Case Report

Radial Loop: Can Straightening of the Loop Push the Guiding Catheter? Do We Need to Be More Watchful? A Case Report and Literature Review

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Abstract

Radial loops are the most common radial anatomical entity for deferring or failure of transradial approach. Complex loops may not straighten immediately after traversing the loop and may take a few minutes to straighten out. Here, we describe a case of a complex radial artery loop encountered during transradial percutaneous coronary intervention. We furthermore present a literature review and outline tips and techniques to successfully traverse the radial loop.

Keywords: Access site, dissection, guide catheter, percutaneous coronary intervention, radial loop

Introduction

Transradial access for coronary angiography and percutaneous coronary intervention (PCI) has rapidly emerged as the predominant access route favored by several operators worldwide. The paradigm shift witnessed this past decade has emanated from lower access site complications, increased patient comfort, and earlier ambulation as compared to traditional transfemoral intervention.[1] However, in some cases, tracking and navigating hardware through radial artery vasculature prove challenging due to smaller radial artery diameter, or complex, variable, or anomalous anatomy.[2] Radial loop is one of the more challenging coronary anomalies encountered and is synonymous with procedural failure. Its prevalence ranges from 0.8% to 2.3%.[3] We describe one such challenging case of a radial loop encountered through transradial PCI.

Case Report

A male patient presented with unstable angina. Coronary angiography revealed 95% occlusion in left anterior descending (LAD) coronary artery, 70% occlusion in the obtuse marginal branch, and a mild diffuse lesion in right coronary artery [Figure 1a and b]. However, while pushing the guiding catheter through the radial artery, a radial loop was encountered [Figure 2a and b] and attempts were made to straighten the catheter [Figure 1c]. A 1.5-mm GLIDEWIRE Baby-J Hydrophilic Coated Guidewire (Terumo Interventional Systems) successfully crossed the radial loop. A drug-eluting stent (DES) was implanted in LAD. However, we noticed left main coronary artery (LMCA) dissection. Attempts to straighten the loop might have pushed the catheter into the LMCA causing dissection of the artery. A second DES was deployed from the LMCA to LAD by overlapping with the first DES to treat the dissection. The DES was postdilated. However, the dissection was still visible, so postdilation

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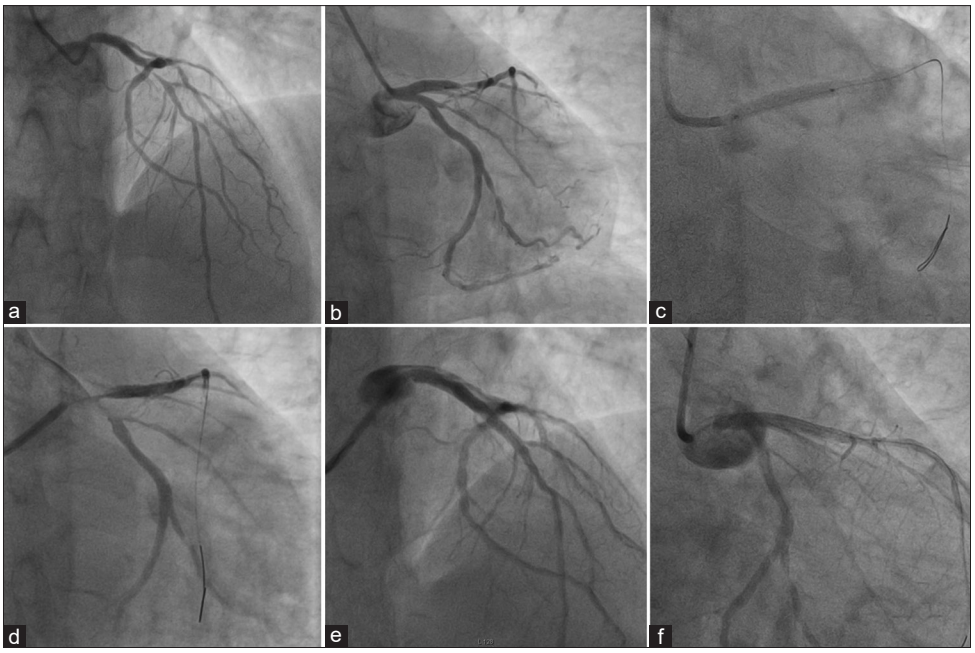

Figure 1: Coronary angiography revealed: (a) 95% occlusion in the left anterior descending coronary artery, (b) 70% occlusion in the obtuse marginal branch, (c) looping of the catheter whilst attempting to straighten the loop, another stent was deployed from left main coronary artery to left anterior descending by overlapping the first stent (d and e) dissection still visible after postdilation, hence another postdilation was performed (f) final thrombolysis in myocardial infarction III flow

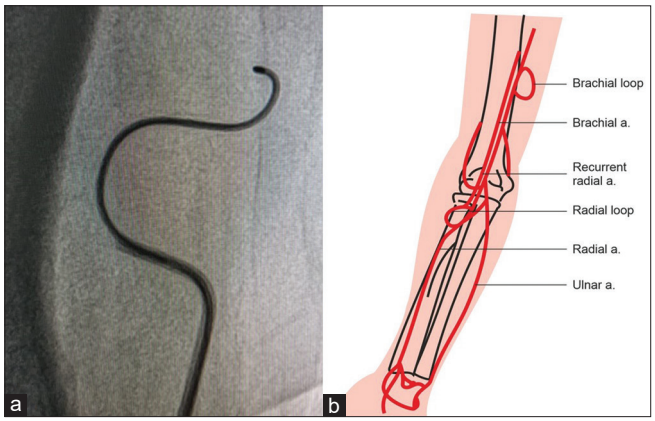

Figure 2: Coronary angiography revealed: (a) A radial loop and (b) schematic vascular anatomy of a radial artery with a radial loop

was performed again [Figure 1d and 1e]. Thrombolysis in myocardial infarction III was achieved, and the patient was discharged 2 days later [Figure 1f].

