Research Letter

Pigtail assisted tracking of guide catheter for navigating the difficult radial: Overcoming the “razor effect”

A B S T R A C T

During transradial procedures, sharp edge of the guide catheter tip may act like a “razor-blade” and can prevent the catheter navigation. It is especially common with radial artery loop, tortuous radial artery and radial artery spasm. We describe a cost effective and easy technique which overcomes this “razor-blade” effect and helps in tracking the guide catheter in complex radial anatomy for the easy and successful completion of procedure.

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1. Introduction

Sometimes, during transradial angioplasty (TRA) it is really difficult to track a guide catheter through the difficult radial anatomy like complex radial loops, tortuous radial artery, radial artery spasm and small caliber radial artery. In these situations, the sharp edge of the guide catheter tip produces a “razor blade effect” which can prevent the guide catheter navigation and sometimes can lead to the radial artery perforation and forearm hematoma formation. Here, we describe a technique for navigating the guide catheter in three different types of difficult radial artery anatomy.

2. Case report

2.1. Case 1

A 61-year-old diabetic female with recent onset angina was taken up for transradial coronary angiography and possible angioplasty. After insertion of a 6 Fr radial sheath (Radifocus, Terumo, Japan), marked resistance was noted in passing the standard 0.035” J tipped guidewire (Medtronic Inc., Minneapolis, USA). Guidewire could not cross the elbow region. Radial artery angiogram was done through the side port of the introducer sheath and showed 360° radial loop (Fig. 1a). Loop was easily crossed with a hydrophilic 0.035” J-tip guidewire (Glidewire, Terumo, Japan). Loop was straightened by the guidewire (Fig. 1b). Angiography was easily completed using 5 Fr Optitorque TIG catheter (Terumo, Japan) and showed severe disease in the left anterior descending (LAD) artery. We proceeded for the angioplasty of LAD. Catheter was taken out over an exchange wire (Guidewire M Stiff type, Terumo, Japan). But, 6 Fr EBU guide catheter (Launcher, Medtronic Inc., Minneapolis, USA) could not be negotiated through the radial artery loop. Marked resistance in the advancement of catheter was felt below the elbow region. Patient complaints of severe forearm pain. Repeated attempts were failed even after the administration of multiple doses of spasmolytic cocktail. “Razor-blade” effect was thought to be the reason.

Then, a 5 Fr pigtail catheter (Boston Scientific, USA) was inserted inside the 6 Fr EBU guide catheter. Pigtail catheter went easily inside the guiding catheter with both proximal as well as its distal ends outside the guide catheter (Fig. 2). Both the ends of pigtail catheter were outside the guide catheter because of relatively lengthier pigtail catheter (110 cm) than the guide catheter (100 cm). This assembly was tracked over the exchange...
wire without any resistance up till ascending aorta (Fig. 3). Pigtail catheter and the exchange wire were taken out from the guide catheter and subsequently left coronary artery was easily hooked with the guide catheter in usual manner. LAD stenting was completed without any complication. Post procedure radial angiogram was done again through the side port of introducer sheath and revealed no damage to the radial artery. Radial pulse was well felt at the time of discharge.

2.2. Case 2

A 60-year-old diabetic female with recent non ST elevation myocardial infarction with near total block of LAD and normal other coronaries was taken up for TRA of LAD. But, 6 Fr EBU guide catheter could not be navigated through the radial artery. Marked resistance in the advancement of catheter was felt below the elbow region. Patient complainants of severe forearm pain. Contrast injection through the side port of radial sheath revealed severe radial artery spasm (Fig. 4a). Again the spasmolytic cocktail was given twice at 1 min interval, but spasm persisted. Guide catheter was successfully navigated through the radial artery spasm segment using same PAT technique as described for case 1. Navigation was easy and without any forearm pain. LAD stenting was completed successfully. Post procedure radial angiogram revealed a total relief in the radial artery spasm and no damage to the radial artery (Fig. 4b). Radial pulse was well felt at the time of discharge.

