

Safety of Transulnar Approach in Patients Undergoing Diagnostic Coronary Angiography

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ABSTRACT

BACKGROUND

The patients who develop access site complications while undergoing diagnostic coronary angiography and percutaneous coronary intervention (PCI) are not only associated with adverse cardiovascular outcomes but also with in-hospital and afterwards morbidity and mortality. During coronary angiography or PCI there is infrequent use of ulnar artery. Although in patients undergoing complex coronary interventions through transulnar approach the ratio of successful clinical outcomes and its long-term safety still remains to be established, but this is an important substitute to the transradial approach for radial experts in particular cases, sharing a very high successful clinical outcomes and enormously little rate of access-site complications during transulnar approach.

OBJECTIVES

The objective of study was to assess the safety of trans-ulnar approach among patients undergoing diagnostic coronary angiography and percutaneous coronary intervention

MATERIAL AND METHOD

Study Design

Clinical trial

Study Duration

6 months from January 2016 to June 2017.

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Study Setting

At Angiography Unit, department of cardiology Jinnah hospital, Lahore.

Sample Size

42 patients assuming 2.8% develop complications with 95% confidence interval and 5% margin of error.

Sample Selection

Non-probability/consecutive sampling

Data Collection and Analysis

Forty-two consecutive patients age 35 years - 65 years of either gender was selected for this clinical trial at Angiography Unit, department of cardiology Jinnah hospital, Lahore. Ulnar artery was punctured through Seldinger's technique and 6F sheath was inserted followed by injection of a cocktail of 250 mcg diluted Nitroglycerine and 1 mg diluted verapamil in sheath. The sheath was flushed with heparinized saline thereafter. After completion of the procedure (coronary angiography/PCI) sheath was flushed again with heparinized saline and ACT of the patient was measured. The sheath was removed after the ACT dropped to 270 or less and pressure bandage was applied. Mean and standard deviation were calculated for numerical variables like age and frequency tabulation was done for safety profile i.e., patency complication rate at 4 weeks.

RESULTS

Mean age was 48.8 years SD 8.048. 71.4% were male and 28.6% were female. 100.0% had primary ulnar artery puncture and only 4.85% had crossover to other access. 4.8% develop ulnar artery spasm and 100.0% had patency after two weeks. No subject developed any complications including hematoma, ischemia and ulnar nerve injury.

CONCLUSION

Ulnar artery approach is a safe approach for Coronary angiography and percutaneous coronary intervention.

KEYWORDS

Safety; Transulnar; Coronary angiography; Percutaneous coronary intervention

INTRODUCTION

The patients who develop access site complications while undergoing diagnostic coronary angiography and percutaneous coronary intervention (PCI) are not only associated with adverse cardiovascular outcomes but also with in-hospital and afterwards morbidity and mortality. During interventional procedures the transfemoral approach is linked with noteworthy access site bleeding rates and to overcome these problems more easily compressible access sites are gradually being used. During coronary angiography or PCI there is infrequent use

of ulnar artery [1]. In a study done by Deshmukh et al. [2] showed high successful ratios of coronary angiography (93.8%) and PCI (100%)/bypass graft interventions (92.6%) through transulnar approach. Short (30 days) and long term (1 year) follow-up was found in 71 and 58 patients respectively. Vascular complications were found in 2.8% patients at 30 days. There were no vascular or neurological complications seen with transulnar approach and even major adverse cardiovascular events were 3.4% at 1 year follow up [2].

There are many contributing factors to failed radial artery puncture like failure to take the catheter to the

ascending aorta and insufficient guiding catheter support. Previously, it was common exercise to swap over to femoral approach after unsuccessful radial puncture but nowadays with the radial experts this exercise results in higher complication rate. In a study Andrate PB et al. performed 410(3.7%) procedures through transulnar approach out of total 11,059 procedures. Rest of the cases were performed either by transradial approach 10,108(91.4%) or by transfemoral approach 541(4.9%). The most commonly used route (88.9%) was right ulnar artery. The success rate of the procedure was 98.5%, while crossover rate to contralateral radial and femoral approach was 1.5%. The complication rate of transulnar approach was around 3.9% comprising of mostly minor bleed. The major adverse effects like major bleeding, ulnar nerve injury, aneurysm formation or arteriovenous fistula were not seen [3].

Transulnar catheterization in case of an occluded ipsilateral radial artery may increase the risk of hand ischemia however Kwan TW et al. reported an interesting observation in their study conducted on 17 patients who had occluded radial arteries [4]. They carried out cardiac catheterization through ipsilateral ulnar arteries. After the procedure they followed the patients up to 30 days after and no case of hand ischemia was reported inspite of one patient developed spasm of ulnar artery. They concluded that ipsilateral transulnar approach in patients with radial artery occlusion might not be an absolute contraindication because of collateral blood supply from the anterior interosseous provided protection from hand ischemia.

Chiam PT and Lim VY did a challenging case of PCI through ulnar artery in a patient with difficult femoral access and ipsilateral radial artery hypoplasia [5].

