Stenting of Vertebral Artery Origin with the Buddy Wire Technique in Tortuous Subclavian Artery

A Case Report

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Summary

Tortuous vasculature is a common reason for failure to stabilize a guiding catheter in an appropiate position and is associated with a higher incidence of vascular complications. In such a case, the guiding catheter often buckles into the aorta during an attempt to place the balloon or stent. In this report, we used the buddy wire technique to support the guiding catheter, and we passed through the vertebral artery origin stenosis with the help of a microcatheter-microguidewire combination which enabled stent deployment. We kept the buddy wire through the guiding catheter throughout the procedure and the 6F guiding catheter allowed passages of both buddy wire and stent system.

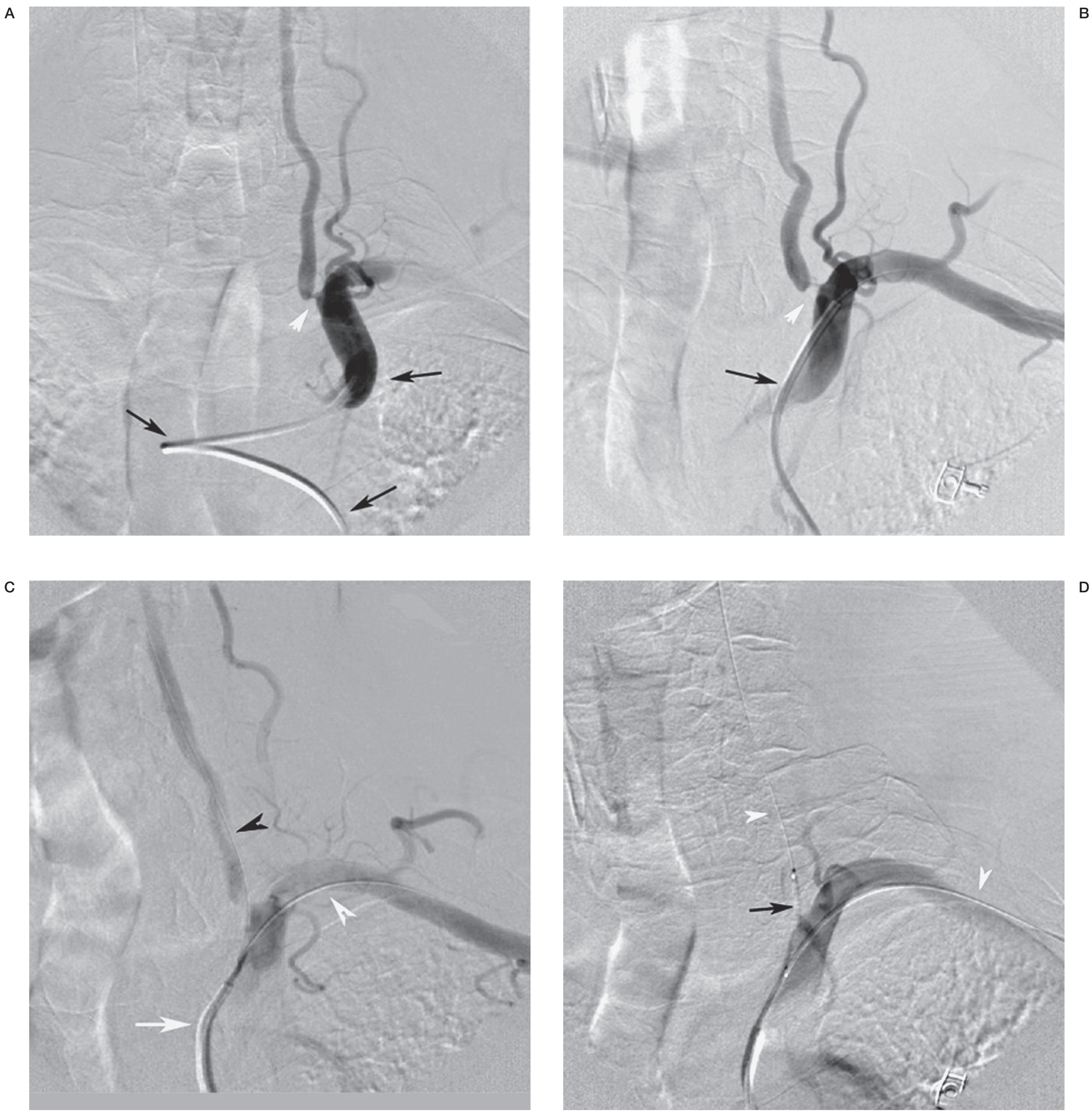
Introduction

Tortuous anatomy of the aortic arch, carotid arteries, or vertebral arteries can create problems when trying to place a guiding catheter which is the first and most important step of endovascular procedures [1-4]. Due to buckling of the guiding catheter back into the aorta, it may be difficult to provide a stable guiding catheter position as in our case. We used the "buddy" wire technique which has been described to overcome this problem in some patients [5-7]. However we could not navigate the microguidewire to pass the stenotic segment due to the curve of the subclavian and vertebral arteries. That is why we used the microcatheter to place the exchange microguidewire into the vertebral artery thereby enabling stent deployment. We kept the buddywire through the guiding catheter throughout the procedure and the 6F guiding catheter allowed passages of both buddy wire and stent system.

Case Report

A 67-year-old man with a history of coronary artery disease and a long history of cigarette smoking and hypertension was admitted to the hospital with transient ischemic attacks. The transient ischemic attacks consisted of vertigo, impaired balance and dysarthria. The patient experienced these symptoms while receiving aspirin. After obtaining informed consent from the patient, diagnostic arteriography was performed. The angiogram of the left common carotid artery showed moderate stenosis of the left ICA. The angiogram of the right common carotid artery revealed no significant stenosis of the right cervical ICA. Angiogram of the left subclavian artery showed that there was a significant vertebral artery (VA) origin stenosis (Figure 1A,B). We scheduled the patient for stenting of the VA. The patient was preloaded with aspirin (325 mg/daily) and clopidogrel (75 mg/daily) for seven days prior to the procedure.

