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Article

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Endovascular coil oclusion of spontaneous ruptured vertebral artery dissecting aneurysm

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Abstract: Spontaneous dissecting aneurysm of vertebral artery is known as a rare pathological condition causing a subarachnoid hemorrhage in the posterior circulation. The treatment of ruptured vertebral artery dissecting aneurysms is still an important subject of debates in the literature. We present a particular case of ruptured vertebral artery dissecting aneurysms that was treated by only endovascular Guglielmi detachable coils occlusion. A brief review of technical possibilities of treatment of these types of vascular lesions, with their advantages and disadvantages are discussed.
Key words: vertebral artery dissecting aneurysm, endovascular coil occlusion

Introduction

Spontaneous ruptured vertebral artery dissecting aneurysms are rare condition but with a higher incidence risks of re-rupture, morbidity and mortality. However, these aneurysms are now being reported more frequently with increasingly use of advanced neuroimaging techniques.

A clinical and autopsy series research reported a 3 to 5% of intradural vertebral artery dissection of patients with subarachnoid hemorrhage. Only 11% of spontaneous vertebral artery dissection appears in the intracranial segment of vertebral artery [5, 6].

Due to their high incidence of rebleeding compared with classic saccular aneurysms a more rapid initiation of treatment of these lesions is indicated. The treatment can be carried out either open surgery or endovascular embolization. The deep location and close relationship to lower brain stem and lower cranial nerves of these vascular lesions made the endovascular techniques as the first intention treatment.

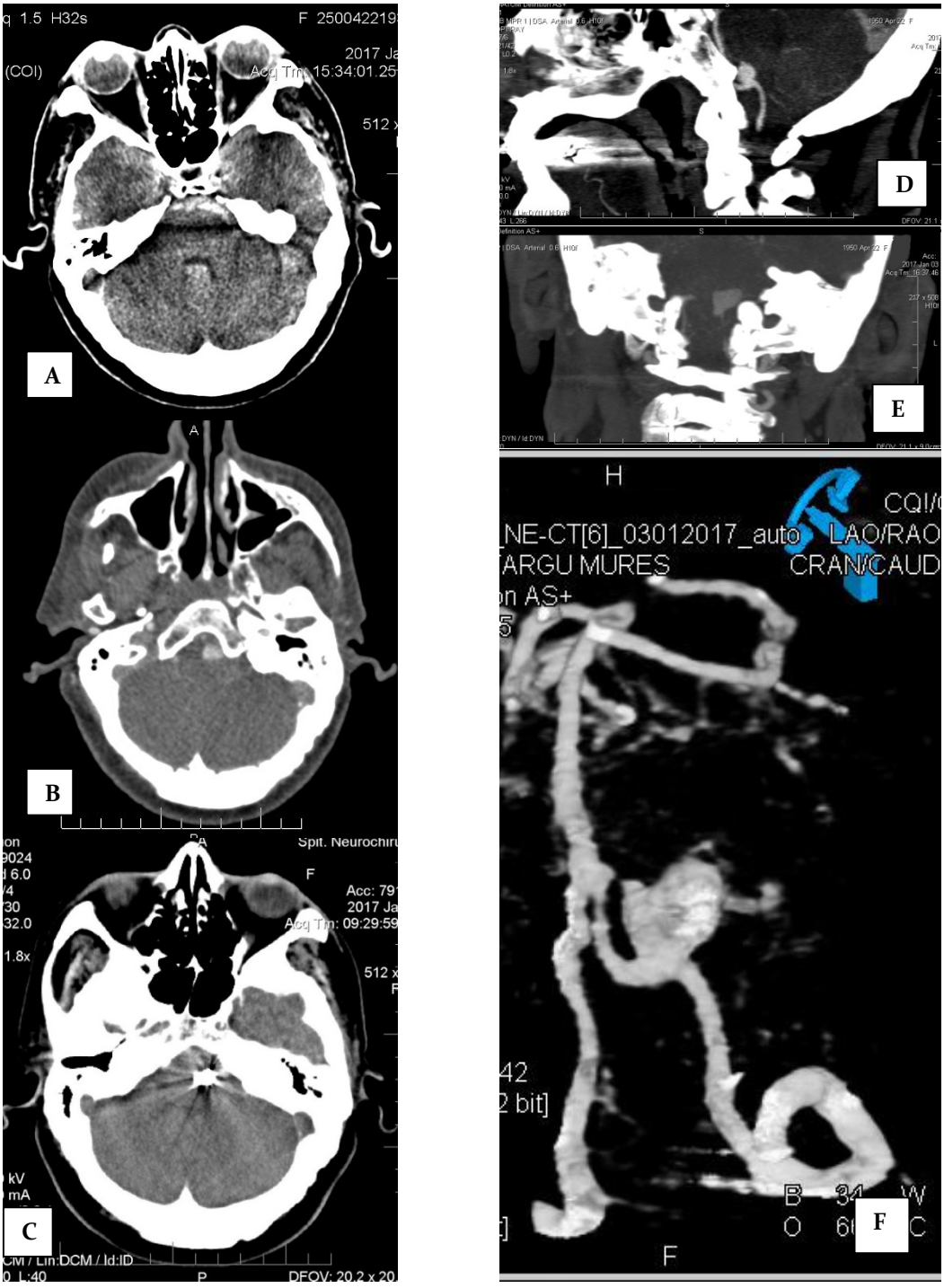
We present a case of spontaneous vertebral artery dissecting aneurysms addressed with a subarachnoid hemorrhage and discuss the technical aspects of treatment of these vascular lesions. We will focus on the endovascular coil technique which is very rare reported in this pathological situation.