Kedey S and co-workers conducted a study to assess the safety and feasibility of transulnar catheterization in 476 patients with ipsilateral radial artery occlusion [6]. Out of these patients 42% underwent coronary angiography, 38% PCI and 17% had carotid artery stenting via transulnar approach. In a subgroup of 240 patients with ipsilateral radial artery occlusion, the success rate of the procedural success was 97% and crossover to femoral approach was 3%. At day 1 and 1 month follow up no case of hand ischemia was reported. Ulnar nerve injury was not found in a single patient. Major hematoma of the forearm was formed in 2 patients but without any untoward effects. Only 8% patients developed minor hematoma at the puncture site. Severe clinical spasm occurred in two patients. At 1 month follow-up, the rate of ulnar artery occlusion was 3.1% but without any symptoms.

Although in patients undergoing complex coronary interventions through transulnar approach the ratio of successful clinical outcomes and its long-term safety still remains to be established, but this is an important substitute to the transradial approach for radial experts in particular cases, sharing a very high successful clinical outcomes and enormously little rate of access-site complications during transulnar approach. The substantial rates of radial artery occlusion after radial artery utilization for cardiac catheterization results in failure of its use in coronary artery bypass grafting, therefore making ulnar approach a viable option to avoid this situation.

The rationale of our study is to evaluate the safety and feasibility of transulnar approach to perform coronary diagnostic and intervention procedures as it has not been studied so far in detail in our set up and there is no relevant local data available in Pakistani population.

OBJECTIVES

The objective of study was to assess the safety of trans-ulnar approach among patients undergoing diagnostic coronary angiography.

DATA COLLECTION AND ANALYSIS

PROCEDURE

Forty-two consecutive patients age 35 years - 65 years of either gender was selected through non-probability sampling assuming 2.8% will have complications with 95% confidence interval and 5% margin of error for this clinical trial at Angiography Unit, department of cardiology Jinnah hospital, Lahore. After an informed consent detailed demographic profile and thorough physical examination was performed. After aseptic measures 4% local lignocaine anesthesia was given. Ulnar artery was punctured through Seldinger's technique and 6F sheath was inserted followed by injection of a cocktail of 250 mcg diluted Nitro-glycerine and 1 mg diluted verapamil in sheath. The sheath was flushed with heparinized saline thereafter. In case of ulnar artery spasm (indicated by failure to advance a catheter through the vessel, absent flush back through sheath or drop in pressure waveform measured from the sheath) further bolus of 250 microgram nitro-glycerine was flushed through the sheath. The access site was switched over to femoral artery or contralateral ulnar artery if the spasm persisted despite of second bolus of nitro-glycerine. In this case the sheath was removed after a second arterial access is obtained and pressure dressing applied. After completion of the procedure (coronary angiography/PCI) sheath was flushed again with heparinized saline and activated clotting time (ACT) of the patient was measured. The sheath was removed after the ACT dropped to 270 or less and pressure bandage was applied. Mean and standard deviation were calculated for numerical variables, like age, frequency and tabulation was

done for safety profile i.e., patency complication rate at 4 weeks.

RESULTS AND MAIN FINDINGS

Mean age was 48.8 years SD 8.048. 71.4% were male and 28.6% were female. 100.0% had primary ulnar artery puncture and only 4.85% had crossover to other access. Conventional manual pressure bandage was applied for 6 hours. 4.8% developed ulnar artery spasm and 100.0% had patency after two weeks. No subject develops any complications including hematoma, ischemia and ulnar nerve injury.

| No | Variable | Frequency | Percentages |
|----|-------------------------------------------------------|-----------------------|-------------|
| 1. | Age | 48.8 years SD + 8.804 | |
| 2. | Gender | | |
| | Male | 30 | 71.4 |
| | Female | 12 | 28.6 |
| 3. | Primary Ulnar Artery puncture | 42 | 100.0 |
| 4. | Cross over to another Access | 2 | 4.8 |
| 5. | Ulnar Artery Spasm | 2 | 4.8 |
| 6. | Patency after two weeks | 42 | 100.0 |
| 7. | Complication (hematoma, ischemia, Ulnar nerve injury) | 0 | 0.0 |

Table 1: It includes variable, percentage and frequency.

DISCUSSION

The use of ulnar artery as access site for diagnostic angiography or PCI was not that much common in the previous era. But recently ulnar artery has got acceptance for its utilization in various interventional procedures. In our study we determined the safety of transulnar approach in patients undergoing diagnostic coronary angiography in terms of local access site and major bleeding. A reasonable sample size was taken to strengthen the results of our study and all of them had primary ulnar artery puncture. Our study found only 4.8% patients had ulnar artery spasm and 100 % patency rate at two weeks. In 2001 a study by Terashima et al. [7] described ulnar artery as access site for coronary angiography for the first time.

CONCLUSION

Transulnar approach is a safe and effective approach for Coronary angiography with negligible incidence of side effects.

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Junaid Zaffar conceived the idea, designed the study and analyzed the data. Usman Mahmood Butt and Rao Shahzad Abdul Tawab Khan did data collection

and manuscript writing. Muhammad Zarrar Arif Butt and Muhammad Khaleel Iqbal did the manuscript writing. Mamoon Akbar Qureshi did review and final approval of manuscript. All the authors contributed significantly to the research that resulted in the submitted manuscript.

CONFLICT OF INTERESTS

All authors declare no conflict of interest.

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