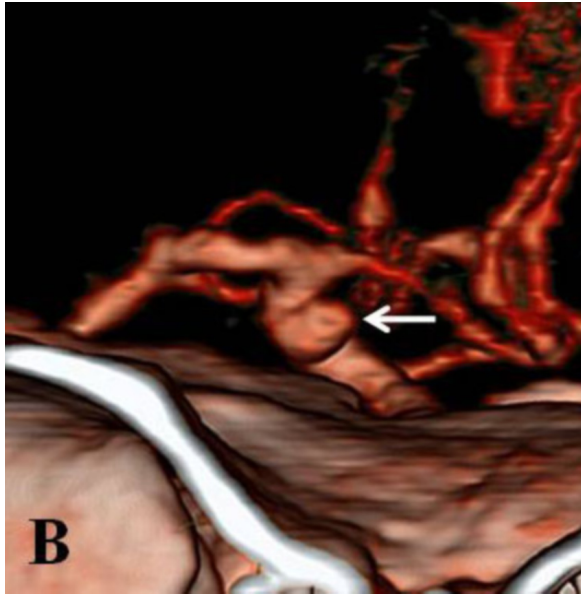


Figure 1B. 63-year-old female with anterior-wall aneurysm of the ICA. 3D-CTA 14 days after the initial symptoms, just after the aneurysm re-ruptured, shows progression to a saccular type aneurysm (arrow), clearly demonstrable by angiography (arrow) (Fig. 1C).

USA) was introduced into the right ICA, preceded by a 5F catheter (Cathex, Japan) with a coaxial system. A microcatheter (Prowler Select Plus, Codman, J & J, USA) was advanced into the right middle cerebral artery (MCA) beyond the aneurysm (Fig. 1A), and a self-expanding nitinol stent 28mm in length (Enterprise, Codman, J&J, USA) was put in place from the M1 portion of the MCA to the paraclinoid portion of the ICA to cover the normal arterial wall beyond the aneurysm.

Angiography immediately after the stent placement showed disappearance of the aneurysm (Fig. 1D); repeated angiography 10 minutes later also showed no aneurysm, so additional stent placement was not performed. The clinical course was uneventful, and followup angiography at three days and then two months (Fig. 2A) after the treatment showed no aneurysm. However, followup 3D-CCTA at the two-month time point did reveal recurrence (Fig. 2B). The patient was conservatively followed up because direct inflow



Figure 1D. 63-year-old female with anterior-wall aneurysm of the ICA. Right ICA angiogram immediately after the stent emplacement indicating disappearance of the aneurysm (arrow)

into the aneurysm was not present on conventional angiography, while slight residual inflow remained on 3D-CCTA. Since additional followup 3D-CCTA three months after the treatment showed remarkable diminution in the size of the aneurysm (Fig. 2C), no further treatment was planned. After four months, the aneurysm had disappeared (Fig. 2D), and the clinical course was subsequently uneventful without neurological deficit.

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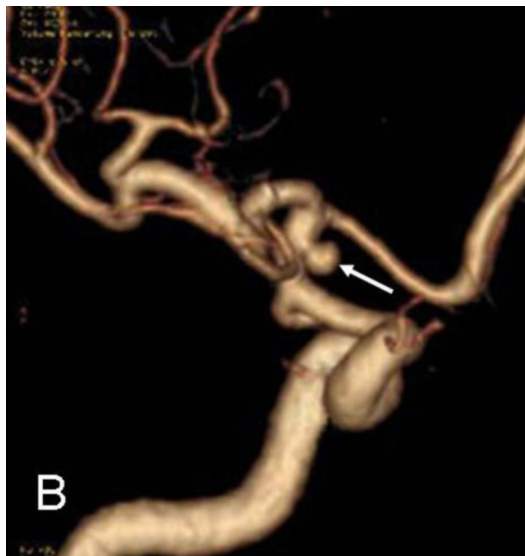


Figure 2A & B. 63-year-old female with anterior-wall aneurysm of the ICA. Followup angiogram and 3D-CTA after treatment. Angiogram two months after the treatment (A) shows no aneurysm (arrow), but it is clear on 3D-CTA (B, arrow).

