

The Trans-radial Approach for Diagnostic Coronary Angiography and Interventions. Our Experience at Queen Alia Heart Institute / Amman – Jordan.

Walid Sawalha , Ashraf Ahmad Abu Alsamen , Laith Saad Obaidat , Ramzi Abdelmajeed Alhyari .

Queen Alia Heart Institute – King Hussein Medical Centre Amman – Jordan.

For correspondence: Dr Walid Sawalha. Jordan. Amman 11814. Bayader Wadi Alseer PO BOX 143388.

Email sawalha_md@yahoo.com. Tel 00962-777419331.

Abstract

Objective;

The aim of our study was to assess our experience of coronary angiography and intervention via the radial artery in comparison to the standard approach from the femoral artery at Queen Alia Heart Institute.

Method;

This was a prospective study conducted from September 2010 till August 2013. This was a single operator experience. All adult patients undergoing coronary angiography or intervention were enrolled into this study. It was left to the operator's discretion to decide which patient is for trans-radial access. Demographic data, risk factors for coronary artery disease (CAD), the amount of contrast used, fluoroscopy time, and the diagnosis were collected. We also looked at the time taken for mobilization of patients following procedure, the incidence of pain from the site, any local complications and hospital stay. The data was compared to a similar number of patients who had coronary angiography via the femoral artery.

Results;

We looked at 456 patients. There were 346 males (76%) and 110 females (24%). Their age ranged from 29 – 76 years with a mean of 53.5 (\pm 10.5) years. The right radial artery was used in almost all cases (454 patients, and the left radial in 2 patients). The prevalence of diabetes was 48.5%, hypertension 59.2%, family history of premature CAD 28%, hyperlipidaemia in 30% and 44% were smokers. These figures were the same for patients who had the procedure via the trans-femoral artery done during the study period.

Successful angiography was feasible in 449 patients (98.46%). Diagnostic angiography was done in 319 patients (71%), while coronary intervention was done in 130 patients (29%). Total procedural time averaged 41 (\pm SD = 22) minutes for trans-radial compared to 40 (\pm 23) for trans-femoral approach (P non significant). Fluoroscopy time was 15 (\pm 10) minutes for the former compared to 18 (\pm 13) minutes for the later approach (P non significant). The amount of contrast used was 180 (\pm 64) ml for trans-radial compared to 192 (\pm 73 ml) for the trans-femoral approach (P non-significant). On average patients in the trans-radial group had less access site complications with early mobility and earlier discharge.

Conclusion;

Coronary angiography and intervention via the radial artery has a high success rate with no difference in terms of procedure time, amount of contrast or fluoroscopy time. It has demonstrable advantages in terms of local site complications, early mobility and discharge leading to better patient's satisfaction.

Key words: coronary angiography; radial artery; Morbidity; Queen Alia Heart Institute.

Introduction:

Atherothrombosis is the leading cause of death worldwide (Fig. 1) ⁽¹⁾. Thus the use of coronary angiography as a

diagnostic tool for coronary artery disease is on the rise, with more complex interventions and more contrast being used per patient.

Selective coronary angiography was originally performed through open brachial arteriotomy. Thereafter, the percutaneous Seldinger technique and the use of preformed catheters popularized the femoral approach. More recently, after the first report of successful coronary angiography by the trans-radial approach in 1989, the radial artery has been increasingly used as an alternative access site. Previously this approach was used as an alternative when the trans-femoral deemed inappropriate either due to arterial disease or in obese patients. Nowadays there is more and more interest in such approach as a routine access rather than an alternative one.

Objective:

The aim of our study was to assess at our experience of coronary angiography and intervention via the radial artery in comparison to the standard approach from the femoral artery at Queen Alia Heart Institute.

Method:

This was a prospective study conducted from September 2010 till August 2013. This was a single operator experience. All adult patients undergoing coronary angiography or intervention were enrolled into this study. It was left to the operator's discretion to decide which patient is for trans-radial access.

Demographic data, risk factors for coronary artery disease (CAD), the amount of contrast used, fluoroscopy time, and the diagnosis were collected. We also looked at the time taken for mobilization of patients following procedure, the incidence of pain from the site, any local complications and hospital stay. The data was compared to a similar number of patients who had coronary angiography via the femoral artery.

Only patients who had a positive Allen's test were selected for trans-radial access. This is done by compressing the patient's radial and ulnar arteries and then the patient is asked to make a tight fist with that hand. This compresses the blood from the hand and blanches the palm. The ulnar artery is then

released, and the time it takes for the hand to return to a normal color is measured. Typically, the test is considered "positive" or "normal" when the time to return of normal color is 5 or 6 Seconds (Figure 2).

Results:

We looked at 456 patients. There were 346 males (76%) and 110 females (24%). Their age ranged from 29 – 76 years with a mean of 53.5 (\pm 10.5) years. The right radial artery was used in almost all cases (454 patients, and the left radial in 2 patients). The prevalence of diabetes was 48.5%, hypertension 59.2%, family history of premature CAD 28%, hyperlipidaemia in 30% and 44% were smokers. These figures were the same for patients who had the procedure via the trans-femoral artery done during the study period.

