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Case Report

Extracranial internal carotid artery-dissecting aneurysm having a re-entry tear and causing lower cranial nerve palsies treated with flow-diverting stent: A case report

Nobuyuki Izutsu[1], Naoki Nishizawa[1], Shin Nakajima[1], Yonehiro Kanemura[1,2], Tomohiko Ozaki[3], Katsunori Asai[1], Tomoki Kidani[1], Koji Kobayashi[1], Yosuke Fujimi[1], Toshiyuki Fujinaka[1]

Departments of [1]Neurosurgery and [2]Biomedical Research and Innovation, NHO Osaka National Hospital, Osaka, [3]Department of Neurosurgery, Osaka University Graduate School of Medicine, Suita, Japan.

E-mail: *Nobuyuki Izutsu - hoheitai8@gmail.com; Naoki Nishizawa - n.nishizawa44@gmail.com; Shin Nakajima - nakajima.shin.tf@mail.hosp.go.jp; Yonehiro Kanemura - kanemura.yonehiro.hk@mail.hosp.go.jp; Tomohiko Ozaki - tomohikoozaki@gmail.com; Katsunori Asai - mm0001ak@yahoo.co.jp; Tomoki Kidani - kkkkidani@ybb.ne.jp; Koji Kobayashi - k.072914er@gmail.com; Yosuke Fujimi - yosukef@hotmail.co.jp; Toshiyuki Fujinaka - fujinaka@nsurg.med.osaka-u.ac.jp

***Corresponding author:**
Nobuyuki Izutsu,
Department of Neurosurgery,
NHO Osaka National Hospital,
Osaka, Japan.

hoheitai8@gmail.com

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ABSTRACT

Background: Extracranial internal carotid artery (ICA)-dissecting aneurysms (DAs) rarely cause re-entry tears and lower cranial nerve palsies. The therapeutic strategies for these pathologies are not well established. This report presents a case of an extracranial ICA -DA with a re-entry tear that caused lower cranial nerve palsy.

Case Description: A 60-year-old man presented with left neck pain, hoarseness, and dysphagia. Physical examination and laryngoscopy determined palsies of the left cranial nerves IX, X, and XII. Digital subtraction angiography (DSA) revealed a DA in the left extracranial ICA, and three-dimensional DSA showed entry and re-entry tears in the intimal flap. Flow-diverting stents (FDSs) were placed on the lesion that covered the entry and re-entry tears because the symptoms did not improve after five weeks of conservative treatment. A post-procedural angiogram indicated flow stagnation in the DA. Symptoms improved remarkably immediately after the procedure, and the aneurysm was almost completely occluded six months later.

Conclusion: Herein, an extracranial ICA -DA with a re-entry tear that caused lower cranial nerve palsy did not improve after five weeks of conservative treatment. FDS placement promptly resolved the aneurysm and symptoms. Thus, FDS placement may be an effective treatment option for extracranial ICA-DAs with re-entry tears or lower cranial nerve palsies.

Keywords: Dissecting aneurysm, Elongated styloid process, Extracranial internal carotid artery, Flow-diverting stent, Lower cranial nerve palsy

INTRODUCTION

Extracranial internal carotid artery (ICA) dissection often results in true lumen stenosis with an intramural hematoma. Contrastingly, extracranial ICA dissection occasionally forms a dissecting aneurysm (DA),[4] which seldom has a re-entry tear. Extracranial ICA dissection is a well-known cause of lower cranial nerve palsy.[8] In most of these cases, the intramural hematoma compresses the lower cranial nerves; however, in a few cases, the DA compresses the lower cranial nerves.

Therefore, reports on extracranial ICA-DA having a re-entry tear or causing lower cranial nerve palsy are limited, and therapeutic strategies for these pathologies have not been well established. Herein, we report a case of extracranial ICA-DA with a re-entry tear that caused lower cranial nerve palsies.

