

CASE REPORT

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Massive Dissecting Aneurysm in the Basilar Tip Artery Treated with Intra-aneurysm and Basilar Artery Coiling

Tran Anh Tuan¹, Nguyen Huu An¹, Nguyen Van Tuan², Vu Dang Luu¹, Pham Minh Thong¹, Huynh Quang Huy³, Nguyen Minh Duc³, Pierot Laurent⁴**ABSTRACT:**

Introduction: Deconstructive versus reconstructive technique remains controversial on the management of acute basilar tip artery dissection. **Aim:** We introduced a case report of massive dissecting aneurysm in the basilar tip artery treated with intra-aneurysm and basilar artery coiling. **Results:** A 30-year-old male presented with sudden headache and severe vomiting. Radiographic study showed a large unruptured dissecting aneurysm in the basilar tip artery involving bilateral P1 segment. This aneurysm was treated with intra-aneurysm and basilar artery coiling. Patient was discharge after 7 days without any neurological deficits. Post-operatively, the patient received 75 mg aspirin and 75 mg clopidogrel PO per day for 3 months - then 75 mg aspirin per day for up to 1 year. Angiographic follow-up at 3 months showed a complete occlusion of aneurysmal sac and basilar tip artery without any deficits (mRS 0). Cerebral arteriography at 6 months follow-up confirmed a stable occlusion of aneurysmal sac with a minor recurrence of aneurysm in left P1 segment. **Conclusion:** Intra-aneurysm and basilar artery coiling is valuable alternative technique to treat complex basilar tip dissecting aneurysm in case of infeasible reconstructive technique. Clinical presentation, aneurysm characteristics and collateral circulation have to be investigated on each case to adopt this technique.

Keywords: Basilar tip dissecting aneurysm, Endovascular treatment, Deconstructive technique.

1. INTRODUCTION

Basilar artery dissecting aneurysm (BADA) is a relatively rare disease, with an estimated incidence of less than 0.25 per 100.000 people/year (1). Endovascular treatment (EVT) has been demonstrated more favorably than surgery in terms of permanent neurologic deficit. In the sight of recent studies, the reconstructive technique by stent or flow diverters with or without coiling should be considered as the first choice in eligible cases (2-4). However, deconstructive technique with intra-arterial and basilar artery coiling (IABAC) is a valuable alternative method for the treatment of this disease in case of reconstructive technique is impossible (3).

To the best of our knowledge, an estimated number of 27 reported cases with BADA were treated by IABAC. We report a case of a 30-year-old patient with BADA that exerted a masse effect on the brainstem. IABAC was performed to occlude the BA and the aneurysm. Adequate obliteration of BA and the aneurysm

sac was revealed by 6-month follow-up DSA without any neurological deficits.

2. AIM

We performed a case report in order to help interventional neuroradiologists know about massive dissecting aneurysm in the basilar tip artery treated with intra-aneurysm and basilar artery coiling.

3. CASE PRESENTATION

A 30-year-old-male patient was admitted to another hospital complaining of sudden fierce headache and severe vomiting without antecedent trauma. The brain MRI was performed due to the suspicion of acute stroke. On his cerebral MRI, neither acute ischemic nor hemorrhagic stroke was detected. However, a large aneurysm of the basilar tip artery was revealed with the largest diameter of 22mm. The aneurysm exerted a critical mass effect on the pons (Figure 1). He was transferred to our hospital for further evaluation on the same day.

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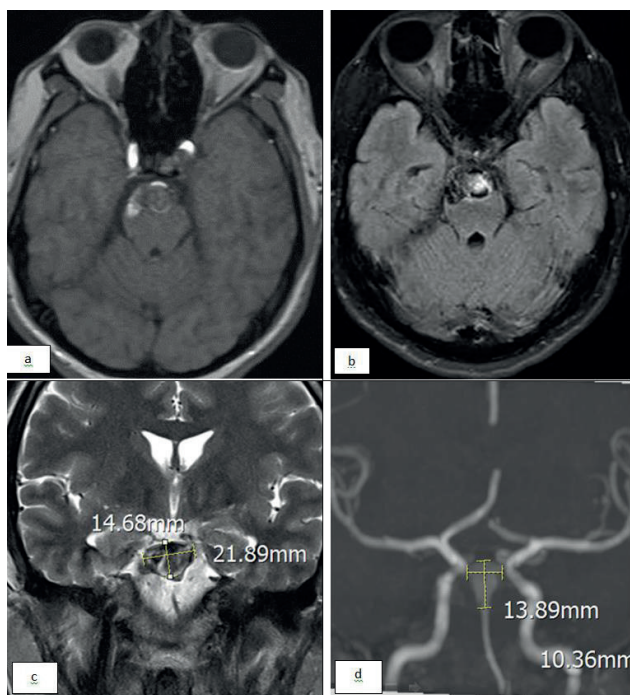


Figure 1. Large dissecting aneurysm in basilar tip with double lumen on T1WI (a), caused a mass effect on bilateral pontine (b), the largest diameter of 22mm on T2WI (c), and partial thrombosis with smaller residual flow on TOF (d).

