

INTERVENTIONAL CARDIOLOGY UPDATE

Radial Approach for Percutaneous Coronary Intervention: Practical Issues

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ABBREVIATIONS

LIMA = left internal mammary artery
PCI = percutaneous coronary intervention

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ABSTRACT

In this brief article we are discussing practical issues that we have to deal with when choosing the radial approach for coronary angiography and percutaneous coronary intervention (PCI).

INTRODUCTION

The radial approach for coronary angiography and percutaneous coronary intervention (PCI) is an alternative to the conventional femoral approach which is associated with reduced access site complications, due to the superficial nature, the smaller size and the easier compression of the radial artery. However, the transradial approach is still not widely accepted as the primary puncture site and this is mainly due to the technical difficulties of this approach and the prolonged learning curve.

**TRANSRADIAL APPROACH IN PATIENTS
WITH NEGATIVE ALLENS' TEST**

Allen's test is a simple method to test ulnar artery patency that is well established in the literature.^{1,2} The hand is often perfused by both the radial and ulnar arteries. The radial artery is not an end artery like the femoral or brachial arteries. In the event of radial artery block, albeit quite uncommon, the hand continues to get blood supply via the ulnar artery. The Allen's test is easy to perform. Briefly, the patient is instructed to clench his/her fist. The examiner then compresses the radial and ulnar arteries simultaneously, and the patient is asked to relax the hand. The ulnar artery is then released and the time needed for maximal palmar blush to return is recorded. Return of the palmar blush within 5–10 seconds is typically considered normal (positive modified Allen test) and indicates adequate collateral circulation. A negative Allen's test was initially considered as an absolute contraindication for the use of transradial approach, due to the possibility of radial artery occlusion after catheterization and critical hand ischemia. The rate of radial artery occlusion varies in different studies between 5% and 20%.³ However, clinically significant hand ischemia was not documented, although an elevated thumb capillary lactate level was measured in patients with radial artery occlusion.² The occlusion of radial artery excludes usage of the same radial artery for future catheterization and as a graft during future coronary artery bypass procedures.

Many high volume centers are applying the transradial approach in patients with a negative Allen test, due to the lack of evidence that the occlusion is clinically harmful. We reviewed the records of all patients catheterized through the transradial approach from March 2011 until January 2014 at the Second Department of Cardiology in Red Cross Hospital, Athens, Greece. There were 1035 patients catheterized through the transradial approach: 588 (56.8%) underwent coronary angiography and 447 (43.2%) underwent coronary angiography and PCI. A total of 256 of them had a negative Allen's test. The baseline patient's characteristics had no differences between the two groups. The two groups of patients had similar procedural results in terms of procedure duration, radiation exposure and conversion rate to femoral approach. Radial artery occlusion was tested clinically at discharge and in case of absence of radial artery pulse, a Doppler examination was performed. Radial artery occlusion was observed in 4.8% of the negative Allen's test group and 6.2% of the positive Allen's test group ($p=NS$), but this was clinically silent even in the negative Allen's test group. These results may encourage physicians to apply the transradial approach in patients with a negative Allen's test.

RADIAL ARTERY SPASM

Radial artery is a small sized artery which is prone to spasm during catheterization. Radial artery spasm is a major problem during the transradial approach leading to patient pain and high conversion rate to femoral approach. Spasm can be avoided with drugs administered transradially, right after sheath insertion. The most common drugs used are xylocaine, nitroglycerine, heparin and verapamil, in different doses and combinations according to every institution's protocol. At our catheterization laboratory, we give 5 mg of verapamil and 5000 IU unfractionated heparin through the sheath, in all patients, right after radial sheath insertion.

RADIAL AND SUBCLAVIAN ARTERY LOOPS

Radial artery loops are quite common in the forearm. This problem can be managed with the use of hydrophilic guidewires, which can straighten the artery, helping catheter insertion. Use of these guidewires must be made by experienced operators, since they can easily insert into small side arteries leading to perforations. A safer, but more expensive, alternative is to use a stiff PCI guidewire to straighten the radial artery. Sometimes, the artery is still looped and straightens only after catheter insertion.

A subclavian loop is often negotiated with deep patient

breathing which flattens the diaphragm and straightens the arteries. Once we have reached the ascending aorta and coronary arteries ostia, it is essential to secure access. This can be achieved using a long guidewire (280 cm), during every catheter exchange.

DIAGNOSTIC AND PCI CATHETERS

There are no major differences between radial and femoral approach in catheter selection. In general, the use of one size smaller left catheters is needed for left coronary artery engagement (for example Judkins left 3.5 instead of 4.0), especially when the right radial approach is used. On the other hand, bigger catheters are generally needed to engage the right coronary artery ostium (for example Judkins Right 5.0 instead of 4.0). An Amplatz Right 1 catheter is often used to engage the right coronary ostium, which is more maneuverable than the Judkins Right catheter.

Finding coronary bypass grafts can be quite challenging and difficult from the radial approach. In patients with a left internal mammary artery (LIMA) graft, the left radial approach is an obvious solution, even though one can try the right radial approach. The vein or free arterial grafts can be found with the same catheter choices like the femoral approach.

When it comes to PCI, the suboptimal support given from the radial approach discourage an operator from using the Judkins Left catheter, with the exception of primary PCI, when one can use directly the catheter and the left main anatomy is unknown. In all other cases one might prefer to use catheters with better "back up" that can increase balloon and stent deliverability, like the EBU 3.0 or 3.5 catheters. For the right coronary artery, the Judkins Right catheter can engage the right coronary ostium quite deep, giving a good guide support. Other options are the ART 4.0 or 4.5 or Amplatz Left 1 or 0.75 catheters.

HEMOSTASIS

It is better to remove all sheaths in the catheterization laboratory when one uses the radial approach. There are numerous closure devices for the radial puncture site, not having comparable studies among them and all having the same philosophy, which is the radial artery external compression. In the case of lack of such devices in one's laboratory, this can be easily performed with hard bandage of the wrist. Closure devices must be removed as soon as possible, in order to reduce the incidence of radial artery occlusion. Closure device removal can be achieved in most cases 4 to 6 hours after catheterization. Patent radial hemostasis is a method of hemostasis with less pressure, permitting blood flow in the radial artery, which

reduces the incidence of radial artery occlusion.³

SAME DAY DISCHARGE

This is a very attractive option in patients catheterized through the radial approach. Same day discharge has been found to be safe in various randomized studies^{4,5} and meta-analyses,⁶ reducing cost for the health system. In our hospital we use this approach in a large proportion of our patients (approximately 90% of all coronary angiography cases and 70% of all PCI cases). This can also be extremely helpful in the real world practice of the Greek health system, whereby the lack of patient's beds is an everyday problem and many patients have to stay overnight, not in a room, but in hospital corridors.

CONCLUSION

The transradial approach is safe, cost effective and patient friendly when applied by experienced operators.

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