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Case Report

Transient third cranial nerve palsy after pipeline shield treatment of a ruptured anterior cerebral artery dissecting aneurysm: Case report

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ABSTRACT

Background: Intracranial dissecting aneurysms (IDAs) are rare vascular lesions usually arising from the posterior circulation. The anterior cerebral artery (ACA) is an unusual location for this pathology. Even rarer is the occurrence of a transient *de novo* third cranial nerve (CN) palsy after flow-diverting device (FDD) treatment of an ACA dissecting aneurysm.

Case Description: A middle-aged man with a prior history of hypertension was admitted to our emergency department with severe headache and loss of consciousness after sexual intercourse. Imaging revealed a subarachnoid hemorrhage with stenosis of the left A1 segment of the ACA. Cerebral digital subtraction angiography confirmed a dissecting aneurysm of the left A1 segment. The aneurysm was treated with an FDD (Pipeline Shield). Transient isolated incomplete third CN palsy was documented 12 h after treatment. No evidence of ischemic or hemorrhagic strokes was found. The condition improved after a few days of empiric steroid treatment.

Conclusion: An FDD is a suitable alternative for the treatment of a ruptured IDA of the anterior circulation. Some infrequent complications associated with the device, such as *de novo* cranial neuropathies, are yet to be studied.

Keywords: Anterior cerebral artery, Dissecting aneurysm, Flow diversion, Intracranial aneurysm, Oculomotor nerve disease

INTRODUCTION

Intracranial dissecting aneurysms (IDAs) account for 3% of all intracranial aneurysms (IAs) and are usually located in the posterior circulation (PCirc).[1,5,7] Subarachnoid hemorrhage (SAH) is one of the frequent presenting patterns of this pathology, but it is not usually related to third cranial nerve (CN) palsies.[4] Endovascular therapy (EVT) has proved to be a successful treatment on account of its high occlusion and low morbidity and mortality rates.[1] We report the case of a male patient with a ruptured anterior cerebral artery (ACA) dissecting aneurysm treated with a flow-diverting device (FDD), who had a post procedural transient isolated third CN palsy.

CLINICAL PRESENTATION

History and physical examination

A 49-year-old man with a medical history of hypertension complained of a 3-day history of thunderclap headache after sexual intercourse, followed by vomiting episodes and a generalized tonic-clonic seizure. Besides nuchal rigidity, the physical examination was unremarkable.

Imaging

A computed tomography (CT) of the head revealed a left frontoparietal SAH and a hyperdensity in the proximal segment (A1) of the left ACA [Figure 1 and Panel-A]. A CT angiography (CTA) of the head showed proximal stenosis and post stenotic dilation of the left A1-segment [Figure 1 and Panel-B]. A cerebral digital subtraction angiography demonstrated an IDA of the left A1-segment [Figure 2]. The patient was diagnosed with a Hunt and Hess Grade-2, WFNS Grade-1, and modified Fisher Grade-3 aneurysmal SAH secondary to a left A1 IDA rupture.

Treatment

A decision was made to proceed with urgent EVT of the aneurysm. The patient received loading doses of dual antiplatelet therapy (DAPT) for 48 h (acetylsalicylic acid 300 mg/day and clopidogrel 300 mg/day) and then was taken to the neuroangiography suite. After induction of general anesthesia, intraoperative infusion of tirofiban (0.16 mcg/kg/min) was initiated. Before A3 segment microcatheterization with PhenomTM 027 microcatheter (Medtronic Inc., Irvine, California, USA) in Avigo™ Hydrophilic Guidewire (Medtronic Inc., Irvine, California, USA) A Pipeline Flex Embolization Device with Shield Technology (Pipeline Shield; Medtronic Inc., Irvine, California, USA) was strategically deployed, from the A2-segment to A1-segment of the left ACA. Post procedure angiography showed adequate permeability of the FDD [Figure 3].

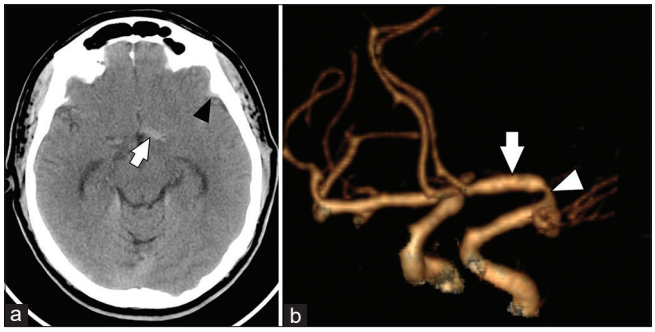

Figure 1: (a) Axial view of a head computed tomography revealed a left frontoparietal subarachnoid hemorrhage (black arrowhead) and a hyperdensity (white arrow) in the proximal segment (A1) of the left anterior cerebral artery. (b) Oblique view of a head computed tomography angiography with 3D reconstruction showed proximal stenosis (white arrowhead) and post stenotic dilation (white arrow) of the left A1 segment.

