Transulnar artery approach for percutaneous coronary intervention: an alternative route in a patient with challenging transfemoral access and hypoplastic radial artery

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ABSTRACT

Transradial coronary angiography and intervention has become a popular technique due to reduced local and bleeding complications, easier post-procedural care and patient preference. In certain patients, transradial access may not be possible due to various anatomical reasons. Usually, the transfemoral route is used for these patients. In a minority of patients, such as those with significant peripheral arterial disease or obesity, the transfemoral approach is challenging and is associated with an increased risk of local complications or bleeding. Transulnar arterial access, however, has recently been shown to be feasible and safe for both coronary angiography and intervention. The procedural success, advantages and complication rates for this procedure appear similar to those for the transradial approach. We describe a case of transulnar artery percutaneous coronary intervention in an obese patient with a hypoplastic radial artery.

Keywords: angioplasty, coronary angiography, femoral artery, radial artery, stent, ulnar artery

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INTRODUCTION

Transradial intervention (TRI) has become popular as an access site for percutaneous coronary intervention (PCI). Since the initial report by Kiemeneij and Laarman in 1993,[1] TRI has been increasingly performed worldwide. Patient preference, early mobility and discharge,[2] and less bleeding complications compared to the transfemoral artery access are the reasons why some operators now perform TRI.[3]

In certain patients, however, TRI may not be possible due to an abnormal Allen's test or other anatomical variations. For most of these patients, the transfemoral route is used. In a minority, transfemoral access is challenging and is associated with an increased risk of bleeding such as in obese patients, or is impossible due to severe vascular disease or an aorto-iliac occlusion. In these patients, vascular access through the ulnar artery may be considered. We describe a case of transulnar artery PCI in an obese patient with a hypoplastic radial artery.

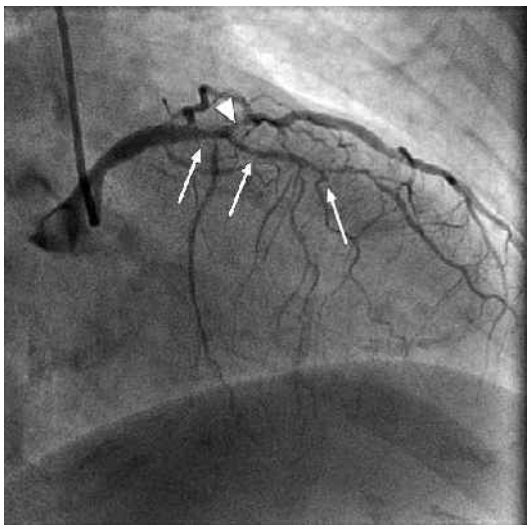

Fig. 1 Angiogram shows disease of the proximal and mid-left anterior descending (LAD), occlusion of the mid-distal LAD (arrows) and 80% stenosis of the first diagonal (arrowhead) arteries.

CASE REPORT

A 60-year-old Indian woman presented with angina of one to two months' duration. The cardiovascular risk factors were hypertension and dyslipidaemia. Clinical examination of the patient was unremarkable, except for gross obesity (body weight 80 kg, height 1.46 m, body mass index 37.5). Myocardial perfusion imaging showed a severe anterior and anterolateral ischaemia of the left

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Fig. 2 Angiogram shows hypoplastic radial artery (small arrows) and a larger dominant ulnar artery (large arrows) at the proximal foreman. A 5-Fr size catheter (arrow head) appears equal in size to the radial artery.

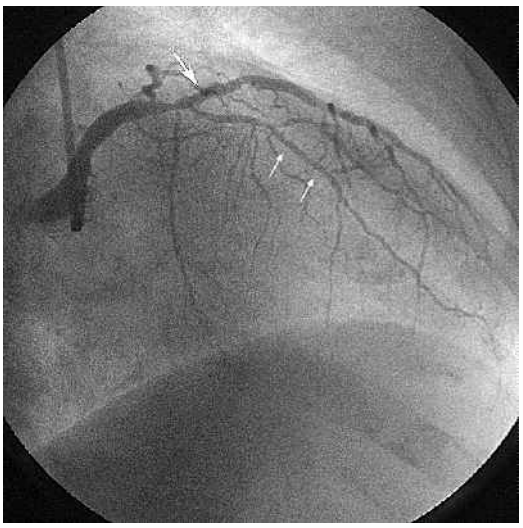

Fig. 3 Angiogram shows successful recanalisation of the mid-distal left anterior descending artery (small arrows) and stenting of the first diagonal artery (large arrow).

ventricle wall with a normal left ventricular ejection fraction.

