TO ACCESS THE SAFETY AND SUCCESS OF TRANSRADIAL CORONARY ANGIOGRAPHY IN A TERTIARY CARE HOSPITAL

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ABSTRACT

OBJECTIVE: To determine the safety and success of transradial coronary angiography and angioplasty in a tertiary care hospital.

METHODS: The feasibility and safety of routine transradial coronary angiography was assessed prospectively in 591 patients from March 2011 to March 2013 at Cath lab of cardiology department Lady Reading Hospital Peshawar. All patients with normal Allen's test were included in study. Patients having abnormal or modified Allen's test, on haemodialysis or had abnormal serum creatinine level were excluded from the study. If the right radial approach was used in all cases. The main outcome measures were success rate and complications of transradial coronary angiography. The catheter selection was a 6FJL 3.5 for right coronary artery and 6FJR 4 catheter for left coronary artery. In 354(60 percent) cases, coronary angiography was performed by using 6F JR4 for both coronary arteries.

RESULTS: The mean age was 55 ± 10.08 years with 437 (74%) males and 154 (26%) females. A total of 591 coronary angiographies were performed through trans-radial route in the study period. Overall procedure success rate was 95%(561 patients) for transradial coronary angiography, with mean procedure time of 21.25 ± 5.25 minutes, mean fluoroscopy time of 6 ± 3.15 minutes, and 90% of patients were discharged on the same day. Only 2 patients had mild forearm haematoma, pain and spasm of radial artery occlusion occurred in 20 (3.38%) study patients. A symptomatic radial occlusion in 8(1.35%). The reason for failure of transradial procedure included failed radial artery puncture (n=6), radial artery loop (n=2), tortuous subclavian artery (n=3), failed catheterization of coronary arteries in 5 patients (2.53%) and severe radial artery spasm in 20(3.38%).

CONCLUSION: Trans-radial artery cannulation is a safe and successful route for performance of coronary procedures. It can be used as an acceptable alternate to transfemoral.

INTRODUCTION

Common femoral artery (CFA), was the key site for angiography because of its large diameter so large catheters were used. The CFA approach for coronary interventions could be complicated by serious vascular access site complications including haematomas accompanied by significant blood loss, arterial pseudoaneurysm and arteriovenous fistulas. Bleeding from vascular access site is by far the most feared complication especially with use of anticoagulation and platelet Glycoprotein IIb/IIIa inhibitors. The overall incidence of major bleeding was 3.9% in the GRACE¹ (global registry of acute coronary events) registry, out of that vascular access site bleeding

occurred in 23.8% and retroperitoneal bleeding in 6% of patients undergoing angioplasty in the setting of acute coronary syndrome from transfemoral approach. The in hospital mortality was significantly higher in patients with major bleeding than in those without major bleeding (18.6% vs 5.1%). In 1989 Campeau first reported the result of transradial angiography (TRCAG) with 5F catheter in 100 patients with a success rate of 88% without any access site complications². Later the work by Kiemeneijetal³ in angioplasty through transradial route³ has taken the cardiology into the realm of minimal invasive percutaneous interventions which attracted the interventionist worldwide. In comparison to transfemoral route,

major vascular access site complications are minimized from radial artery approach, even with concomitant use of high doses of anticoagulation and Glycoprotein IIb/IIIa platelet inhibitors⁴⁻⁵.

In spite of the potential benefits of this approach, coronary angiography continues to be performed via the femoral artery in 85% to 90% of cases. Although there have been significant improvements in catheter dimensions, vascular complications are still frequent with the femoral route, particularly in obese patients, aortoiliac disease, or where potent anticoagulants or thrombolytics are used. Such complications result in prolonged hospital stay and increased need for transfusion; they also prevent early ambulation.

This study was designed to determine whether the radial approach could be used routinely for coronary angiography in our patients. The primary objectives were to assess the feasibility of transradial angiography for selective catheterization of the coronary arteries, and to determine the complication rate and procedure duration. Data was collected for future comparison with the femoral route in terms of radiation exposure, procedure duration, and complications.