CASE DESCRIPTION

A 60-year-old man presented with sudden onset of left neck pain after rotating his head to the right, followed by hoarseness and dysphagia. The patient had no significant history of other diseases. The physical examination determined the poor elevation of the left soft palate and leftward deviation of the tongue on protrusion. Laryngoscopy revealed left-sided vocal cord paralysis. Magnetic resonance imaging and magnetic resonance angiography showed dilatation of the left ICA, and diffusion-weighted imaging indicated no cerebral ischemic lesions. Digital subtraction angiography (DSA) revealed a DA in the left distal cervical ICA extending into the petrous portion [Figure 1a]. The true lumen was narrow, and high blood flow through the false lumen was observed. The patency of the left ascending pharyngeal artery was confirmed. Three-dimensional DSA revealed entry and re-entry tears in the intimal flap [Figures 1b-e]. Computed tomography angiography revealed an elongated left styloid process, which was 35 mm in length and near the DA [Figure 1f].

The diagnosis was left cranial nerve IX, X, and XII palsies caused by compression from the DA, which was further caused by the elongated styloid process. Expecting spontaneous recovery of ICA dissection, we initiated conservative treatment. Anticoagulant therapy with heparin was started to prevent artery-to-artery embolism due to a thrombus within the false lumen. One week later, however, we changed the antithrombotic therapy to dual antiplatelet therapy with acetylsalicylic acid (100 mg/d) and clopidogrel (75 mg/d) in preparation for an emergency stent placement for ICA occlusion due to false lumen thrombosis. During the four weeks of conservative treatment, the patient developed aspiration pneumonia due to severe dysphagia and was required to stop oral intake and start tube feeding. Surgical treatment was planned as the patient's symptoms did not improve, and the DSA exhibited no changes in the aneurysm. We chose flow-diverting stent (FDS) placement, expecting a reduction in the DA size and preservation of ICA blood flow. FDS placement was performed five weeks after onset.

The procedure was performed under general anesthesia and systemic heparinization. After the placement of an 8-Fr sheath introducer in the right common femoral artery, an 8-Fr guiding catheter was delivered proximal to the lesion in the left ICA. Using a coaxial system with a micro-guidewire, an inner-catheter and a 5-Fr catheter (AXS Catalyst 5 115 cm, Stryker Neurovascular, Fremont, CA, USA), was delivered distal to the lesion through the true lumen. In this