Post procedural care

The patient was transferred to the neurointensive care unit. Tirofiban infusion was continued for the next 24 h, and the DAPT was instated to a maintenance dose (acetylsalicylic acid 100 mg/day and clopidogrel 75 mg/day). Twelve hours after the end of the procedure, the patient complained of intermittent binocular diplopia. On examination, there was evidence of preserved visual acuity for both eyes; mild left-eye ptosis; a non-reactive dilated left pupil; left superior, medial, inferior recti, and inferior oblique muscle paresis [Figure 4]. A head CTA and brain MRI ruled out ischemic or hemorrhagic lesions and confirmed adequate positioning of the FDD. The condition of the patient improved during the next 72 h with empiric steroid therapy. Two weeks after the procedure, the third CN palsy had entirely resolved. On the 1-month follow-up angiography, there was complete exclusion of the IDA [Figure 5].

DISCUSSION

IDAs

IDAs account for 3% of all IAs, with a yearly incidence rate of 1–1.5 per 100,000 people.[1,7] They commonly affect the PCirc, and those found in the anterior circulation (ACirc) are predominantly located in the middle cerebral artery.[5] IDAs may present with ischemic insults, SAH, or a combination thereof.[4] IDAs of the ACirc frequently present with thromboembolic complications; conversely, PCirc IDAs are more prone to rupture.[5,7] In a meta-analysis evaluating 91 patients with IDAs of the ACA, the majority (73%) presented with ischemia, while SAH accounted for only 10% of the cases.[4] A negative prognosis has been reported for unsecured ruptured IDAs secondary to high rates of rebleeding (71.4%).[7]

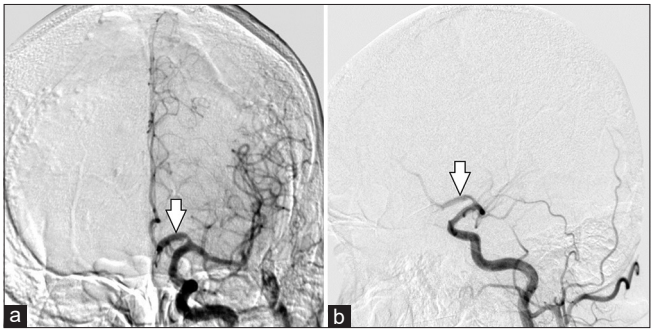

Figure 2: Diagnostic cerebral digital subtraction angiography. Anteroposterior (a) and lateral (b) views of a left common carotid artery contrast injection confirmed a ruptured intracranial dissecting aneurysm (white arrow) of the left A1 segment.

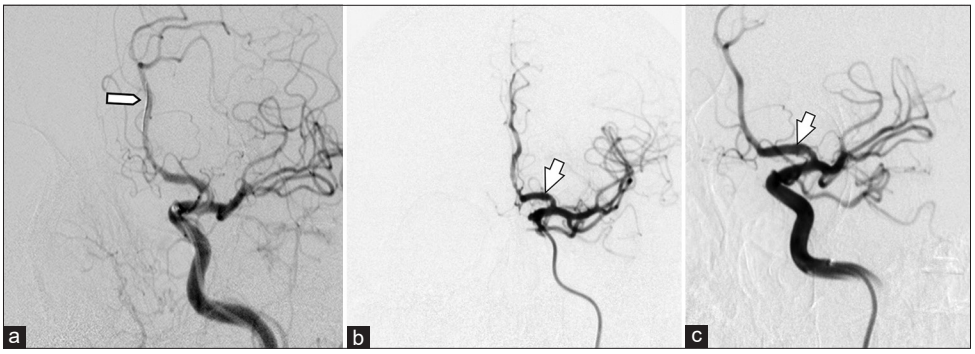

Figure 3: Digital subtraction angiography anteroposterior projection. Road mapping microcatheterization until A3-segment (a) and PPD implantation from A2 to A1 was performed. Immediate post procedural cerebral digital subtraction angiography. Anteroposterior (b) and oblique (c) views of a left internal carotid artery contrast injection after deployment of the Pipeline shield in the left A1 segment (white arrow).