METHODOLOGY

This prospective study was carried out over a 24-month period of 591 patients from March 2011 to March 2013, in cardiology department Lady Reading Hospital Peshawar, a major tertiary referral center of province of Khyber Pukhtunkhawa. All patients had a functional palmar arch as assessed by an Allen's test⁶. Contraindications included a negative Allen's test, chronic renal failure requiring regular hemodialysis.

Informed consent was obtained in all cases. With the arm abducted 30 degrees to the body in the supine position, the hand was hyperextended. Local anesthesia consisted of 1 to 2 mL of 2% lignocaine injected subcutaneously, just enough to produce a wheal over the skin⁷. A puncture was made with a short pricking needle. A 6F sheath was used in most patients (Terromatransradial sheath). After introduction of the sheath, a spasmolytic

consisting of nitroglycerin 200 µg were injected intraarterially. Left and right Judkins diagnostic catheters were used for the left and right coronary arteries.

In 60 % of cases 6F JR3.5 catheter used to cannulate both left and right coronary arteries. The sheath was removed immediately, allowing a brisk back flow of blood to expel any clots. Hemostasis was achieved by applying a firm pressure over radial artery followed by applying a tourniquet. The tourniquet was removed after 1 hour. Patients were ambulated immediately, and discharged the same day whenever possible.

Radial access time was measured from injection of lignocaine to introduction of 0.018 inch guide wire. Procedure time was measured from the point of time patient was ready for procedure until procedure is completed. Fluoroscopy time was defined as the total time of fluoroscopy use during the coronary angiography. Complications were considered as significant if there was a large forearm haematoma with haemoglobin drop of 2mg/dl, requirement of blood transfusion because of blood loss at vascular access or surgical intervention because of acute compartment syndrome and forearm ischaemia. Allen's test is a valid clinical screening test for assessment of hand circulation and to prevent ischaemic complication of the hand⁸.

The Allen's test was performed by asking the patient to clench the fist for 1 minute while both radial and ulnar arteries were compressed with the examiner's fingers. The palm of the hand blanched. Then compression of ulnar artery was released; the normal colour of palm returned within 10 seconds, if there was adequate collateral circulation. A positive test was reported when there was abnormality in the capillary filling of the fingers in 10 seconds. The modified Allen's test was performed similarly except radial artery was released instead of ulnar artery and normal blush of hand was noted. All procedures were supervised by interventionist with significant experience in transradial interventions.

The following data was collected in a database

throughout the study period: successful radial puncture and cannulation, selective catheterization of each vessel and type of catheter used (as well as success or failure), procedure duration, screening time, complications, and patient comfort (comfortable/painful). The collected data was entered and analyzed by the Statistical Package for Social Sciences version 15.0 Software (SPSS Inc., Chicago, Illinois). Discrete variables were expressed as percentage frequencies and continuous variables as mean $\pm$ standard deviation.

RESULTS

The mean age was 55 ± 10.08 years with 437 (74%) males and 154 (26%) females. A total of 591 coronary angiographies from the trans-radial route in the study period. Overall procedural success rate was 95% (561 patients) for trans radial coronary angiography, with mean procedure time of 21.25 ± 5.25 minutes, mean fluoroscopy time of 6 ± 3.15 minutes, and 90% of patients were discharged on the same day. Only 2 patients had mild fore arm haematoma and asymptomatic radial artery occlusion occurred in 8 (1.35%) study patients. Overall procedural un success rate was 5% (30 patients) for transradial coronary angiography, and converted to femoral route. The reason for failure of transradial procedure included failed radial artery puncture ($n=6$), radial artery loop ($n=2$), tortuous subclavian artery ($n=3$), failed catheterization of coronary arteries in 5 patients (2.53%) and severe radial artery spasm in 20 (3.38%). Shown in table 1.

