Complete fracture of an Ikari guiding catheter in the axillary artery during transradial coronary intervention

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Complete fracture of a guiding catheter during percutaneous coronary intervention is an exceedingly rare but potentially serious complication. The present case report describes the complete fracture of an Ikari guiding catheter and the various manoeuvres used to retrieve the

broken catheter fragment. The anatomy and limited space in the radial and axillary arteries made it possible for the catheter to twist on itself during a difficult cannulation, resulting in its complete fracture and separation. The present case highlights the need for caution in the manipulation of an Ikari guiding catheter by the transradial approach.

Key Words: Axillary artery; Coronary; Fracture; Ikari guiding catheter; Intervention; Transradial

The Ikari catheter is a novel guiding catheter developed in Japan, and is specially designed for transradial coronary intervention. Compared with other guiding catheters, the Ikari guiding catheter produces a stronger backup force by using the angle between the subclavian and brachiocephalic arteries in transradial coronary intervention (1). The experimental use of the Ikari guiding catheter was first reported 10 years ago (2), and it became available for clinical use in 2002 in Japan. In a single-centre experience, a success rate of 97% was reported in a series of 103 patients undergoing transradial coronary interventions, using 6 Fr Ikari guiding catheters (3). No complications related to the Ikari guiding catheter were reported.

The fracture of a guiding catheter is an uncommon complication during percutaneous coronary intervention. It sometimes occurs during engagement of the right coronary ostium, when there is excessive twisting of the guiding catheter. In most cases, the fracture is incomplete, and the removal of the catheter in one piece can be performed without much difficulty. An interesting case of complete fracture of a 6 Fr Ikari guiding catheter in the axillary artery during transradial coronary intervention is presented.

CASE PRESENTATION

A 52-year-old man presented with typical exertional angina and dyspnea for two months. His cardiovascular risk factors included diabetic mellitus, hypertension and hypercholesterolemia. Physical examination and a 12-lead electrocardiogram were normal.

Diagnostic coronary angiography was performed through the right radial artery. This revealed a discrete 90% stenosis in the proximal segment of the left anterior descending artery, which was deemed responsible for the patient's symptoms; thus, a percutaneous coronary intervention was recommended.

Figure 1) Complete fracture of the Ikari guiding catheter into two pieces at the level of the right axillary artery

A 6 Fr Ikari left 4.0 guiding catheter was used to cannulate the left coronary ostium. During the procedure, there was difficulty manipulating the catheter into the coronary ostium, and it subsequently resisted further advancement. Visualization at the proximal portion of the catheter showed it to be completely broken and separated at the level of the right axillary artery (Figure 1). It was obvious that the Ikari guiding catheter

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Figure 2) Attempt to snare the distal tip of the retained catheter using an Amplatz Goose Neck snare (ev3 Inc, USA). It was unsuccessful because the catheter tip was abutting the right brachiocephalic artery

was fractured while being rotated into the left coronary ostium. The proximal fragment of the broken catheter was removed from the right radial sheath.

The retrieval of the distal fragment of the broken Ikari guiding catheter was more complicated, because it was retained between the axillary artery and the brachiocephalic artery. The first attempt to retrieve the distal fragment was made through the right femoral artery. An Amplatz Goose Neck snare (ev3 Inc, USA) was loaded into a 6 Fr Judkins right 4.0 guiding catheter through the right femoral artery to retrieve the distal catheter tip. However, the attempt was unsuccessful because the catheter tip abutted the right brachiocephalic artery, and could not be captured by the snare (Figure 2). Next, the same snare was introduced through the right radial sheath to capture the proximal end of the broken catheter, with the intention of retrieving it through the radial sheath. Although the broken catheter was pulled back to the level of the proximal one-third of the forearm, radial artery spasm and the resulting pain felt by the patient prevented it from being withdrawn any further (Figure 3).

To resolve this difficult situation, the broken catheter fragment was cautiously pushed upward using the snare. The distal tip of the catheter fragment was positioned at the arch of the aorta (Figure 4). The distal tip of the catheter was then successfully captured by another snare introduced through the femoral artery (Figure 5), and the snare and catheters were successfully taken out of the body through the femoral artery. The patient subsequently underwent uneventful coronary stent implantation into the left anterior descending artery lesion by the right femoral artery approach.