Although the right radial artery was clinically of a small calibre, a coronary angiogram was performed via the transradial approach as the Allen's test was normal. A 6-French (Fr) size sheath was placed without difficulty, and angiography was performed with a 5-Fr Tiger catheter (Terumo, Tokyo, Japan). This showed triple vessel disease, with the left anterior descending (LAD) artery and the first diagonal (D1) artery having the most severe disease (occlusion of the mid to distal LAD and 80% stenosis of the D1) (Fig. 1). A decision was made to proceed with PCI of the LAD/D1. A 6-Fr Extra Back Up (EBU) 3.5 guiding catheter (Medtronic, Minneapolis, MN, USA) was selected. Resistance was encountered when advancing the catheter into the forearm just distal to the elbow. An angiogram revealed that the reason for the resistance was a small non-dominant radial artery; the ulnar artery was noted to be larger and dominant (Fig. 2).

We were able to continue with PCI with a "slender" 5-Fr size EBU 3.5 guiding catheter which could be advanced through the small radial artery. The D1 stenosis was stented (2.5 mm × 12 mm bare metal stent [BMS]), and the mid LAD occlusion was successfully recanalised. However, due to the small calibre, a stent could not be implanted and only balloon angioplasty was performed (using a 1.5 mm balloon) (Fig. 3). The plan was to stage the subsequent bifurcation angioplasty and stenting four weeks after recanalisation to allow the LAD calibre to increase with time.

As bifurcation angioplasty and stenting requires a 6-Fr size (or larger) guiding catheter, utilisation of the transulnar route was considered for the second procedure. The examination revealed the presence of a right radial pulse, a larger and easily palpable right ulnar artery and a positive reversed Allen's test (indicating sufficient collateral supply to the hand by the radial artery). The ulnar artery was cannulated 1–2 cm proximal to the pisiform bone and a 6-Fr sheath was placed. A 6-Fr EBU 3.5 guiding catheter was then advanced easily into the left coronary artery. The angiogram showed that the mid to distal LAD remained of a small calibre. Therefore, a stent (3.0 mm × 18 mm BMS) was deployed from the proximal LAD into the D1, and final "kissing balloons" was performed to the mid LAD / D1 bifurcation (Figs. 4a & b)

The guiding catheter and sheath were then removed, and a compression bandage was applied over the access site. Recovery was uneventful, except for a limited right forearm haematoma that resolved with manual compression, and the patient was discharged the following day. The patient has remained symptom-free, and both the right radial and ulnar pulses were easily palpable at one-year follow-up.

DISCUSSION

As compared to the transfemoral approach, transradial angiography and PCI have been shown to significantly reduce local access site complications (0.3% transradial vs. 2.8% transfemoral)[4] and major bleeding (0.05% transradial vs. 2.3% transfemoral).[3] Recent data suggests that bleeding during PCI, regardless of the cause of the bleeding, can adversely affect mortality outcomes.[5]

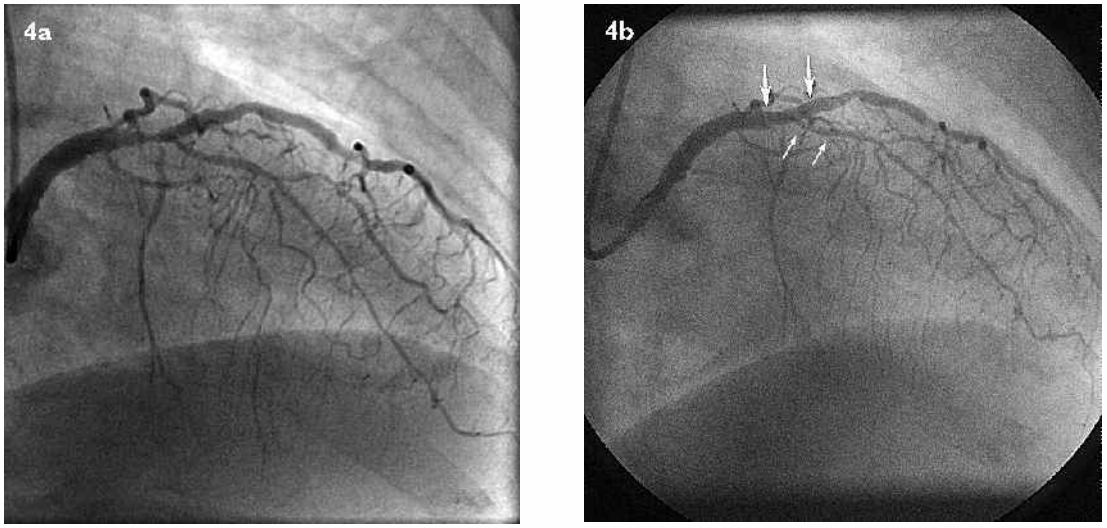

Fig. 4 (a) Angiogram at staged procedure shows a persistently small calibre left anterior descending (LAD) artery and a larger first diagonal artery. (b) Final angiogram shows the stent implantation from the proximal LAD into the first diagonal (large arrows) artery and angioplasty of the LAD (small arrows) artery.