Discussion

Radial loop is the most encountered anatomical variation responsible for procedural failure even for experienced radial interventionalists. However, with the growing numbers of transradial interventions, interventional cardiologists are bound to face obstacles at various anatomical levels beginning from the radial artery to the coronary artery level, as demonstrated in the present case and Figure 2. We present a case from our institution along with a literature review [Table 1].[1-9] We also outline tips and techniques to successfully traverse the loop.

After obtaining an arteriogram, the first strategy is to traverse the radial loop with specialized wires. If a 0.035"J-wire is unsuccessful, an atraumatic 0.035" wire such as a Wholey guidewire (Medtronic) or Magic Torque guidewire (Boston Scientific Corporation) followed by a 0.014" angioplasty wire or a 0.025–0.035" hydrophilic wire may be attempted. The 0.035" 1.5-mm GLIDEWIRE Baby-J Hydrophilic Coated Guidewire (Terumo Interventional Systems) is a more advanced specialized wire that can also be employed in such cases. This wire provides lubricity of a hydrophilic wire while maintaining safety of a small trackable J-tip. If greater support is necessitated to straighten out the loop, a 4-F multipurpose diagnostic catheter or a hydrophilic catheter, such as a Glidecath Hydrophilic Coated Catheter (Terumo Interventional Systems), can be employed to track over the wire. Furthermore, rotating a low-profile catheter while pullback may straighten the loop.[10]

Mother–daughter technique can be employed if the loop has been crossed with a wire but difficulty straightening out the loop for safe delivery of the diagnostic catheter persists. An earlier method details a pigtail-assisted tracking method. In this method, a 5-F pigtail catheter is loaded in a 6-F guide catheter. The distal pigtail is extended outside the guide and tracked over the wire through the loop. This method circumvents the razor-blade effect of the guide catheter as it passes through the tortuous segment of the radial loop. This avoids dissection in cases where the catheter is aggressively passed through the loop. The protruding pigtail lessens contact between the sharp edge of the guide catheter tip and the vessel wall.[11]

Table 1: Clinical and technical details of other cases of radial loop in recent literature

Year	Author	Gender	Patient age	Anomaly	Challenge	Technique
2002	Esent *et al*.[4]	Male	80	Radial loop	Guidewire blockage	0.035" glidewire used
2003	Barbeau[5]	Male	76	Radial loop	GLIDEWIRE blockage/ perforation	Hydrophilic-coated coronary guidewire
2003	Barbeau[5]	Female	74	Radial loop	GLIDEWIRE blockage/ perforation	Hydrophilic-coated coronary guidewire
2010	Farman *et al*.[6]	Male	60	Radial loop	Guidewire blockage	0.035" guidewire was used to cross the loop
2011	Sarji and Sricharoen[7]	Female	60	Radial loop	Guidewire blockage	Loop successfully negotiated with a 0.035″×150 cm GLIDEWIRE
2012	Chitsaz *et al*.[3]	Male	90	Radial loop and perforation at vortex of radial loop	Guidewire blockage	0.035" GLIDEWIRE used
2014	Deora *et al*.[1]	Female	69	Small caliber radial artery with radial loop	Guidewire blockage	Balloon-assisted tracking
2014	Deora *et al*.[1]	Male	63	Radial loop	Guidewire blockage	The loop was crossed with 0.014" BMW PTCA guidewire, followed by balloon-assisted tracking
2014	Patel *et al*.[2]	Male	60	Radial loop	Guide catheter blockage	The loop was crossed with 0.014" BMW PTCA guidewire, followed by balloon-assisted tracking
2015	D'Amario *et al*.[8]	Male	76	Radial loop	Resistance to sheath insertion and catheter blockage	Balloon-assisted tracking
2020	Dossani *et al*.[9]	Male	75	Radial loop	Inability to negotiate with the conventional technique	Microcatheter system with stiff microwire used to navigate and straighten radial loop under road map guidance

BMW: Balance middleweight, PTCA: Percutaneous transluminal coronary angioplasty

The balloon-assisted tracking (BAT) is a technique that may be adopted. This is a technique wherein an inflated percutaneous transluminal coronary angioplasty balloon is partially protruded through the distal end of a guide catheter and deployed at 3 or 6 atm. Low-pressure inflation aids the catheter to negotiate extreme curves and loops. A 1.5-mm balloon is recommended for a 5-F diagnostic or guide catheter, whereas a 2.0-mm balloon is recommended for 6-F guide catheter. Balloons of 15 or 20 mm are sufficient. Once the balloon is partially protruded from the distal end of the catheter and deployed, the entire assembly is advanced over a soft-tipped 0.014" guidewire facilitating smooth and nontraumatic progression through difficult vasculature. The key benefit of BAT is prevention of the "razor effect" of the catheter tip to the radial artery endothelium.[1,2]

Conclusion

Radial loop is a rare, yet challenging anomaly associated with transradial intervention. However, technical difficulties can be overcome with adequate training, specialized wires, and techniques such as pigtail-assisted tracking and BAT. After crossing the loop with a wire, slight pull on the catheter or wire can straighten the loop. However, caution should be taken as straightening the loop may push the guide catheter a little deep into the artery.

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Conflicts of interest

There are no conflicts of interest.

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