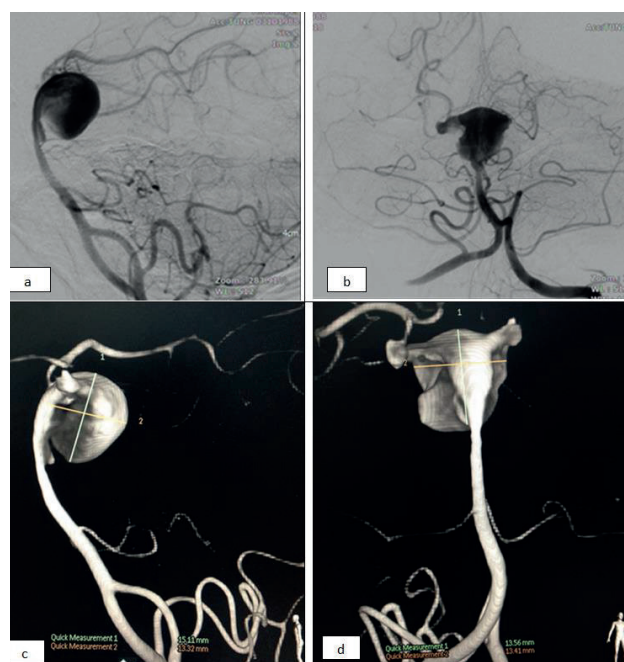


Figure 2. Subsequence cerebral angiogram confirmed the diagnosis of large dissecting aneurysm in basilar tip with the entrance tear above pontine arteries (a), extended into bilateral P1 segment (b). On 3D rotational angiography, the largest diameter of aneurysm was 15mm (c), the right P1 was severe stenosis and the left P1 was occluded (d).

Initial neurological examination on admission noted that he was conscious and without neurological deficit. His medical history was unremarkable. Subsequent diagnostic cerebral angiogram confirmed the present of a fusio-sacciform dissecting aneurysm in the distal segment of the basilar artery. The aneurysm had partial thrombosis, measuring 13 mm in width and 15mm in height, with an undefined neck. Its location in the trunk was just above the pontine perforators. In particular, the dissecting part involved in both P1 segments of posterior cerebral artery (PCA), causing severe stenosis of right P1 and occlusion of left P1. Regarding to the collateral circulation, the bilateral PCA was supplied by bilateral posterior communicating artery (PCoMA). The diameter of right and left PCoMA were 2mm and 2.5mm respectively (Figure 2).

Endovascular treatment

After taking the clinical symptoms, the aneurysm characteristics, and patient’s age into account, treatment of the aneurysm by endovascular approach was considered appropriate in order to prevent rupture and to release the mass effect on the brainstem. This proposal was accepted by the patient and his family.

The procedure was performed under general anesthesia via bilateral femoral artery. Bilateral vertebral artery was selected with Chaperon 6F guiding catheter (Microvention, Aliso Viejo, California, USA). Angiography confirmed the presence of unchanged dissecting aneurysm in the distal segment of the basilar artery. Working projections were selected to show the aneurysm sac, the proximal part of the dissecting lesion, and the origin of the pontine perforators. Via the left VA, a PX Slim microcatheter (Penumbra, Alameda, California, USA) with half round loop was placed along the posterior wall of the



Figure 2 (continued). Selective bilateral internal carotid artery was shown good collateral from bilateral PICOM (e, f). Final results of embolization with partial occlusion of aneurysm on right vertebral DSA run (g); the left V4 segment did not appear on left vertebral DSA run (h); the packing density of coils inside the aneurysm on nonsubtractive DSA (i).