Case report

A 67 years old female was addressed to our Neurosurgical Clinic for a sudden episode of headache followed by a short episode of loss of consciousness which started two days ago. Initially the patient was evaluated with grade 3 on Hunt and Hess scale and recovered to grade 2 at admission. Computerized tomogram (CT) scan performed to the addressing Department have showed a subarachnoid hemorrhage localized in perimedullary cistern and left cerebellopontine angle and forth ventricle (Figure 1A). CT angiography revealed large dissecting aneurysm at proximal portion of intracranial vertebral artery (V4 segment) (Figure 1B, D, E, F, G) [1].

The digital substraction angiography (DSA) performed in our department confirmed the CTA diagnosis and decision for an immediately endovascular treatment with coils was taken (Figure 1H).

The procedure was performed with the patient under general anesthesia. An introducer sheath of 6FR was used to access the right femoral artery. A 6 Fr guiding catheter was placed at the V2 segment of the left vertebral artery using an angled hydrophilic guide 0.035 (Terumo). Repeated angiographic imaging acquisitions were performed for clear exposure of aneurysmal neck. After obtaining an optimum working position, an Excelsior SL-10 microcatheter (Stryker) was placed inside the aneurysm by using a Transend 0.014 micro-guidewire (Boston Scientific) slightly curved on top. A GDC-10 3D coil with a diameter as close as possible to the aneurysmal sac was chosen and introduced, to obtain a more stable anchorage configuration at both aneurysmal sac and at its neck level. Subsequently they were successively introduced and detached another more 9 coils GDC-10 with complete occlusion of the aneurysm, and without any coil loop protrusion into the lumen of the carrying artery. The stable configuration of coil construction was maintained after the withdrawal of the microcatheter from the aneurysm. Repeated control angiographic exposures were performed in various angulations (Figure1I). The whole guiding system was then retracted with local compressive bandage application. During the procedure 2500 UI heparin were given after placing the first coil and another 5000 UI at the end of the procedure. Post-operative CT showed no signs of hydrocephalus or cerebral infarction (Figure 1C). The clinical evolution was very good and the patient was discharged home after 19 days.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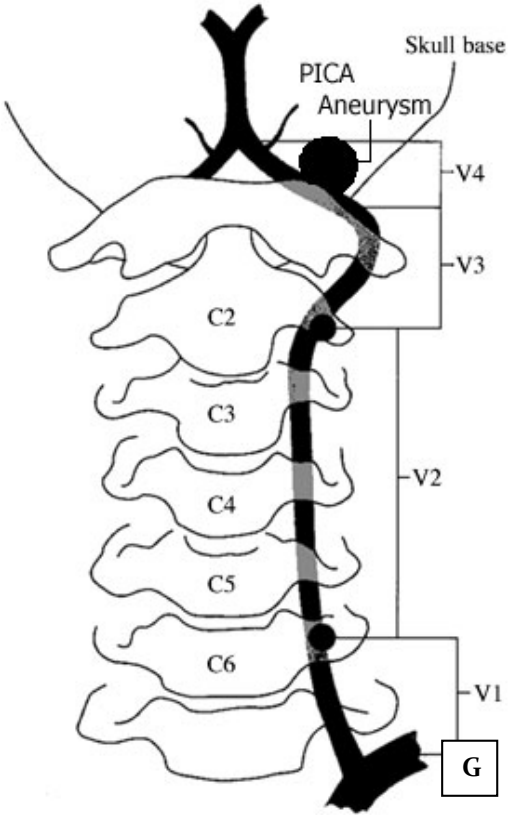

Figure 1 A - axial CT- proved SAH in the perimedullary cistern; B,D,E: - MPR images with CTA revealing a left-sided VADA; F - three dimensional computed tomography (3D CT) angiography showing a left VADA and G - Schematic representation[1]; H,I: - DSA images with the left-side VADA before and after coil embolization

Discussion

Vertebral artery dissecting aneurysm (VADA) is a rare condition caused by successive phenomena represented by disruption of the internal elastic lamina, leukocyte and macrophage infiltration, endothelial coverage followed by neointima formation. Continuous hemodynamic stress on this thin layer of intradural adventitia will result in a subarachnoid hemorrhage. The reported incidence of SAH in the literature was between 67% and 86% [7, 8].

