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Initial clinical experience with Xpert-Pro peripheral self-expanding stent system for internal carotid artery dissection: Two case reports

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ABSTRACT

Background: The standard treatment for internal carotid artery (ICA) dissection is obscure. Current therapeutic strategies include the use of antiplatelet drugs, anticoagulant drugs, intravenous thrombolysis, and endovascular treatment. Endovascular treatment is important in acute internal carotid artery dissection. This study reports two acute internal carotid artery dissection cases that were treated successfully using the Xpert-Pro peripheral self-expanding stent system.

Case summary: The first case was of a 38-year-old male patient with transient speechlessness and paralysis of the right limb in July 2021. Cervical computed tomographic angiography (CTA) showed ICA occlusion on the left side. Digital subtraction angiography (DSA) showed severe stenosis of the C1 segment of the left internal carotid artery with intermural hematoma. The patient subsequently underwent Xpert-Pro peripheral self-expanding stent implantation, and his condition stabilized. The second case was of a 56-year-old male patient with speechlessness and paralysis of the right limb. Cervical CTA showed a dissected left ICA, and DSA showed an occluded left ICA and middle cerebral artery. The patient subsequently underwent stent implantation, and his condition stabilized.

1. Introduction

Internal carotid artery dissection (ICAD) is defined as a mural hematoma in the arterial wall, accounting for less than 2% of all ischemic strokes. However, ICAD accounts for more than 10% of strokes in younger patients.[1–3] Although the mechanism of ICAD remains elusive, studies have shown that it is a multifactorial process linked to potential risk factors, such as trauma and genetic predisposition.[4] Current therapeutic strategies for ICAD include intravenous and intra-arterial thrombolysis, antiplatelet medications, anticoagulation, and surgical repair.[1,3,5] In most patients, the arterial lumen will heal on its own with a mean healing time of 3 months; hence, traditional medical therapy for patients with ICAD has been more accepted over the years than surgical repair. However, despite medical intervention, many patients with ICAD remain at high risk for recurrent stroke and insufficient cerebral blood flow. Recent studies have recommended endovascular treatment for patients with recurrent ischemic stroke who do not respond to antithrombotic therapy after ICAD and acute artery occlusion.[3,6] In this report, we present two Xpert-Pro peripheral self-expanding stent system cases for treating ICAD.

2. Case 1

A 38-year-old male patient with a history of hypertension was admitted to the emergency department (ED) with temporary speechlessness and paralysis of the right limb for 3 hours.The patient engaged in strenuous exercise (playing basketball) 3 days earlier and has since been experiencing progressively worsening pain on the left side of his neck, especially when turning the neck.The patient also denied any history of injuries. His vital signs in the ED were recorded as follows: heart rate, 68 bpm; respiratory rate, 16 cpm; temperature, 36.7 °C; BP, 153/106 mmHg. Neurological examination showed no positive signs. He had an ABCD2 and mRS scores of 3 and 1, respectively. Radiographic examination through non-contrast CT (NCCT) of the brain was unremarkable. Computed tomography perfusion imaging (CTP) of the brain showed impaired perfusion in the left carotid supply territory (Fig. 1A), and