Table -1

During procedure	Complications	After procedure	Complications
Haematoma at site of puncture	02	Puncture failure	06
Occlusion	08	Radial loop	02
		Tortuous	03
		Catharization failure	

Table 2: Demographic and clinical characteristics in 591 patients.

Variables	No. of patients	%
Mean age (years)	54 ± 10.08	
Male	437	74
Female	154	26
Indication for angiogram		
Positive stress test	291	49
Unstable angina	153	26
Stable angina	99	17
Post infarction angina	48	08

Table 3. Puncture Site Complications in 591 Patients

Complications	No. of patients	%
Asymptomatic radial thrombosis	21	3.50
Hand ischemia (transient)	2	0.30
Minor fore arm hematoma	2	0.30
Pain or spasm	20	3.38
Vascular surgery	2	0.30

DISCUSSION

In our study, overall procedural success rate was 95% (561 patients) for trans radial coronary angiography, in comparison to it a study by Kiemeneijetal in 1993, the failure to complete the procedure from radial artery approach has been relatively high and related to radial artery spasm, radial loops, subclavian artery tortuosity and dilated aortic root³. Transradial approach has a learning curve period and the failure rate is especially high during this period. With experience, failure rate could be reduced from 10% to 1 % after 1000 cases⁹. The failure or cross over rate of radial access site was 5.9% in the meta-analysis by Jolly et al,¹⁰ compared to 1.4% in the femoral group. A dichotomous trend was noted in cross over or failure rate in the studies performed in the early era of radial access and the recent era (2011-2013).

In our study only 2 patients had mild forearm haematoma and asymptomatic radial artery occlusion occurred in 8 (1.35%) study patients. The reason for failure of transradial procedure included failed radial artery puncture ($n=6$), radial artery loop ($n=2$), tortuous subclavian artery ($n=3$), failed catheterization of coronary arteries in 5 patients (2.53%) and severe radial artery spasm in

20(3.38%). This lower rate of complications is also clear from international data which has demonstrated that the most successful coronary percutaneous intervention can be complicated by vascular access site complications in as much as 2-8% of cases performed from transfemoral route^{4,11}. The findings of access study also clearly demonstrated reduction of major access site complications from radial compared to femoral and brachial approaches (0% vs 2.3% vs 2%% respectively)¹¹. In a recent meta-analysis of 22 randomized controlled trials by Sanjit S Jolly et al,¹⁰ radial access reduced major bleeding by 73% compared to femoral access (0.05% vs 2.3%), OR 0.27 [95% CI 0.16-0.45], $p < .001$). Asymptomatic radial artery occlusion occurs in 3-5% of patients in different studies¹². Asymptomatic, in hospital radial artery occlusion occurred in 1.4% of our study population. In our study, no post discharge followups were done, so the lesser number of occluded radial artery could be an under-estimate. Majority of occluded radials are known to recanalize overtime¹³.

In our study mean procedure time of 21.25 ± 5.25 minutes, mean fluoroscopy time of 6 ± 3.15 minutes, and 90% of patients were discharged on the same day. In comparison to our study, in the carafe study¹⁴, the procedural duration from the radial approach was 12.4 ± 5.8 min and fluoroscopy time was 3.8 ± 2.2 min for coronary angiography. The procedural time in the transradial group (40.2 min) was longer than the transfemoral approach (37.0 min) in the study by Bruecket al¹⁵, but it was recognized that if sheath removal time of transfemoral procedure had been included, the procedure duration would have been similar¹⁵. This has been demonstrated that radial experts have shorter procedure time compared to non-radial experts¹⁰. The limitation of our study was the absence of a comparative femoral group, because I selected all the cases I have performed myself, and we prefer femoral route in selective cases like CTO and complex bifurcations lesions. Another limitation was lack of followup for identification of radial artery occlusion or any other complication.

CONCLUSIONS

The radial artery approach is found to be very safe with high degree of success and low vascular access site complications for coronary diagnostic and interventional procedures in local population.

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