2.3. Case 3

A 63-year-old diabetic female with acute anterior wall ST elevation myocardial infarction was urgently taken up for the primary angioplasty. A 6 Fr radial introducer sheath was inserted (Radifocus, Terumo, Japan). We experienced severe resistance in the movement of standard 0.035" J tipped guidewire and it could not be navigated through the radial artery. Contrast injection through side port of introducer sheath revealed tortuosity in the radial artery with atherosclerosis (Fig. 5). Hydrophilic 0.035" J-tip guidewire (Glidewire, Terumo, Japan) could easily be passed through the tortuosity and angiography was easily completed using 5 Fr Optitorque TIG catheter (Terumo, Japan) and showed blocked LAD with normal other vessels. We proceeded for the angioplasty of LAD. But, 6 Fr EBU guide catheter could not be navigated through the radial artery tortuosity because of marked resistance in the advancement of catheter with severe forearm pain. Guide catheter was navigated successfully using the same PAT technique as described for case 1. Navigation was easy and was without any forearm pain. LAD stenting was completed successfully. Post procedure radial angiogram

Fig. 1 – (a) Radial angiogram revealing 360° loop in the proximal segment of radial artery (black arrow). (b) Loop was easily crossed with 0.035” hydrophilic J-tip guidewire. Note the straightening of radial loop by the guidewire.
Fig. 2 – Pigtail assisted tracking (PAT) for overcoming the “razor-blade” effect. (a) Guide catheter loaded over 0.035” guidewire. Note the wide free space between the inner lumen of guide catheter and guidewire. Sharp edge at guide catheter tip works like a “razor blade” (inset picture). (b) Pigtail catheter fills this wide free space and abolishes the “razor-blade” effect. Additionally, it works like the dilator of EBU guide catheter and helps in navigating the complex forearm vasculature. (c) “Pigtail catheter-EBU guide catheter assembly”; 5 Fr pigtail catheter inside the 6 Fr EBU guide catheter with both ends of pigtail catheter outside the guide catheter. This assembly resembles and works like any single guide catheter.

Fig. 3 – Pigtail assisted tracking (PAT) of 6 Fr EBU guide catheter navigating the radial loop successfully. (a) “EBU-pigtail assembly” across the radial loop. Please note the smooth tapering from guide catheter to the pigtail catheter and from pigtail catheter to 0.035” guidewire. (b) “EBU-pigtail assembly” navigating through the region of radial loop. (c) “EBU-pigtail assembly” in the ascending aorta.
revealed no damage to the radial artery. Radial pulse was well felt at the time of discharge.

3. Discussion

Difficult vascular anatomy is the most important cause of TRA failures and has been reported to occur in about 2–4% of patients.2,3 In these difficult to do situations, pigtail assisted tracking (PAT) of guide catheter as performed by us in this case series can be used to successfully navigate the guide catheter through the difficult radial artery anatomy. It is very easy to perform and provide non-traumatic navigation of guide catheter through the challenging radial artery anatomy. Various techniques have been described to overcome complex radial vasculatures.4,5 Most of these techniques are limited by either difficulty in doing them, requirement of additional hardware (angioplasty wires and balloons) and trauma to the radial artery. Despite the application of these techniques, some anatomical situations cannot be overcome. In all these situations PAT technique should be the technique of choice.