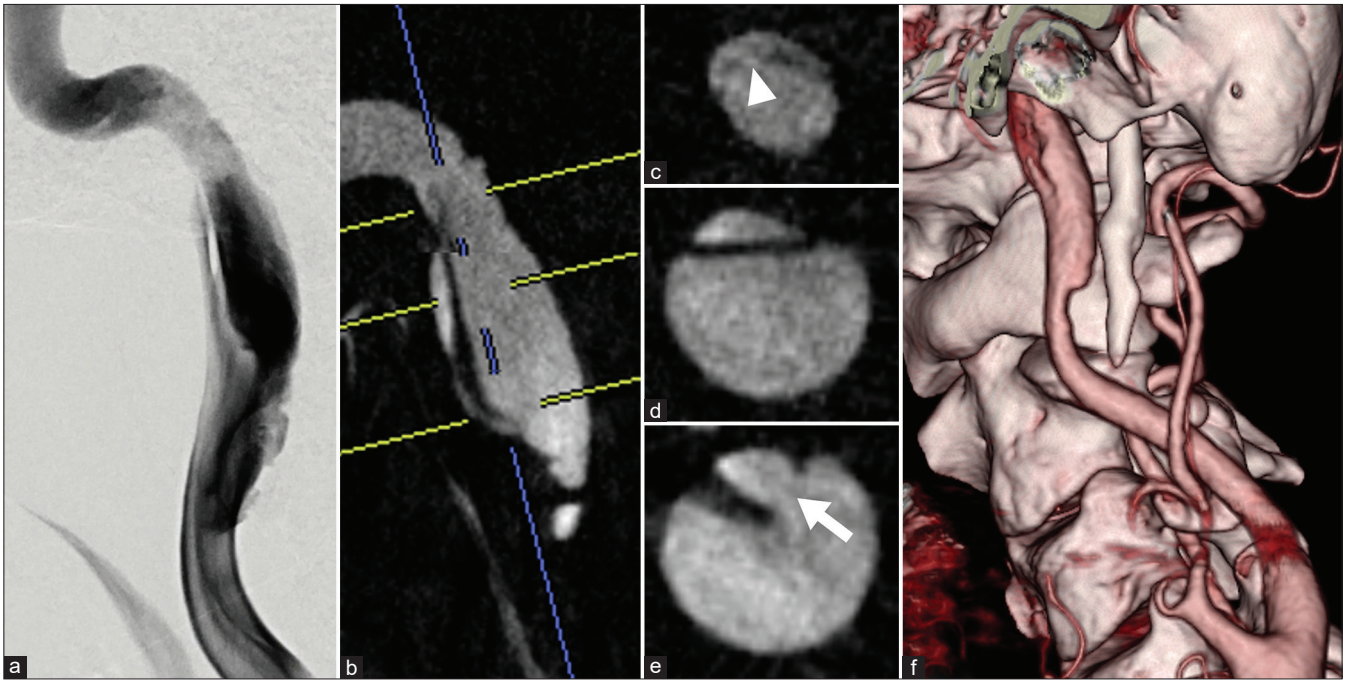

Figure 1: (a) Digital subtraction angiogram demonstrating the left extracranial internal carotid artery-dissecting aneurysm. (b-e) Three-dimensional digital subtraction angiograms indicate an intimal flap and narrowing of the true lumen. (c) Axial images indicate a re-entry tear (arrowhead) in the upper line level, (d) an intimal flap in the middle line level, (e) and an entry tear (arrow) in the lower line level. (f) Computed tomographic angiogram demonstrating an elongated left styloid process near the dissecting aneurysm.

procedure, the 5-Fr catheter occluded the true lumen, and antegrade blood flow through the false lumen was clearly observed. The lesion length was 37 mm, and the diameters were 4.9 mm in the distal ICA and 5.4 mm in the proximal ICA. We selected Surpass Streamline 5.0 mm × 50 mm (Stryker Neurovascular, Fremont, CA, USA) as the FDS and placed it in the true lumen from the petrosal portion to the cervical portion of the ICA to cover the entry and re-entry tears. Two telescoping surpass-streamline FDSs were placed due to stent shortening due to dilatation on the lesion. After FDS deployment, balloon angioplasty was performed over the entire length of the FDS. A post-FDS placement DSA demonstrated blood flow stagnation in the DA and true lumen dilation [Figure 2a].

Cranial nerve palsy improved remarkably immediately after FDS placement. The DSA performed 7 d after FDS placement exhibited regression and thrombosis of the DA [Figures 2b and c]. Six months after FDS placement, DSA revealed almost complete obstruction of the DA and regression of the thrombus in the DA [Figures 2d-f], and the symptoms were completely resolved.

DISCUSSION

We described a case of extracranial ICA-DA with a re-entry tear and high blood flow through the false lumen, which caused cranial nerve IX, X, and XII palsies. The DA and symptoms associated with the lower cranial nerve palsies were promptly resolved with FDS placement.

Extracranial ICA dissection forms DA at an incidence of 13.9%,[4] and a DA having a re-entry tear is rare. A systematic review reported that only 3% of the extracranial ICA-DAs increased in size during follow-up, 52% remained unchanged, 21% diminished, and 19% completely resolved.[10] Thus, the natural course of extracranial ICA-DA appears to be benign, and conservative treatment is selected in most cases. Surgical or endovascular treatment can be attempted in refractory cases.

Surgical and endovascular treatment options available for ICA-DA include surgical or internal trapping with or without blood flow reconstruction, such as external carotid artery-radial artery graft-middle cerebral artery bypass and superficial temporal artery-middle cerebral artery bypass, resection with artificial vessel grafting, coil embolization of the DA with or without stents, and stent placement alone using a conventional carotid artery stent or FDS. Recently, stent placement for ICA-DA has been reported to be less invasive and highly effective. Satisfactory angiographic and clinical results have been reported in patients with ICA-DAs treated with FDS.[2,3,5,12] FDS placement is a potential treatment option for ICA-DAs. To the best of our knowledge, only four ICA-DA cases with re-entry tears treated with stent placement have been reported to date, including this case.[1,5,11] Three of the four patients were treated with FDS, whereas the other patient was treated with a conventional carotid artery stent. In two FDS cases and a case with a conventional carotid artery stent, the DA was successfully