Discussion

Aneurysms on the anterior wall of the ICA have been shown to be somewhat different from standard berry aneurysms because they are rather small with a broad neck, they enlarge within a short period of time, and they rupture easily, especially during surgery (5). Koga et al (6) described a rapidly growing anterior-wall aneurysm that changed in form from blister-like to saccular type in two weeks; it resembled our case, in which re-rupture occurred within the same time frame with similar morphological development.

They emphasized that immediate appropriate treatment becomes mandatory if the shape or size changes.

Subarachnoid hemorrhage with this type of aneurysm shows a female dominance, and the mean age of incidence has been reported to range from 45 years (7) to 56 years (5).

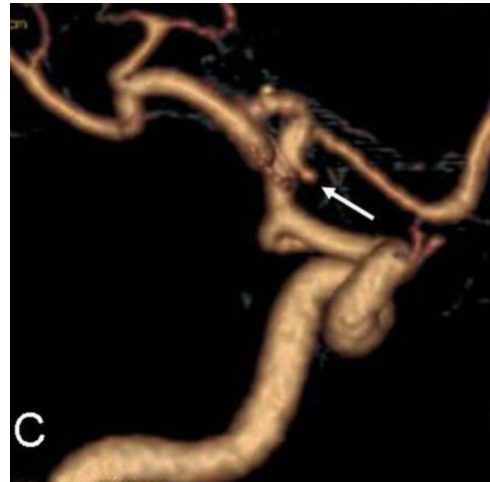


Figure 2C. 63-year-old female with anterior-wall aneurysm of the ICA. Followup 3D-CTA three months after the treatment shows remarkable decrease in the size of the aneurysm (arrow).

Etiology: Satoh et al (8) confirmed dissection of the internal carotid artery in 50 out of 221 SAH cases in a nationwide survey of the IC dorsal aneurysm data bank, covering 365 cases. In 193 surgically treated cases, 97 (55.6% of those undergoing operations) were thought to be of the dissection type. The presently described anterior wall aneurysm immediately disappeared on angiography after stent placement, but could be delineated by 3D CT. The mecha-



Figure 1D. 63-year-old female with anterior-wall aneurysm of the ICA. Follow-up 3D-CTA 4 months after the treatment shows disappearance of the aneurysm (arrow). (* = distal end of the stent)

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nism was thought to be sealing of the intimal flap of the dissection by the stent. Diversion-like effects of a stent would not exert influence, because the mesh size was large (about 3mm). Contrast medium could still enter the aneurysm slowly, resulting in delineation on 3D CT. To our knowledge, this patient is the first case to feature an intimal flap of an anterior wall aneurysm resulting in dissection.

Treatment: The incidence of intraoperative bleeding is significantly higher and the surgical outcome is significantly worse with dissection-type than nondissection-type aneurysms (8). Treatment options for the presently described case, which was difficult and unusual, are controversial. Trapping surgery with or without bypass has been documented, but re-rupture may occur during surgery because of the fragile nature of the ICA (3, 7, 9, 10). Kurokawa et al (5) reported the efficacy of a large silicon sheet encircling clip (Vascwrap; Mizuho Ikakogyo Co., Ltd., Tokyo, Japan), concluding that this method was adequate for treatment of difficult aneurysms without causing postoperative regrowth or occlusion of the patient's ICA. However, wrapping therapy may be incomplete, and surgical outcomes for patients with this type are poor in almost half of the cases (3, 7, 9). Thus, it has been suggested that this type of aneurysm is difficult to manage using only surgical approaches (3, 9).

Some authors have reported success with endovascular surgery using coils (10-12), stent-assisted coiling (13), flow-diverting stents (14-16), and covered stents (15, 17), but there is a danger of intractable bleeding during the insertion procedure (14, 15). McNeely et al (10) emphasized that tight dense packing with coils should be avoided and that soft coils should be used for this type of aneurysm. Recently, Lee et al (15) and Rasskazoff et al (16) reported that a stent-within-a-stent technique effectively prevented rebleeding and regrowth of the blood blister-like aneurysms without sacrificing the ICA. To our knowledge, ours is the first case of a single stent placement therapy for a ruptured anterior wall aneurysm that has had such a favorable outcome. A self-expanding stent is minimally invasive and may in itself be an effective treatment. In the future, self-expanding covered stents with nonthrombogenic properties offer a promising alternative treatment for anterior wall aneurysms of the dissection type.

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