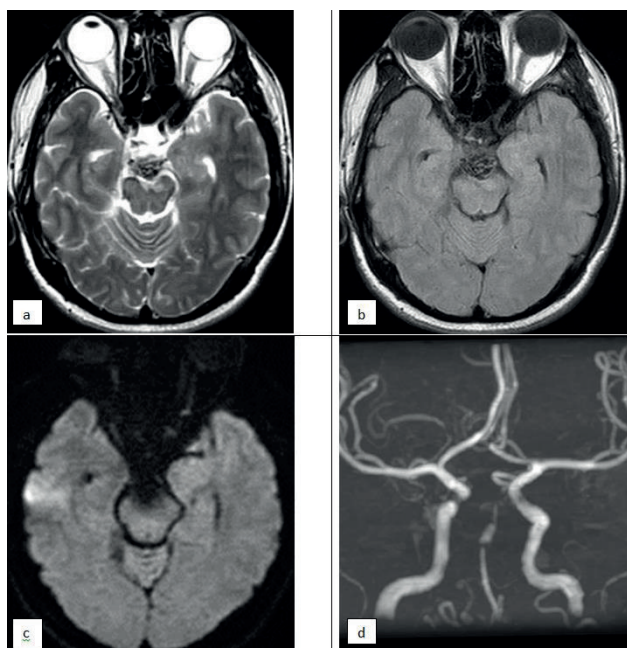


Figure 3. Cerebral MRI on the next day due to an appearance of nausea and vomiting revealed edema in bilateral pons (a, b). There were no signs of infarction on DWI (c). Thrombosis formed in the false lumen of dissecting aneurysm (d).

sac. The proximal part of the aneurysm was selected by a Headway 17 microcatheter (Microvention, Aliso Viejo, California, USA) via the right VA. Through the PX Slim microcatheter, six Ruby conventional 18 coils (Penumbra, Alameda, California, USA) were deployed into the aneurysm sac. Then, eleven Hydrocoils (Microvention, Aliso Viejo, California, USA) were placed in the proximal part of the aneurysm via the Headway microcatheter. The angiographic control was performed to evaluate the occlusion of the aneurysm. The final DSA showed the disappearance of blood flow in left VA upper of the PICA, the normal blood flow in right VA, and a significant reduction of blood flow in the aneurysm (Figure 3). Because the aneurysm was unruptured, we decided to not occlude completely and to stop the coiling. The procedure was completed with the compression of bilateral femoral artery. Anticoagulant therapy with 3000 IU (50 IU/kg) unfractionated heparin was administered with an IV bolus after the first coil deployed.

Outcome

The patient recovered post-procedure without any neurological symptoms or femoral access site complications. An emergent non-enhanced CT scan of brain was performed at night of the intervention day due to his worsening headache symptoms. Neither ischemic nor hemorrhagic stroke was noted (Figure 4). The brain MRI on the next day showed an edema in the pons without hyperintensity on DWI. The aneurysm sac was occlusion. The solumedrol 40 mg was administered for the next 5 days. The dual antiplatelet therapy with clopidogrel 75 mg and aspirin 81 mg per day was given for 3 months post intervention. The patient was discharged after 7 days without any neurological deficit.

The first angiographic follow-up after 3 months of the intervention revealed a complete occlusion of basilar tip as well as the aneurysm sac with a hypoplasia of the

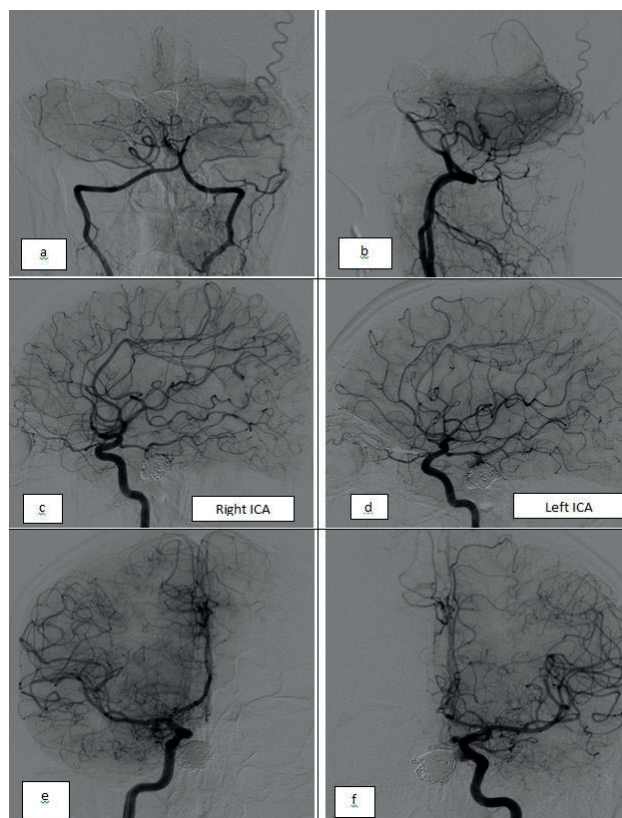


Figure 4. Cerebral angiography follow up after 6 months shown a complete occlusion of basilar tip (a, b) and a minor recurrence of aneurysm vascularized by small branch of left PICOM (d, f).

basilar trunk. The aspirin 81 mg per day was maintained up to 1 year. The DSA follow-up after 6 months showed a stable occlusion of the aneurysm with a minor recurrence in the left remnant P1 segment. According to the size of recurrent aneurysm and the difficult anatomy, we decided to continue follow up. The most recent routine clinical follow-up after treatment revealed that the patient was still clinical intact (mRS 0).