Successful angiography was feasible in 449 patients (98.46%). In the remaining patients the procedure had to be completed from the femoral artery. Diagnostic angiography was done in 319 patients (71%), while coronary intervention was done in 130 patients (29%). Total procedural time averaged 41 (\pm SD = 22) minutes for trans-radial compared to 40 (\pm 23) for trans-femoral approach (P non significant). Fluoroscopy time was 15 (\pm 10) minutes for the former compared to 18 (\pm 13) minutes for the later approach (P non significant). The amount of contrast used was 180 (\pm 64) ml for trans-radial compared to 192 (\pm 73 ml) for the trans-femoral approach (P non-significant).

On average patients who had the procedure done via the radial artery mobilized 2 hours post procedure, compared with 6 hours for femoral approach and after 12 hours post procedure if they had coronary intervention. Patients were discharged home 5 hours following diagnostic angiography compared to 8 hours in the trans-femoral approach. Patients who had coronary intervention were discharged second day in 92% of trans-radial compared with 86% of trans-femoral approach (P \leq 0.005).

None of our patients had haematoma compared with 3% in the trans-femoral

group ($P \leq 0.05$). Local pain was reported in 7% in the trans-radial compared with 23% in the trans-femoral group ($P \leq 0.005$).

The main problems of trans-radial approach were; spasm which occasionally led to changing to femoral approach, failure to cannulate the radial artery, tortuous radial or brachial artery.

Discussion:

The trans-radial approach for coronary angiography and angioplasty while not new is gaining momentum as an alternative to trans-femoral approach². Arterial access via trans-radial has been described since the 1980s for Angiography and angioplasty^{3,4}. It is fear of the unknown and the large number needed to re-train oneself that may make some experienced interventionalists hesitant to adopt the trans-radial approach in spite of its proven advantages. Technically it can be challenging but it has advantages in terms of patients discomfort, early ambulation and discharge with reduction of cost and complications. Unlike trans-brachial artery access, with trans-radial access there is less of a chance of limb-threatening damage since there is usually adequate collateral blood supply from the ulnar artery to the palmar arch (figure 3), which can be assessed using Allen's test^{5,6}. The procedure was carried out by placing the patients in the standard supine position on the Catheterization lab table. Their right arm is placed immobilized and the wrist is hyperextended and then draped in sterile fashion (figures 4 & 5). The right radial artery was usually used since it is closer to the operator but in patients with bypass grafts if the left internal mammary artery was used and if for any reason the right radial could not be cannulated, the left radial artery is used. The radial artery was accessed using the Seldinger technique, and a sheath was inserted over wire using a vascular micropuncture radial kit. After the insertion of the sheath all patients were given Tridil (glyceryl trinitrate) 200

micrograms and heparin up to 5000 u via the sheath. This is to reduce spasm and arterial thrombosis^{7,8}. The standard catheters used for the trans-femoral access were used in trans-radial approach.

In our study we demonstrated that there was no difference in procedure time, contrast used and fluoroscopy time between the two approaches. Yet one of the greatest benefits was through patient satisfaction in terms of early mobilization with shorter hospital stay and less site complication.

One of the biggest concerns about performing cardiac catheterization through the radial artery is obtaining access. The technique is similar to the trans-femoral, but given the smaller size of the radial artery and the tendency of the radial artery to spasm, it is sometimes harder to place a sheath. There was very low rate of crossover to a femoral site in our study.

We demonstrated that the trans-radial approach has high success rate with statistically significant rare early ambulation and less site complication. In addition patients were discharged earlier. This lead to better patient's satisfaction.

Meta-analyses of trials have suggested reductions in bleeding, as well as trends towards reductions in myocardial ischemic events and death due to these bleeding reductions⁹. Patients who underwent coronary procedures through the radial artery had a statistically significant reduction in both major and minor bleeding (4.2% vs. 1.96%, $P = 0.03$) and death or myocardial infarction (3.1% vs. 0.6%, $P = 0.005$)¹⁰.

Conclusion;

Coronary angiography and intervention via the radial artery has a high success rate with no difference in terms of procedure time, amount of contrast or fluoroscopy time. It has demonstrable advantages in terms of local site complications, early mobility and discharge leading to better patient's satisfaction.