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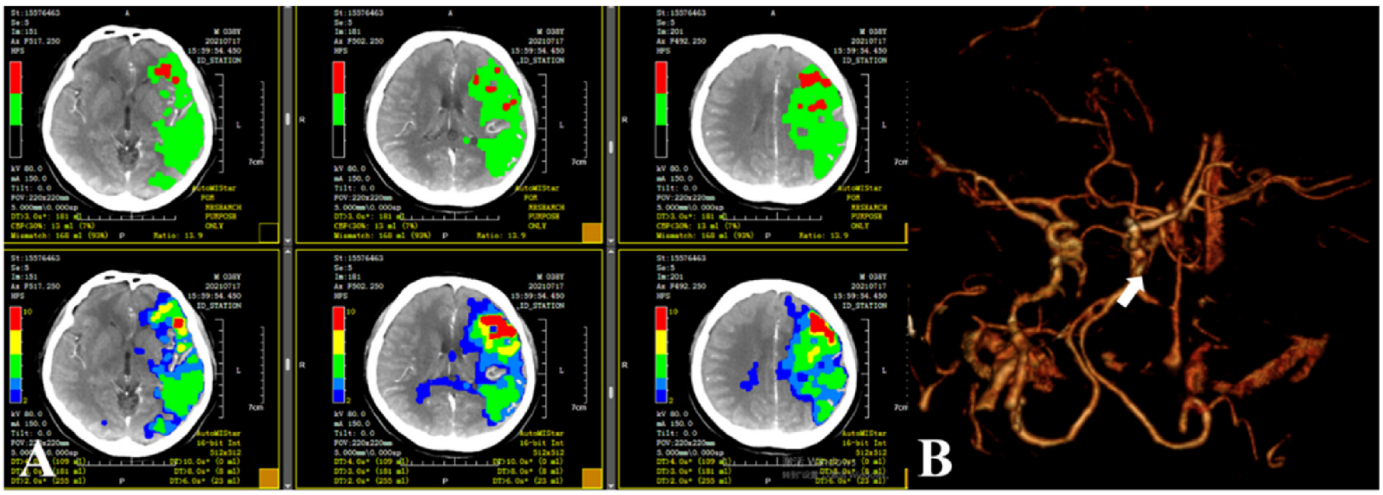

Fig. 1. A: Left cerebral perfusion was impaired in CTP; B: Left-side ICA occlusion (white arrow) in cervical computed tomographic angiography.

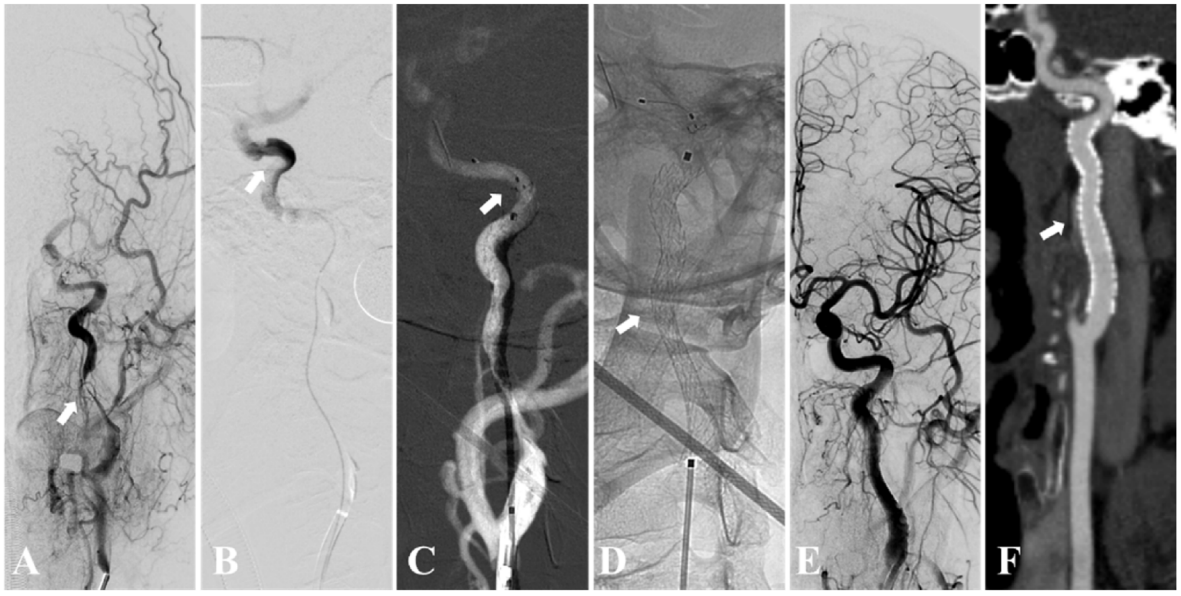

Fig. 2. A: DSA confirms left ICA occlusion; B: Confirmation of true lumen by microcatheter; C： Umbrella in position; D and E: The patient underwent Xpert-Pro stent endovascular therapy; white arrow shows the dense stent mesh; F: Three months later, cervical CTA showed that the shape of Xpert-Pro stent was normal.

cervical computed tomographic angiography showed a left-side internal carotid artery (ICA) occlusion (Fig. 1B).

