Complex Hair pin loop in origin of radial artery- How to address the issue during transradial catheterization.

Authors: Santosh Kumar Sinha, Kumar Himanshu, Lokendra Rekwal, Puneet Aggarwal, Mahmodulla Razi, Vinay Krishna

DOI: 10.5603/FC.a2018.0094
Article type: Case Reports
Submitted: 2018-08-25
Accepted: 2018-08-29
Published online: 2018-09-14

This article has been peer reviewed and published immediately upon acceptance. It is an open access article, which means that it can be downloaded, printed, and distributed freely, provided the work is properly cited.
Complex Hair pin loop in origin of radial artery. How to address the issue during transradial catheterization

Santosh Kumar Sinha, Kumar Himanshu, Lokendra Rekwal, Puneet Aggarwal, Mahmodulla Razi, Vinay Krishna

Deptartment of Cardiology, LPS. Institute of Cardiology, G.S.V.M Medical College, Kanpur, Indie

Address for correspondence: dr. Santosh Kumar Sinha, Deptartment of Cardiology, LPS. Institute of Cardiology, G.S.V.M Medical College, 208002 Kanpur, Indie, e-mail: fionasan@rediffmail.com

Abstract

During transradial catheterization, sharp edge of the guiding catheter tip may act like a ‘‘razor-blade’’ and can hinder its navigation which is more common when one encounters radial artery loop, tortuosity, and radial artery spasm. Here, we report a case of 59-year old female who had a double hairpin turn with 360° loop at radio-brachial region. The loop was creating a ‘‘razor-blade’’ effect which was circumvented using balloon assisted technique and thus enabling tracking the diagnostic catheter, making procedure successful.

Key words: Transradial catheterization; Double hairpin turn; Razor-blade effect; Balloon assisted technique

Introduction

Normally one encounters no resistance while advancing guidewire and catheter up to the ascending aorta during transradial catheterization. However, if the patient complains of pain, or resistance is felt while manouevring the guidewire and catheter, it indicates the problem of passage. This resistance is usually interpreted as spasm but in reality, it turns out to be an anatomical variation because of tortuosity, loops, curvature, or rarely stenosis of artery. Therefore, an angiogram of radial artery should always be performed to address the issue.
There has been an increase in the use of transradial catheterization (TRC) as it is associated with reduced access site bleeding complications, and mortality compared to transfemoral approach [1]. Radial artery loop is one of the common causes of transradial failure whose incidence varies from 2–4%, with complete hair-pin loop of 360° being rare [2, 3]. The sharp edge of the catheter tip produces a “razor blade effect” which hinders its navigation and often causes spasm, perforation and rarely forearm hematoma [4]. Downsizing of the wire, buddy wire, balloon assisted technique, exchange of the wire technique, switchover to contralateral side, and finally switching to transfemoral approach if everything fails are the various solutions to overcome the problem.