This is particularly pertinent in the modern era of PCI, where potent anti-platelet and anti-thrombotic agents are routinely used. Therefore, transradial access for angiography and PCI provide an important advantage in decreasing bleeding complications. In addition, transradial access reduces the length of hospital stay and hospital costs, improves the quality of life post procedure and is strongly preferred by patients.[2]

For the above reasons, transradial access is now the predominant approach for coronary angiography and PCI for some operators, although this approach is associated with a learning curve and a higher rate of technical failure.[3,6] Radial access is unsuitable for a significant number of patients due to an abnormal Allen's test, a small calibre artery and other anatomic anomalies.[7] Previous data has shown that up to 27% of patients have a negative Allen's test,[8] precluding the safe use of the transradial route. Furthermore, nearly 10% of patients in a Japanese study had anatomic variations such as excessive tortuosity, radio-ulnar loops, stenoses and hypoplasias, although transradial PCI was successfully performed in 97% of the cohort.[9]

Terashima et al first reported the use of the ulnar artery as a possible alternative access site for coronary angiography in 2001.[10] Several small, single centre case series that demonstrated the feasibility and safety of transulnar angiography and PCI have since been published.[11-13] One randomised study comparing the transulnar and transradial approaches has shown that both approaches had high rates of technical success (95.2% transulnar vs. 96.2% transradial) and a low incidence of local haematomas (5.7% transulnar vs. 8.1% transradial), without significant differences in either route.[14] No patient required a blood transfusion or vascular surgery, and none had symptoms or signs of hand ischaemia.[14]

The transulnar approach may therefore be an attractive alternative entry site in patients with unsuitable radial access, since it appears to share the same benefits as the transradial route, with no major disadvantages. This is particularly so if transfemoral access is also associated with an elevated risk of local complications, or if it is not possible due to severe peripheral arterial disease. An additional advantage in using the transulnar approach is that it can preserve the future use of the radial artery as a conduit for coronary artery bypass surgery.

The transulnar approach was ideal in our obese patient who had a small non-dominant radial artery, where transfemoral access posed an increased risk of local complications and bleeding. This approach enabled PCI to be safely performed using a 6-Fr system (required for bifurcation PCI). The local forearm haematoma observed post procedure was likely due to the suboptimal placement of the compression bandage and also the insufficient pressure applied due to the deeper location of the ulnar artery, more so in this obese patient. The haematoma in this superficial location was easy to observe and was resolved with manual compression. No further therapy was required, as has been the experience reported in the literature.

The patient's radial and ulnar pulses were easily palpable at one year post procedure. The rate of asymptomatic occlusion was reported to be 0.8%–5.7%,[13,14] which is similar to that for asymptomatic radial artery occlusion.[14,15] There were no reports of hand

ischaemia if a proper screening (normal reversed Allen's test) was conducted. Indeed, the reversed Allen's test is much more likely to be normal compared to the standard Allen's test, since the deep palmar arch (supplied by the radial artery) is complete in 95% of the patients.[14]

Due to the proximity of the ulnar nerve, which runs along the medial border of the ulnar artery, there is a risk of nerve injury during transulnar procedures. With a careful puncture using a fine gauge needle, permanent neuropraxia has not been observed, although a few patients have reported lightning-flash pain in the ulnar side of the hand.[13] Due to its deeper location, access to the ulnar artery may be more challenging than the radial artery, and a learning curve has also been documented, even for experienced transradial operators.[13] The only instance in which transulnar access should not be attempted is when an unsuccessful attempt at radial cannulation has just been performed during the same procedure, risking the rare event of acute occlusion of both arteries.

In conclusion, transulnar arterial access for coronary angiography and intervention has been shown to be feasible and safe. The procedural success, advantages and complication rates appear to be similar to those for the transradial approach. The transulnar access site can be considered as an alternative approach, should the transradial or transfemoral route be unsuitable or unsuccessful.

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