

## Radial Artery Perforation Management with Internal Tamponade using a Long Vascular Sheath

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### Abstract

Radial artery access has rare but significant vascular complications that can occur even in high volume centers. We present a case of a 60-year-old man with perforation of a high takeoff radial artery due to catheter manipulation. A combination of manual external pressure of the axillary artery combined with internal tamponade effect from a 45 cm hydrophilic sheath was used with no immediate or late neurovascular complications. As radial technique becomes more popular, operators should be aware of potential management options. The present case illustrates one such complication and management strategy.

**Keywords:** Radial artery access; Vascular complication

### Case Report

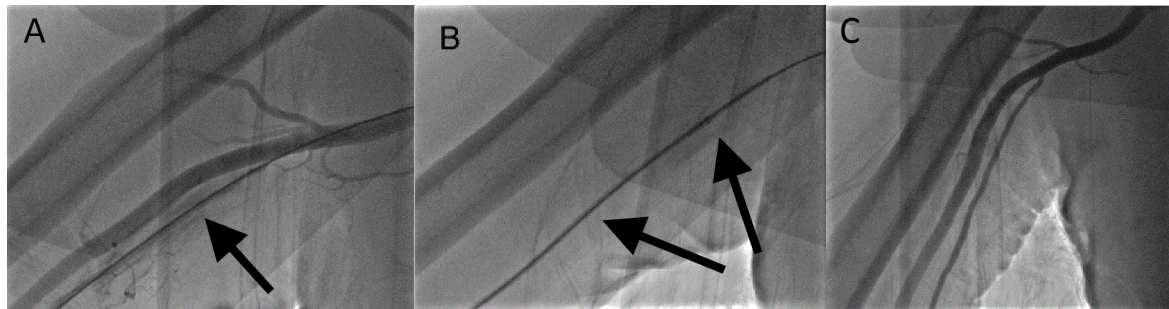
A 60-year-old man with past medical history of coronary artery disease, hypertension and diabetes was evaluated for worsening exertional angina. He underwent exercise nuclear stress test during which, with moderate exercise, he developed chest pain and ST segment changes. Thallium based single-photon emission computed tomography imaging showed moderate anterolateral ischemia. He was then referred for cardiac catheterization at our lab. A Barbeau test of the right radial artery prior to catheterization showed a type A pattern [1-6]. Right radial artery access was obtained with 21-gauge needle and a 0.025" wire was then advanced into radial artery without any resistance. 200 mcg of intra-arterial Nitroglycerine was administered via a 21-gauge cannula in the radial artery and the 0.025" wire was reintroduced. A French GlideSHEATH 250 mm was then advanced over the wire. Due to difficulty crossing with a 0.035 J wire through the upper arm, an angled GlideWIRE 0.035x180 cm was advanced easily to the aortic root. A French JR4 (Cordis, diagnostic catheter) and Radial Tiger 4.0 5F (Terumo, diagnostic catheter) catheters were respectively used to intubate the right and left coronary artery. Angiography revealed multi-vessel coronary artery disease with sequential ostial and proximal left anterior descending (LAD) 50% stenosis, 90% first obtuse marginal branch (OM) stenosis, a 70% posterior descending artery (PDA) stenosis and a totally occluded posterolateral artery. It was unclear whether the perfusion defect pertained to the LAD or OM [1] disease so, to confirm the significance of LAD disease, an interventional cardiologist was consulted and a Fractional Flow Resistance study was planned. After removal of the diagnostic catheters, difficulty was noted in advancing a JCL radial [5] French guide catheter at the level of the axilla. A radial artery angiogram was performed via the radial sheath that revealed a high takeoff radial artery with a contained perforation proximally (Figure 1A). Manual pressure was held for 15 min, and then 6 French GlideSHEATH was exchanged for a 45 cm Ansel [1,5] French sheath (Figure 1B) that was introduced over the previously placed 0.035" wire

to cross beyond the anomalous high origin of the radial artery to the subclavian artery. FFR and Intravascular ultrasound evaluations were performed via this long sheath. Following the end of the interventional procedure heparin anticoagulation was reversed with protamine. The long sheath was withdrawn and further images showed excellent angiographic appearance of the radial artery without any evidence of ongoing contrast extravasation (Figure 1C). The Barbeau test of the right hand remained type A.

The patient was referred for coronary artery bypass grafting, and successfully received a left internal mammary artery graft to the mid LAD as well as reverse saphenous venous grafts to the OM [1] and PDA. He had no neurovascular complications from the perforation and had an uneventful hospital course.

### Discussion

Transradial approach to cardiac catheterization is relatively new compared to transfemoral approach and is slowly being adopted in the United States [1,2]. Significant benefits of using transradial access have been demonstrated, with less bleeding, fewer vascular access site complications, shorter hospital stays and lower healthcare costs [3-5]. Additionally, patients prefer the new approach with higher Quality-of-life questionnaire scores for transradial catheterization [6]. Despite all the benefits associated with this transradial approach, there are rare access related complications which include asymptomatic radial artery occlusion, radial artery perforation, local hematoma and hand ischemia [7,8]. Radial artery perforation is a rare complication and conservative management has been previously described as being usually effective in case reports [8-12]. These measures include manual pressure of the brachial artery, use of a manual blood pressure cuff inflated above systolic pressure to externally compress the proximal artery, introduction of long sheaths or guides, and the use of protamine or other reversal agents for anticoagulants used during procedure [7-9]. In some rare cases balloon angioplasty or use of covered stent has also been described [8,10,11,13].



**Figure 1:** (A): Contrast extravasation from proximal segment of anomalous radial artery at the end of diagnostic procedure. (Panel A – Arrow). (B): A 45 cm hydrophilic sheath advanced to the subclavian artery (Panel B – Arrows showing sheath). (C): No contrast extravasation following the procedure.

In our case, conservative management was used and an interventional procedure was performed without any long-term complication. The case is unusual in that the perforation occurred at the ostium of an anomalous radial artery arising from the axillary artery. In view of this, conservative management required the use of a long vascular sheath to internally tamponade the vessel, it is of note that a hydrophilic sheath was used to reduce the risk of entrapment by vessel spasm. We were able to complete the cardiac catheterization and perform an interventional procedure through the long sheath. After the procedure, the patient continued to be asymptomatic, with no evidence of perforation and retained hand perfusion. Our center is unusual for the current US practice in that over 85% of cases, including acute myocardial infarction cases, are successfully completed transradially. Despite the very low complication rate from the radial approach, it remains important for the operator to be cognizant of these and aware of how to correctly manage them when they inevitably arise.

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