The etiology of spontaneous VADA is still discussed and various predisposing factors like collagen abnormalities, fibromuscular dysplasia or arterial hypertension were attributed to its pathophysiology. Clinical

manifestation varies and patients can present with headache, ischemic stroke, subarachnoid haemorrhage, or symptoms associated with mass effect, mostly on the brainstem or low cranial nerves.

Unlike traumatic VADA, ruptured spontaneous VADA have been reported with an unfavourable clinical outcome due to their high incidence of rebleeding within 24 hours. Emergency treatment initiation is mandatory to prevent the fatal rebleeding. The two main concept of VADA treatment are represented by deconstructive and reconstructive techniques of the parent vessel. Both techniques could be applied by surgical or endovascular procedures (Figure 2).

Open surgical techniques are represented by proximal parent artery clipping, dissection segment trapping, dome clipping, circumferential wrapping and vertebral arterial reconstruction. The firs surgical procedure consisting in proximal occlusion of the vertebral artery close to dissection was reported by Yonas et all in 1977. For about a decade this procedure was considered as standard surgical technique for this vascular condition [5, 6, 7, 8].

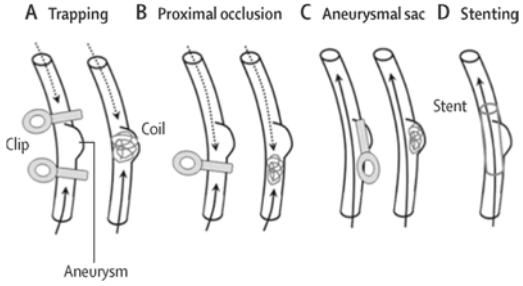

Figure 2 - A, B, C, D: Schematic representation of deconstructive and reconstructive techniques for treatment of VADA

First endovascular treatment for VADA by proximal occlusion of vertebral artery using detachable balloon or coils was considered the safest techniques. This technique was indicated especially in patients with VADA involving posterior inferior cerebellar artery (PICA). Reports showing refilling of the aneurysm from the opposite vertebral artery and repeated haemorrhage caused the search of new treatment options.

Thus, the strategy of endovascular treatment changed from proximal occlusion to trapping by complete occlusion of arterial dissection segment with detachable coils. Even if this endovascular procedure has been reported in many series of cases as the most efficient treatment of ruptured VADA, especially in acute phase, it is not indicated in situation of PICA or spinal artery involvement at the site of arterial dissection. This procedure was also reported to be limited by antegrade recanalization of the aneurysm from contralateral vertebral artery. Incomplete coil occlusion of the entry to dissecting aneurysm or detachable coil occlusion of the false lumen followed by true lumen dilatation to the normal diameter simultaneously with false lumen collapsing could be the explanations of this unfavourable evolution.

For lesion involving the origin of PICA or spinal artery Iiahara et all [5, 6] reported a therapeutic planning to minimize the risk of treatement-releated morbidity based on balloon test occlusion followed by internal trapping of the dissected site [7, 8, 9, 10].

More recent reconstructive endovascular techniques such as coil occlusion, stent

placement or stent-supported coil embolization were successfully reported. The only coil occlusion technique is feasible in case of o saccular dome configuration of arterial dissected wall. This will offer the possibility to obtain a stable coil arrangement with or without a balloon assisted technique. The stenting or stent-supported coil embolization are still debated especially due to need of major anticoagulation in the acute SAH phase.

Multimodal approaches in the context of a combined treatment (endovascular and microsurgical) have been also mentioned in the literature. Additional anastomotic surgical revascularization was proved helpfully and effective after endovascular occlusion. Autoexpandable stent placement followed by subsequent surgical circumferential wrapping of the aneurysm was also reported as multimodal treatment [3, 4, 11].

Nevertheless, treatment of spontaneous ruptured VADAs is not without some complication. Kitanaka et all reported that a very high rate of postoperative complication with major causes of disability were attributable to lower cranial nerve palsy and associated condition as prolonged intubation and tube feeding [2, 5, 6]. Vertebral artery recanalization by antegrade flow, coil compactation, coil loop migration, intra-stent thrombosis and distal thrombembolism have been also reported as complications of endovascular treatments. Intermittent headache episodes accompanied by vertiginous syndrome were mentioned to some patient with unilateral vertebral artery occlusion due to hemodynamic stress caused by enlarging diameter of opposite vertebral artery.

Conclusions

Despite discussions regarding optimal treatment of spontaneous ruptured VADAs it is a common practice to treat immediately the patients presented with SAH. Most patients with subarachnoid haemorrhage undergo surgical or endovascular treatment to prevent rebleeding. Major reports showed that endovascular techniques appear to be the safe and effective method especially in critical condition. Also, follow-up angiographic studies are needed due to unpredictable evolution of these lesion and some related technique complications.

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