Treatment: (1) Emergency DSA showed severe stenosis of the C1 segment of the left internal carotid artery with intermural hematoma (Fig. 2A); (2) Synchro-2 guidewire (Stryker Neurovascular, USA) and Excelsior SL-10 microcatheter (ev3 Neurovascular, USA) were confirmed to be located in the true vascular cavity (Fig. 2B); (3) Spider 5.0 umbrella (ev3 Neurovascular, USA) crossed the stenosis and was released after positioning it distally to C1 (Fig. 2C); (4) Xpert-Pro (8–60 mm) stent (Abbott, USA) was placed in the stenosis and released (Fig. 2D); (5) the angiogram showed that the C1 segment stenosis was restored to normal diameter and the blood flow distal to the C1 segment was unobstructed (Fig. 2E).

Prognosis: mRS and NIHSS scores 90 days after the procedure were 0. Cervical CTA showed that the shape of the Xpert-Pro stent was normal, and the CTP of the brain presenting bilateral intracranial blood perfusion was not significantly different.

3. Case 2

A 56-year-old male patient was admitted to the emergency department (ED) after experiencing speechlessness and paralysis of the right limb for 9 hours. The patient had weakness in the right limb, speechlessness, headache, dizziness, and palpitation. He was delivered to a local hospital for treatment, and his vitals were as follows: heart rate, 77 bpm; respiratory rate, 18 cpm; temperature, 36.3 °C; BP, 153/106 mmHg. The NIHSS and mRS scores were 11 and 4, respectively. Subsequently, he received intravenous thrombolytic therapy (43.2 mg alteplase) at 12:02. By 13:02, the patient's weakness in the right limb had significantly improved when nearing completion of IV. The NIHSS score was at 5 after thrombolysis. At 16:57, the patient was delivered to our hospital for further examination and treatment (aspirin 100 mg/day and statin 25 mg/day). Cervical CTA showed dissection of the left ICA (Fig. 3A). However, the patient was lethargic after 2 days. Physical examination showed lethargy, aphasia, gaze left, and limb muscle strength was grade 2 on the right. Babinski signs were positive in the right limb. Radiographic examination through a cervical CTA showed left-side ICA and MCA occlusions (Fig. 3B). CTP showed that blood flow perfusion of the left cerebral hemisphere was significantly reduced (Fig. 3C).

Treatment: Emergency DSA showed that the left ICA and MCA were occluded. We decided first to remove the thrombus from the MCA using a catalyst-6 aspiration catheter and subsequently implant a stent in the left