We catheterized the subclavian artery with a 5 French diagnostic catheter and placed an exchange 0.035 inch guidewire (Terumo®, Medi-



cal Corporation) into the distal subclavian artery then placed a 6 French guiding catheter (Envoy; Cordis, Miami Lakes, FL, USA) into the subclavian artery (Figure 1B,C). However we could not provide the guiding catheter in the stable position and it buckled back into the aorta. In this situation, we contemplated using a microguidewire as a buddy wire. While the exchange guidewire was in the artery we inserted a 0.014 inch high-torque microguidewire (Abbott Vascular) to stabilize the guiding catheter in its position.

Then we tried to pass the stenosis using a soft tip 0.014 inch microguidewire (Thunder; Medtronic Vascular). However, due to the angle of the VA origin, we could not navigate the microguidewire into the vertebral artery. Then we decided to use a microcatheter and microguidewire combination (Prograte; Terumo®) which enabled us to pass beyond the stenotic lesion. After that, a 0.014 inch high-torque microguidewire was deployed through the microcatheter and the microcatheter was withdrawn. After stabilizing the guiding catheter with these

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Figure 1 A) Left subclavian angiography shows significant stenosis of the left vertebral artery origin (white arrow head), note the tortuosity of the subclavian artery (black arrows). B) Left subclavian artery angiography after placement of an exchange 0.035 inch guidewire and 0.014 inch HI-torque microguidewire to the distal subclavian artery. The angle of the subclavian artery is now better after placement of the 6 F guiding catheter (black arrow) and two guidewires. But the passage of the microguidewire through the stenotic segment is still difficult due to the angle of VA origin (white arrowhead). C) Left subclavian artery angiography after passage of a 0.014 inch high-torque microguidewire (black arrowhead) through the VA origin stenosis. The other microguidewire is positioned in the distal subclavian artery. D) Left subclavian artery angiography after positioning of the balloon-expandable stent (black arrow) to the stenotic segment at the VA origin stenosis. Note the guiding catheter is still in an acceptable position with the help of two microguidewires (white arrowhead). E) Control angiogram after deployment of stent shows moderate recanalization of the tight stenosis (black arrow), both microguidewires are still in the correct position (white arrowheads).