DISCUSSION

The present case illustrated a rare complication of complete fracture of an Ikari guiding catheter during transradial coronary intervention. The retained part of the broken catheter could not be retrieved through the radial sheath due to spasm

Figure 3) Attempt to retrieve the catheter was made through the ipsilateral radial sheath. Although the broken catheter was pulled back to the level of the proximal third of the forearm, radial artery spasm and the resulting pain felt by the patient prevented it from being withdrawn further

Figure 4) The broken catheter fragment being cautiously pushed upward using the snare so that the distal tip of the catheter fragment is positioned at the arch of the aorta

of the radial artery. With special manoeuvres, it was eventually retrieved through the femoral artery.

The fracture of a guiding catheter is an uncommon complication of percutaneous coronary intervention. In the trans-femoral approach, it sometimes happens during cannulation of the right coronary ostium using a Judkins right catheter, when clockwise rotation of the catheter is required. In most

Figure 5) The distal tip of the catheter being successfully captured by another snare introduced through the femoral artery. The snare and catheters were subsequently taken out of the body through the femoral artery

instances, the fracture is incomplete and the partially broken guiding catheter can be successfully removed through the vascular sheath in one piece. In our patient, the guiding catheter was completely broken and separated into two pieces during manipulation of the guiding catheter to engage the left coronary ostium. The proximal fragment of the catheter held by the operator was removed successfully through the radial sheath. After failing to snare the distal tip of the retained catheter through the aorta, the next manoeuvre was to retrieve the broken catheter through the ipsilateral radial sheath. Retrieval through the radial sheath had the advantage of obviating the risk of catheter fragment dislodgement in the aorta before it reached the femoral artery. However, the attempt was unsuccessful due to spasm of the radial artery. To resolve this difficult situation without surgery, the broken catheter was carefully pushed forward so that the distal tip protruded beyond the brachiocephalic artery into the aortic arch. This proved to be a successful approach because the distal tip of the catheter was captured by the snare and removed through the femoral artery.

In comparison with the transfemoral approach, the transradial approach has the disadvantages of a longer puncture time (at least for inexperienced operators) and suboptimal backup support from the traditional guiding catheters, which are designed for a transfemoral approach. However, the transradial approach has the merits of reducing puncture site bleeding complications, facilitating early mobilization and cost savings (4). It was recently reported that transradial coronary intervention allows same-day hospital discharges even in moderate and

high-risk patients who are given abciximab (5). Moreover, introduction of the Ikari guiding catheter has improved the problem of inadequate backup support and facilitated transradial coronary intervention procedures. Transradial coronary intervention is now a common practice in Japan. The National University Hospital has started to perform more transradial procedures over the past few years. In this regard, it is possible that the lack of long-term experience in transradial intervention may have contributed to this adverse event.

We postulate that guiding catheters are more susceptible to fracture in transradial coronary intervention. In the transfemoral approach, the guiding catheter is almost entirely located in the aorta, where there is more space for it to rotate during engagement. In contrast, the space available for the guiding catheter to rotate is much more limited in the radial and axillary arteries. For this reason, the guiding catheter may be more prone to twisting on itself during manipulation, resulting in a complete fracture. The physical properties of the Ikari guiding catheter – including the inner lumen, outer lumen and thickness of the material – are similar to those of other commercially available guiding catheters. However, the other catheters are designed solely for a transfemoral approach and may not be subjected to the same twisting force as the Ikari catheter in a transradial approach. It is possible that guiding catheters designed for transradial intervention may need stronger materials to reduce the risk of fracture during manipulation. Until then, extra care should be taken when engaging an Ikari guiding catheter using the transradial approach to minimize the risk of excessive twisting, which may lead to catheter fracture.

CONCLUSION

We report an interesting case of complete fracture of an Ikari guiding catheter in the axillary artery during transradial coronary intervention. Multiple manoeuvres were used, and the retained catheter fragment was eventually retrieved through the transfemoral artery.

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