4. DISCUSSION

The management of BAD is challenging and empirical (1, 2). The decision of treatment method including conservative therapy or intervention therapy should be based on three factors: clinical presentations (hemorrhage, ischemic or brainstem compression), the extent of dissection on imaging, and overall patient status. With a high risk of early rebleeding in ruptured BAD and bleeding in unruptured large BAD caused masse effect, the treatment either by surgery or endovascular should be done (2, 3).

Endovascular treatment (EVT) is now the first choice for most intervened cases (1, 2). There are two strategies for EVT, including deconstructive technique (parent artery occlusion, internal trapping or flow reversal) and reconstructive technique (stenting or flow diversion with or without coiling). Both of these techniques showed the efficacy with low rate of complications (3, 4). In the sight of recent studies, reconstructive technique by stent or flow diverters with or without coiling should be considered as the first choice in eligible cases (2, 4). However, a recent systematic review and meta-analysis on endovas-

cular treatment of vertebrobasilar dissecting aneurysms found that the occlusion rates were higher in deconstructive technique (3). Deciding on the type of technique to treat have to be tailored to each case.

Considering the exact aneurysm anatomy, some strategies have been proposed and discussed below:

The first option was reconstructive technique with stent or flow diverter. Unfortunately, this approach would have two major difficulties. Firstly, the dissection part involved both P1 segment with occlusion of left P1 as well as severe stenosis of right P1. It was difficult to cover the entire pathology area with stent or flow diverter, which is crucial to the success of the technique. Secondly, the aneurysm was just above the pontine perforators of the BA. It means that these perforating branches would be covered in case of using flow diverter, leading to a risk of ischemic events in the pons as reported in literature (5).

The second option was deconstructive technique with total occlusion of bilateral vertebral artery above the origin of posterior inferior cerebellar artery (PICA). Kim et al have addressed the problem of severe ischemic complications (2). This risk may be even higher in our case due to the involvement of dissection in bilateral P1.

The third option was deconstructive technique with intra-aneurysm and basilar artery coiling. An estimated 27 clinical cases treating with this technique have been reported with favorable outcome in 26 cases (6-10). The largest series was reported by Mu SQ et al, in which 14 out of 15 patients had a good recovery (10). The most challenging subject of this technique was how to make sure that the important perforators (pontine perforators and thalamic perforators) will be protected. On the one hand, it was pointed out that the size of PcomA is the most important factor to choose this technique (6-10). With the size of bilateral PComA larger than 1 mm, the procedure is considered safe. Meanwhile, with the sizes smaller than 1 mm, a test occlusion with or without SPECT study should be performed to confirm the adequacy of PComA flow. On the other hand, it is highly likely basilar perforator arteries incorporated into the aneurysm sac are either occluded by thrombus or disrupted their blood supply into the brain stem (6). Adequate collateral circulation has been formed to supply these perforating artery territories at the time of diagnosis. This argument was certainly evident in our patient because he had no infarction injury on MRI at the time of admission. Even so there is no way to predict that this collateral circulation will be sufficient after intra-aneurysm and basilar artery coiling (7). For unruptured aneurysms like our case, we have implemented several solutions to deal with this challenge. Firstly, we performed the procedure with the patient awake that permits constant monitoring of the patient's neurological status. Secondly, we thought that a partial occlusion of the aneurysm sac was enough to prevent the bleeding complication and the dense parking of coils in the aneurysm inflow zone would prevent the recanalization as well as cause a gradual occlusion of the aneurysm. Finally, to prevent an abrupt occlusion of basilar tip artery, anticoagulation with intravenous hep-

arin followed by antiplatelet therapy has been used for our patient.

5. CONCLUSION

Deconstructive technique with intra-arterial and basilar artery coiling is a valuable alternative method for the treatment of dissecting aneurysm involving the basilar tip. Clinical presentation, aneurysm characteristics and collateral circulation have to be investigated on each case to plan an appropriate treatment.

- **Ethical approval and Declaration of patient consent:** Institutional review board of Bach Mai hospital approved this study. Informed consent of patient was obtained.
- **Author's contribution:** Each author gave a substantial contribution in acquisition, analysis, and data interpretation. Each author had a part in preparing article for drafting and revising it critically for important intellectual content. Each author gave the final approval of the version to be published and agreed to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
- **Conflicts of interest:** There are no conflicts of interest to declare.
- **Financial support and sponsorship:** Nil.

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