Figure 2: (a) Digital subtraction angiogram (DSA) immediately after stent placement exhibiting blood flow stagnation in the dissecting aneurysm. (b) DSA after 7 d exhibiting regression of the dissecting aneurysm. (c) Three-dimensional DSA after 7 d indicates the remaining thrombosis in the dissecting aneurysm (arrowhead). (d) DSA after six months exhibiting almost complete occlusion of the dissecting aneurysm. (e) Three-dimensional DSA after six months indicating thrombosis regression in the dissecting aneurysm. (f) Reconstructed image from three-dimensional DSA after six months indicating the positional relationship between the flow-diverting stent and the styloid process.

treated without any complications. Thus, FDS placement may be an effective treatment for patients with ICA-DA with re-entry tears. Furthermore, covering entry and re-entry tears with a stent seems necessary.

Cranial nerve palsy is present in 12% of adult patients with spontaneous extracranial ICA dissection, and 5.2% of patients have lower cranial nerve palsies.[8] Spontaneous recovery after conservative treatment has been reported in most cases of cranial nerve palsy caused by extracranial ICA dissection.[7] In most cases, the false lumen of the dissected lesion was thrombosed, and aneurysm formation was rare. In the present case, no spontaneous recovery was observed during conservative treatment for one month. Two mechanisms have been suggested for lower cranial nerve palsies caused by ICA dissection. One is compression from a dissecting lesion, and the other is nerve ischemia caused by the occlusion of the ascending pharyngeal artery. Here, the patency of the ascending pharyngeal artery was confirmed using DSA; therefore, compression by the DA was considered the cause. Therefore, we planned complete DA occlusion to improve the cranial nerve palsy. Furthermore, FDS placement covered the entry and re-entry tears. The FDS properly sealed the DA and provided sufficient flow diversion to promote thrombus formation. Cases of CN palsies caused by ICA dissection were summarized; most patients were treated with conservative care, and the symptoms improved in 90% of patients, with an average period of improvement of 61.1 d.[7] Particularly, symptoms improved within one month in patients treated with stent placement.[7] Herein, the cranial nerve palsies improved remarkably immediately after FDS placement, even though the DA remained. Thus, blood flow stagnation within the DA due to FDS placement may immediately reduce the direct compressive forces or pulsations. Furthermore, FDS placement may improve cranial nerve palsy caused by the ICA-DA more rapidly than conservative treatments.

ICA dissection caused by an elongated styloid process has been reported as vascular Eagle's syndrome. Elongated styloid processes are defined as those longer than 30 mm that compress the cervical nerves or arteries. Some cases of ICA dissection with an elongated styloid process that was treated by stent placement have been described.[6,9,13,14] In addition, four case reports described the fracture or compression of a stent placed in the ICA by an elongated styloid process.[6,11,13,14] Styloid process resection (styloidectomy) should be considered after stent placement because an elongated styloid process can compress and damage the placed stent.

Although case reports of FDS placement for extracranial ICA-DA having a re-entry tear or causing cranial nerve palsy are limited, the patients were successfully treated, and FDS placement is, therefore, a promising treatment option. Further investigations are necessary to increase our understanding of the treatment strategies for patients with these pathological conditions.

CONCLUSION

Herein, FDS placement promptly resolved the extracranial ICA-DA with a re-entry tear and causing lower cranial nerve palsies when five weeks of conservative treatment had not improved the DA and symptoms. Spontaneous resolution of the DA with a re-entry tear and high blood flow through the false lumen may be rare. In addition, early decompression of the affected cranial nerves may lead to early improvement of the symptoms. FDS placement may, therefore, be an effective treatment option for extracranial ICA-DAs with re-entry tears or causing lower cranial nerve palsy. Furthermore, early FD stent placement may be better than conservative treatment in patients with these pathological conditions.

Ethical approval

The Institutional Review Board approval is not required.

Declaration of patient consent

Patient's consent not required as patient's identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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