**Case report**

A 59-year old female presented with exertional angina of 6-months duration. Hypertension and diabetes were her risk factors. Her treadmill test was strongly positive for reversible ischaemia. Her physical examinations and biochemistry were all unremarkable. Electrocardiogram revealed nonspecific ST-T changes in precordial leads. Echocardiography revealed mild concentric hypertrophy, grade-I diastolic dysfunction, and normal ejection fraction. Transradial catheterization was planned after proper consent. 5-F sheath was placed after puncturing right radial artery by 21 G needle (Cordis Corp, USA). After sheath replacement, cocktail containing 200 μg nitroglycerin, 2.5 mg diltiazem, and 2500 IU unfractioned heparin were injected. While pushing diagnostic catheter after some length, a resistance was encountered as it was not going forward. Check angiogram revealed double hairpin turn with 360° loop (Fig. 1). First, the turn was negotiated by 0.035” hydrophilic wire (Terumo, Japan) which was advanced into brachial artery but the catheter failed to budge further after cruising through the first turn (Fig. 2). 0.035” hydrophilic wire was exchanged with 0.014” runthrough guidewire (Terumo, Japan) which similarly crossed the loop but diagnostic catheter refused to budge any further after crossing the first hairpin turn of the loop. 1.5 x 10 mm semicompliant sapphire balloon (OrbusNeich, Netherland) was pushed by keeping distal 3–4 mm of the balloon beyond the tip of the catheter. The balloon was inflated up to 3 atm pressure while keeping the distal end of the runthrough wire into brachial artery. Holding the wire-balloon-catheter assembly firm, it was gently advanced which negotiated the first turn. The balloon was deflated and repositioned one again into the second turn of the loop. Similar manoeuvre was repeated, which led to successful negotiation of the 360° loop by overcoming razor effect of tip of diagnostic catheter (Fig. 3). Once it was beyond the loop,
0.014" wire was once again exchanged with 0.035" hydrophilic wire which was advanced into subclavian artery. The catheter was pushed into brachial artery. Once catheter was fairly far from the loop, it was pulled little and torqued counter clockwise which straightened the loop (Fig. 4). The left main artery was cannulated in usual fashion which revealed normal left main, left anterior descending artery, and circumflex artery. While cannulating the right coronary artery, suddenly dampening of the arterial pressure and resistance in manoeuvring the catheter was noted. When probed at the loop, it showed the twisting of the catheter (Fig. 5A). The catheter was torqued counter clockwise to release the knot. One it straightened the loop and the catheter, hard end of the 0.035" hydrophilic wire was carefully pushed under the fluoroscopic supervision to keep it just beyond right coronary artery by keeping the hard end of the wire inside the catheter. Once it cannulated, the wire was removed, and angiogram was successfully completed which revealed critical proximal tubular lesion with 90% stenosis in its proximal part (Fig. 5B). The catheter was gently pulled over the wire. Once it tip was proximal to the loop in the brachial region, a check arteriogram was done to rule out dissection, or perforation, and thus angiography was successfully done (Fig. 6).

Discussion

After a steep learning curve, technical failure in of transradial catheterization are mainly attributed to anatomical variations such as radial loops, turn and spasm. Double hairpin turn thus creating a 360° loop, makes the journey of the catheter and wire tough as it commonly causes spasm which makes the procedure painful even if one manages to cross the loop as the affected segment creating a vicious cycle of pain and further spasm.

As reported by Patel et al [5, 6], balloon assisted tracking technique (BAT) carries a very success rate to overcome the loops and turn in radio-brachial region. They have reported the 3 failure rate out of more than 8,000 transradial procedures by utilizing BAT technique. Partially protruding segment of inflated balloon beyond the catheter tip gives a smooth transition and makes the traumatic tip of the catheter to atraumatic one. It helps in non-traumatic advancement of a catheter through even the radial artery of smaller calibre either because of anatomy or spasm, thereby annihilating the “razor effect” of the distal catheter tip and related damage to vasculature. As it functionally increases the length, therefore it helps the catheter to traverse even through complex curves by increasing the flexibility of assembly. The low pressure balloon inflation keeps balloon tip more flexible hence, it can take the complex curves and overcome obstructions with much ease. It is an attractive
technical alternate in selected cases. Certain things needs to be exercised while one uses BAT — balloon should be inflated at low pressure (3 atm pressure), and should partially protrude beyond the catheter tip to give more flexibility. Also, one should park the wire as distal as possible when one rotates the catheter counter clockwise to straighten the loop after one manage to cross the loop as it gives a better hinge for rotation.

**Conflict of interest:**

None.

**References**


**Figure legend**

Figure 1. Angiogram of radio-brachial region revealing double hairpin turn with 360° loop (A — anteroposterior view; B — left anterior oblique projection for better delineation).
Figure 2. 0.035” hydrophilic wire was advanced into brachial artery (A); the turn was tried to be negotiated but the catheter failed (red arrow) to budge further after cruising through the first turn (B).

Figure 3. 0.014” Runthrough guidewire was parked distally into brachial artery after crossing the complex loop (A); Using balloon assisted tracking technique, balloon-catheter assembly was gently pushed overcoming the razor effect (B,C,D,E) and thus successfully crossing the loop (F; red arrow showing partially protruding tip of balloon).

Figure 4. Once catheter was fairly far from the loop, it was pulled little and torqued counter clockwise (A, B, C) to straighten the loop (D).

Figure 5. Catheter showing the knot due to clockwise twisting while right coronary artery was being cannulated (A). The catheter was torqued counter clockwise to release the knot. RCA is showing critical proximal tubular lesion with 90% stenosis in its proximal part (B).

Figure 6. Post procedure radial artery angiogram showing the integrity of the loop and absence of local complication.