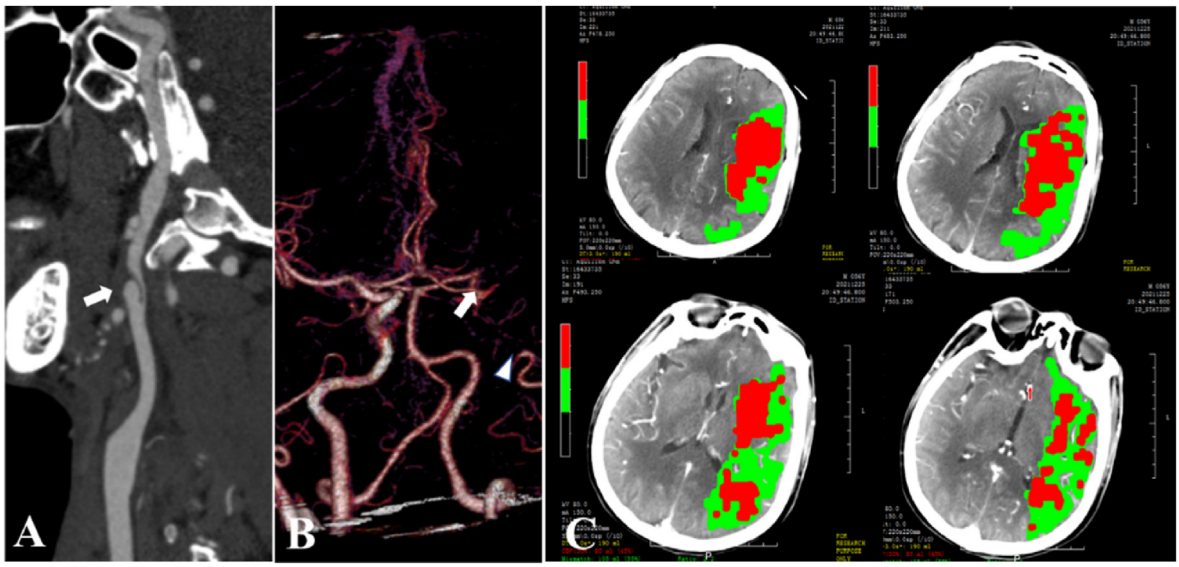

Fig. 3. A: Cervical CTA (February 23, 2021) showed left ICA dissection (arrow); B left ICA (white triangle) and MCA (white arrow) occlusions in Cervical CTA (February 25, 2021); C: left cerebral perfusion was impaired in CTP (February 25, 2021).

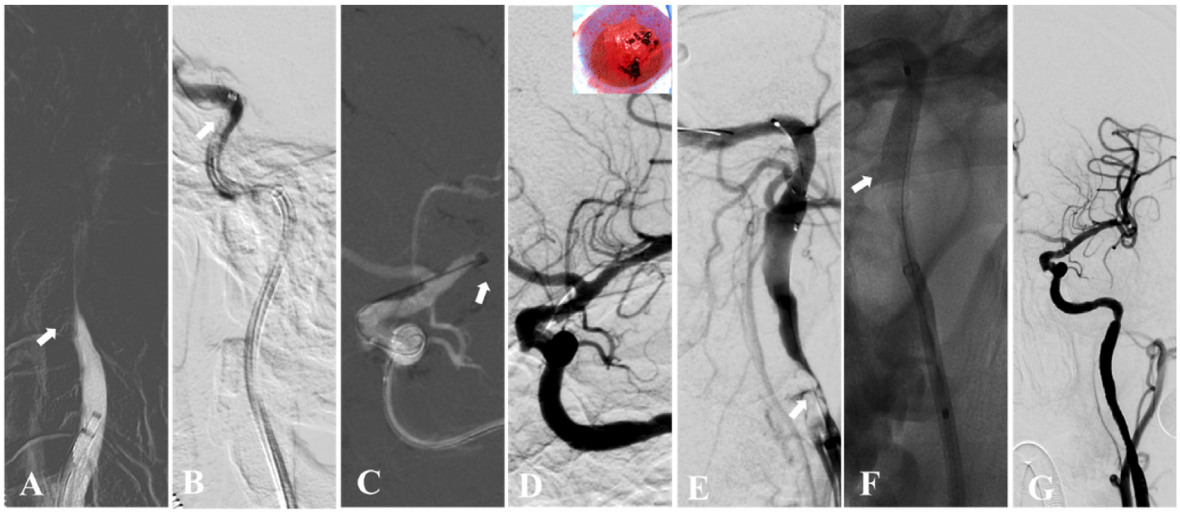

Fig. 4. A: DSA confirms left ICA occlusion; B: Confirmation of true lumen by microcatheter; C and D: MCA recanalization after catalyst-6 aspiration catheter for embolization; E, F and G: The patient underwent Xpert-Pro stent endovascular therapy.