microguidewires, we withdrew the 0.035 inch exchange guidewire and navigated the monorail balloon-expandable stent to the stenotic segment (Figure 1C,D). A 6 F guiding catheter allowed passages of both buddy wire and stent system. The stent was positioned across the lesion, and angiography was performed to confirm its position (Figure 1D). The stent measuring 22x4 mm (Titan; Cordis Endovascular) was deployed and the next angiogram showed a moderate improvement in the narrowed segment of the artery (Figure 1E). After control angiography, both of the microguidewires were withdrawn. The patient was transported to the intensive care unit and hospitalized for 24 h after the procedure. He also continued to receive aspirin and Plavix after the procedure. Diffusion weighted magnetic resonance imaging (MRI) 24 h after the procedure showed that there was no any ischemic complication related to the procedure.

Discussion

Tortuous vessels may create problems during placement of a guiding catheter which is the initial step in almost all neuroendovascular procedures. As many as 4-6% of cases fail in carotid or vertebral interventions because of tortuosity of the access vessel [2,3]. This access problem is primarily due to buckling of the introducer sheath or guiding catheter back into the aorta. Slipping of the microguidewire and/or stent during positioning may result in embolic complications.

The buddy wire technique has been described to provide a stable platform in the subclavian artery for stenting of the vertebral artery origin in patients with tortuous access vessels [7]. Techniques other than the buddy wire technique have been described to overcome the problem of vessel tortuosity. Some have used large caliber guiding catheters in size range 7-10 F [8]. The disadvantages of the use of large caliber guiding catheters include an increased rate of complications at the access site, trauma to the vessel which may result with catheter-induced vasospasm or dissection and embolization, and formation of thrombi around the larger surface of these catheters [8].

Another method of circumventing tortuous vascular anatomy is by direct puncture of the carotid or vertebral artery [9]. However, this technique increases the possibility of puncture-related vasospasm with or without thrombus formation and cervical hematoma when compared with puncture of the femoral artery.

A third way to overcome the problem of tortuous vasculature is to use a stiff microwire to provide greater wire support to the stent catheter. However, there is some increased risk associated with placing stiff microwires into the intracranial circulation [2,10].

Lastly, the radial artery access site can also be used as an alternative to the femoral artery approach. Patel et al. presented a feasibility study of the transradial approach for stenting of symptomatic vertebral and basilar artery stenosis which was successful in 42/42 (100%) patients [11]. They also noted that further refinement of the technique and results of large randomized multicenter studies may ultimately allow more consistent success in the endovascular management of vertebrobasilar stenosis transradially. Among these techniques, the buddy wire technique is well-known and mostly preferred in coronary stenting [5]. Kizilkilic described this technique for a new application area and found that in the presence of unfavorable anatomy of the subclavian artery resulting from dolichoectasia, the buddy wire technique is extremely useful for vertebral artery origin stenting procedures [7]. He also noted that 6 F guiding catheters may be prefered to 5 French guiding catheters for performing easy road mapping, angiography and most importantly keeping the buddy wire through the guiding catheter during the procedure as in this case.

In this case, we were able to stabilize the guiding catheter in the subclavian artery, but we could not navigate the soft tip 0.014 inch guidewire into the VA. That is why we used a microcatheter and microguidewire combination and then we easily passed the stenotic segment of the VA using a standard technique. Since the microcatheter may cause sluggish flow or artery occlusion, we rapidly exchanged the microguidewire with a high torque microguidewire and then we withdrew the microcatheter. We made an effort to keep our high-torque microguidewire proximal to the intracranial segment of the vertebral artery, thus reducing the risk of injury. After these manipulations, we could deploy the stent without any complication.

We think that the use of a buddy wire gives additional support to the stability of the guiding catheter. The major advantage of this technique is that there is no need for larger calibrated guiding catheters. A 6 F guiding catheter enables the passages of both wire and stent system.

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