Guide catheter when loaded over 0.035” guidewire has got a wide free space between the inner lumen of guide catheter and guidewire (Fig. 2a) leading to a direct contact of the unopposed sharp edge of the guide catheter tip with the inner surface of radial artery leading to a “razor blade effect”.4,5 This not only prevents the catheter navigation through the radial artery but sometimes can also lead to radial artery perforation leading to forearm hematoma formation. PAT technique overcomes this “razor blade effect”. Pigtail catheter basically fills the free space between the lumen of guide catheter and guidewire. Inner diameter of 6 Fr guide catheter (1.8 mm) is closely occupied by the 1.7 mm outer diameter of the 5 Fr pigtail catheter while on the other hand 0.9 mm thick guidewire snugly fits inside the 1 mm lumen diameter of pigtail catheter. This leads to a smooth tapering transition from guidewire to the pigtail catheter and then from pigtail catheter to the guide catheter (Figs. 2b and 3a). So, the unopposed guide catheter tip (working as sharp razor blade) will no longer be directly exposed to the radial artery lumen and abolishes the “razor blade effect”. More or less, pigtail catheter serves like a dilator of the guide catheter in the same way as any dilator works for any introducer sheath.

A 5 Fr pigtail catheter is an ideal catheter to track the 6 Fr guide catheter because of multiple reasons. Firstly, 5 Fr catheter (pigtail catheter) passes very easily inside the 6 Fr catheter (guide catheter). Secondly, pigtail catheter is always longer (110 cm) than all the standard guide catheters (100 cm). So, whenever it is inserted inside any guide catheter, both the ends of pigtail catheter (proximal as well as distal end) will remain outside the guide catheter and works like a single catheter (Fig. 2b). This “pigtail-guide catheter assembly” is very easy to handle and can easily be tracked just like a guide catheter. Finally but not the least, 5 Fr pigtail catheter is almost always available in all the cardiac catheterization laboratories. We think that the shape of the pigtail does not seem to contribute in the passage of the guide catheter and any long 5 Fr diagnostic catheter can be used (if available). Almost universal availability and longer length of pigtail catheter make it an attractive and least expensive solution for such a situation.

Balloon assisted tracking (BAT) technique has been described to overcome the complex arm vasculature.4,5

Fig. 4 – (a) Severe radial artery spasm (black arrow) persisting despite the multiple doses of cocktail. A 6 Fr EBU guide catheter was successfully navigated through the radial artery spasm segment using pigtail assisted tracking (PAT) technique. (b) Post procedure radial angiogram showing a total relief in the radial artery spasm and no damage to the radial artery.
Fig. 5 – A 63-year-old diabetic female with radial artery tortuosity and atherosclerotic lesions (black arrow). A 6 Fr EBU guide catheter navigated the radial artery tortuosity using pigtail assisted tracking (PAT) technique leading to a successful completion of her primary angioplasty.

However, PAT technique has several advantages over the BAT technique. PAT technique is much simpler, easier and quicker to perform in comparison to the BAT technique. Additionally it is less traumatic and does not require any additional hardware such as angioplasty wires/balloons. PAT should be the technique of choice in such a situation to improve the overall success rates of TRA.

In our opinion, in instances of non-progression of diagnostic catheter or guide catheter at any level during TRA, operator should inject the contrast agent through the side port of introducer sheath to define the anatomical issues of that region. Once that is identified, one should use a 0.032” or 0.035” hydrophilic J-tip guidewire to cross the affected segment. Most of the times, diagnostic as well as guide catheter can easily be tracked over it leading to a successful completion of TRA. In all cases of guide catheter navigation failure, PAT technique as described in this report should be tried first. BAT technique should only be performed in cases with PAT failure or if the hydrophilic guidewire and/or diagnostic catheter cannot be navigated over the 0.035” guidewire. Sheathless guide catheters, 4 Fr or 5 Fr guide catheters and long sheath introducers can also be used in such a situation.

4. Conclusions

Pigtail assisted tracking (PAT) technique may be useful to navigate through the difficult radial artery anatomy. It is much easier to perform than the previously described BAT technique and should always be the technique of choice in such situations and BAT technique should only be performed if PAT technique is not possible or fails to track the guide catheter.

Conflicts of interest

The authors have none to declare.

Disclosure

This work was presented in the TCT 2015 held at San Francisco, USA.

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