internal carotid artery. The procedure was as follows: (1) Synchro-2 guidewire (Stryker Neurovascular, USA) and Excelsior SL-10 microcatheter (ev3 Neurovascular, USA) were located at the true lumen and distal to the M1 embolus (Fig. 4A and 4B); (2) the thrombus was removed from the M1 segment utilizing the CAT6 aspiration catheter (Fig. 4C and 4D); (3) following the release of the Spider 5.0 umbrella (ev3 Neurovascular, USA) in the distal left ICA, Xpert-Pro stent (5–60 mm, Abbott, USA) was positioned over the occlusion and released (Fig. 4E and 4F); (4) the angiogram showed that the left ICA was restored to normal diameter and blood flow was unobstructed (Fig. 4G).

4. Discussion

ICAD is the leading risk factor for ischemic stroke in younger patients.[2] Previous studies have demonstrated that thromboembolism is a potentially dangerous factor for ischemic strokes secondary to ICAD.[6] Therefore, for selected patients with ICAD, treatment with anticoagulative or antiplatelet agents as the primary treatment is effective.[1,5] Therefore, endovascular stenting may be an alternative treatment option for patients with recurrent ischemic stroke despite medical therapy or hemodynamic hypoperfusion.[6] However, endovascular stenting in ICAD is limited, which may be related to its specific technical difficulties. These include identifying true and false lumens, the arterial segments being too long, the requirement of superimposition of stents to avoid intrastent arterial dissections while using multiple and combined stents, and an excessive curvature of the internal carotid artery causing an inadequate stent apposition.[7,8]

Selecting the appropriate patients and choosing suitable materials are necessary for endovascular stenting. The Xpert-Pro peripheral self-expanding stent system consists of a self-expanding stent integrated into a delivery system intended for use in the peripheral vasculature. The use of Xpert-Pro stent as an open-loop stent has advantages, such as excellent radial support, a high degree of flexibility that is especially suitable for twisted vascular diseases, the length of the stent is too long to suit longer lesions, better adaptability to different vessel diameters, and better adhesion to the wall.[9] We used this peripheral self-expanding stent to treat two ICAD cases with severe lumen stenosis. There were no perioperative complications in either case. Symptoms of ischemic stroke did not recur during the follow-up period. The lumen was anatomically repaired, the dissection disappeared at 3 months, and there was no

residual space-occupying effect. As noted in recent studies, different stents have been successfully used to manage carotid disease.[7,8] However, no studies have been conducted on the use of Xpert-Pro stent for ICAD. Therefore, the Xpert-Pro stent might be suitable for implants and have better outcomes, which deserves further study. Nevertheless, several aspects of the Xpert-Pro stent should be mentioned. Firstly, the Xpert-Pro stent provides more radial supporting force, which might result in greater outward pressure on the carotid artery and lead to a significantly higher frequency of hemodynamic changes. Secondly, the surface of open-loop stents is unsmooth when deployed in ICA, leading to the recycling difficulty of the distal cerebral protection devices after stent release.[8] Two cases are insufficient for testing the effectiveness of the Xpert-Pro stent. Therefore, more studies with many patients are necessary to determine the benefits of the Xpert-Pro stent in managing ICAD.

5. Conclusion

Based on the prognosis of these two cases, we believe that Xpert-Pro stent implantation might achieve good results in treating ICAD. However, more large-sample studies are required to confirm this clinical outcome.

Ethical approval

The study was approved by the ethics committee of Zhejiang Provincial People's Hospital and Affiliated People's Hospital of Hangzhou Medical College. All clinical practices and observations were conducted in accordance with the Declaration of Helsinki. Informed consent was obtained from each patient before the study was conducted.

Declaration of interest

We declare that we do not have any commercial or associative interest that represents a conflict of interest in connection with the work submitted.

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