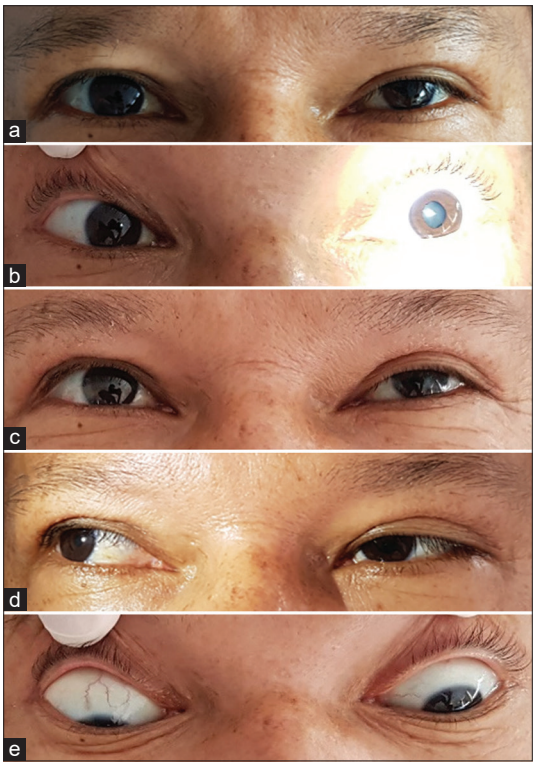

Figure 4: On post procedural examination, there was evidence of mild left-eye ptosis (a), a non-reactive dilated left pupil (b), left superior (c), medial (d), inferior recti (e), and inferior oblique muscles paresis consistent with an incomplete third cranial nerve palsy.

Treatment of IDAs

Surgical therapy and EVT have proved to be successful for the treatment of IDAs. However, EVT has become the treatment of choice on account of its high occlusion and lower morbidity and mortality rates.[1] FDDs have been widely used for the treatment of IDAs.[6] The Pipeline Embolization Device (PED; Medtronic Inc.) was the first FDD used for this purpose. The safety and efficacy of the PED have been repeatedly demonstrated.[8] Although unusual, post procedural ischemic stroke is the most common neurological complication after aneurysm treatment with FDDs, with estimated rates ranging between 3% and 6%.[11] As an attempt to reduce this ischemic risk, novel FDDs with reduced thrombogenicity have been designed (e.g. the Pipeline Shield).[8,11] Nevertheless, antiplatelet therapy is still required to prevent thromboembolic complications associated with FDDs.[10] Therefore, ruptured IAs may pose a significant challenge because of the risk of peri-procedural hemorrhage. Different antiplatelet regimens have been reported in this scenario.[8,9,11] Samaniego *et al.* evaluated the safety of treating ruptured IAs with FDDs using periprocedural tirofiban infusion and a loading dose of DAPT (acetylsalicylic acid and clopidogrel), reporting a low overall symptomatic hemorrhage rate (3.3%).[10]

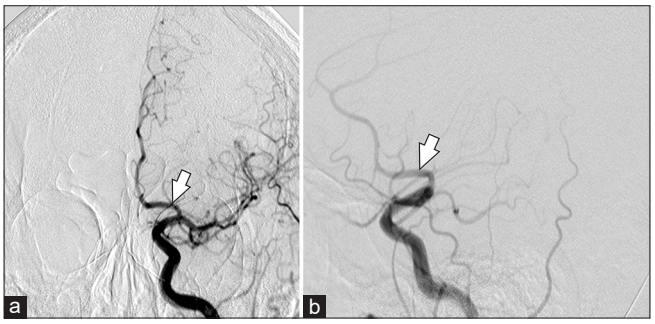

Figure 5: One-month follow-up cerebral digital subtraction angiography. Anteroposterior (a) and lateral (b) views of a left common carotid artery contrast injection confirmed the complete exclusion of the left A1 dissecting aneurysm (white arrow).

Regarding EVT for ruptured IDAs, the evidence is predominantly based on case series of PCirc lesions. Chan *et al.* conducted a single-center retrospective review of

eight patients with IDAs of the PCirc treated with the PED, reporting no major procedure-related complications (hemorrhagic or ischemic complications).[2] The authors concluded that the PED is a feasible treatment option for ruptured IDAs in the acute phase.

Third CN Palsy

Third CN palsies are rare in patients with ACA aneurysms, and various etiologic hypotheses have been established for this condition.[3] As there is no close anatomic relationship between these structures that could clearly explain this symptomatology, hemotoxicity, ischemia, and increased intracranial pressure might play a more feasible role.[3]

To the best of our knowledge, the patient described in this report is the first documented case of a transient isolated incomplete third CN palsy after successful Pipeline Shield treatment of an ACA IDA without evidence of peri-procedural hemorrhagic or ischemic events. This complication might be a consequence of the inflammatory response generated by the deployment of the FDD or the hemotoxicity exerted by the SAH. However, the precise underlying pathophysiological mechanisms remain uncertain and are yet to be investigated.

CONCLUSION

An FDD efficiently is a suitable alternative for adequately treating a ruptured IDA of the ACirc with high occlusion and lower morbidity and mortality rates especially PED.[6,8,10] Infrequent complications after the deployment of the device, such as *de novo* third CN palsy, may occur and need to be further investigated.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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