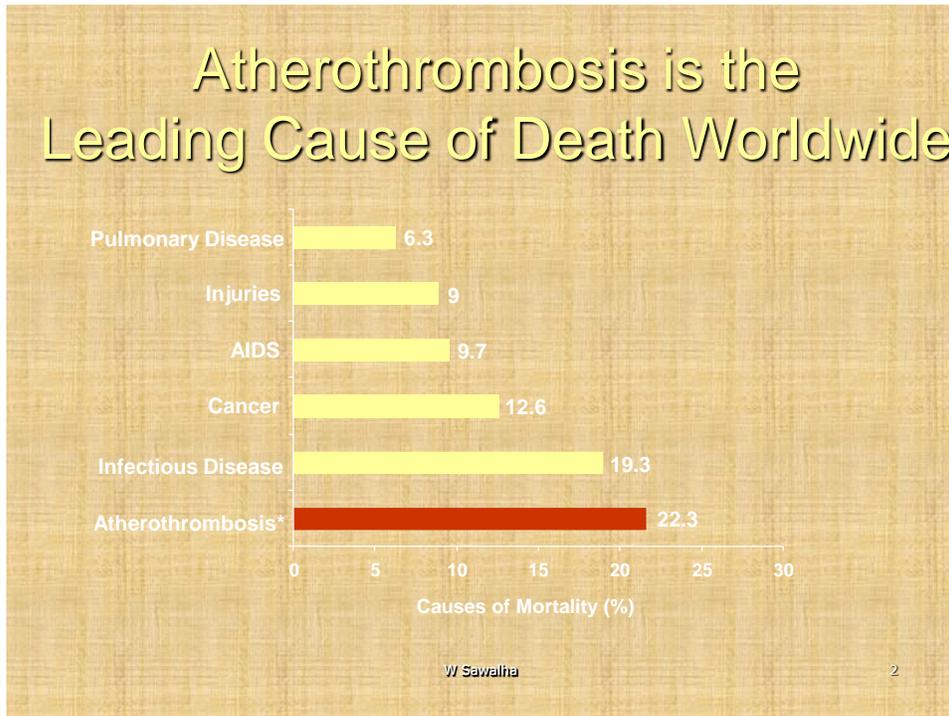


Figure 1. Atherosclerosis as a leading cause of death.



Figure 2. Allen's test.

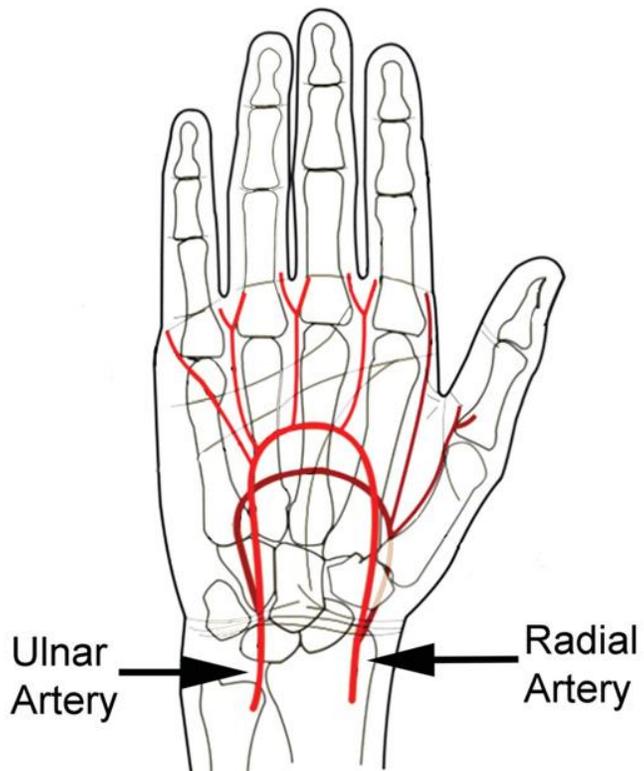


Figure 3. Blood circulation to the hand.



Figure 4.



Figure 5.

References;

1. **The World Health Report 2001:** Geneva: WHO; 2001.
2. **Caputo RP, Tremmel JA, Rao S *et al.* (2011):** Transradial arterial access for coronary and peripheral procedures: executive summary by the transradial committee of the SCAI. *Catheter Cardiovasc Interv.*, 4. doi: 10.1002/ccd.23052.
3. **Campeau L:** Percutaneous radial artery approach for coronary angiography. *Cathet Cardiovasc Diagn*,16(1):3–7.
4. **Kiemeneij F, Laarman GJ:** Percutaneous transradial artery approach for coronary stent implantation. *Cathet Cardiovasc Diagn*,30(2):173–178.
5. **Hildick-Smith D:** Use of the Allen’s test and transradial catheterization. *J Am Coll Cardiol.*, 48(6):1287; author reply 1288.
6. **Puttarajappa C, Rajan DS:** Images in clinical medicine. Allen’s test. *N Engl J Med.*, 363(14):e20.
7. **Chen CW, Lin CL, Lin TK, Lin CD:** A simple and effective regimen for prevention of radial artery spasm during coronary catheterization. *Cardiology*,105(1):43–47.
8. **Pancholy SB(2009):** Comparison of the effect of intra-arterial versus intravenous heparin on radial artery occlusion after transradial catheterization. *Am J Cardiol.* 104(8):1083–1085.
9. **Jolly SS, Amlani S, Hamon M *et al.* (2009):** Radial versus femoral access for coronary angiography or intervention and the impact on major bleeding and ischemic events: a systematic review and meta-analysis of randomized trials. *Am Heart J.*, 157(1):132–140.
10. **Pristipino C, Trani C, Nazzaro MS *et al.* (2009):** Prospective Registry of Vascular Access in Interventions in Lazio Region Study Group. Major improvement of percutaneous cardiovascular procedure outcomes with radial artery catheterisation: results from the PREVAIL study. *Heart*, 95(6):476–482.