

PERCUTANEOUS TRANSRADIAL APPROACH FOR THE CORONARY ANGIOPLASTY AT A TERTIARY CARDIAC CENTRE IN NEPAL

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ABSTRACT

Percutaneous coronary intervention is an integral part of the management of coronary artery disease. Transradial artery access has emerged as alternative to transfemoral artery access for the percutaneous coronary intervention. The main objective of the study was to assess the trend of the transradial percutaneous coronary intervention, procedural outcome and complication of the procedure. This is a retrospective study including three hundred and eighty seven consecutive patients who underwent percutaneous coronary intervention through radial artery access at Shahid Gangalal National Heart Centre from 2007 to 2012. The data on demographic profile, target vessel revascularized, type of stent, complications of the procedure, switch over to other access were collected and analyzed. Among 387 study population, age ranges from 36 to 78 years, most of them were male 316 (81.6%). Majority of them 366 (94.8%) had single vessel coronary intervention and left anterior descending artery was the most common 173(42.5%) vessel revascularized. Around 19.8% of the procedure had to be switched from radial to femoral access. The radial artery access was utilized for the percutaneous coronary intervention in 10 (6.9%) in 2007 and in 229 (32.07%) of the patients in 2012. The radial artery access for percutaneous coronary intervention has increasing trend with the acceptable complication.

KEYWORDS

Percutaneous coronary intervention, radial access, vessel revascularized

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INTRODUCTION

Andreas Gruentzig introduced the first Percutaneous Coronary Intervention in September 1977.¹ The history of transradial artery intervention appears to date back to 1989 when Campeau *et al* performed one hundred catheterizations through this approach. He was successful in 88 of the patients, although an absent or diminished pulse was documented in 22 patients.² The first transradial Percutaneous Coronary Intervention was performed in Amsterdam,³ which was followed by first transradial stent in 1993.⁴ This was first study to demonstrate transradial access as alternative to transfemoral access for Percutaneous Coronary Intervention. Percutaneous Coronary Intervention was started in Shahid Gangalal National Heart Center, Nepal in 2003 and the radial artery was utilized for the coronary intervention for the first time in 2007.

Radial access for percutaneous coronary intervention has emerged as alternative to femoral access. Relatively lower risk of access site complication, patient comfort and lower bleeding complications are some of the advantages of radial procedure.⁵ Complex anatomy can make radial procedure difficult. Many of the authors discussing radial approach for PCI give emphasis to a relatively long training period.⁵ The number of radial PCI are increasing every year. Study on transradial access and its outcome is lacking in Nepal. This is first study in Nepal which aims to analyze the trends of radial percutaneous coronary intervention, procedural outcome and complications of the procedure in the tertiary cardiac Center of Nepal.

MATERIALS AND METHODS

Patient selection: This is a retrospective study. The data of all the consecutive patients undergoing percutaneous coronary intervention with radial access at Shahid Gangalal National Heart Center, Nepal from 2007 to 2012 were reviewed and analyzed.

Procedural Method

Percutaneous Coronary Intervention was performed in a standard fashion via the transradial route. All the patients received heparin, dual antiplatelets and verapamil according to the standard practice.

RESULTS

Three hundred and eighty seven patients had underwent percutaneous coronary intervention through the radial access during the study period. Patient were between the age of 36 to 78 years. Among 387 patients, male were 316 (81.6%) and female were 71 (18.4%).

Majority of the patients 366 (94.8%) had single vessel intervention and 21 (5.42%) patients had multivessel intervention. Left anterior descending artery was the

most common in 173 (42.5%) vessel revascularized followed by right coronary artery in 129 (31.7%) and then left circumflex artery in 105 (25.8%). Four hundred and twenty two stents were deployed. Among them 276 (65.4%) were drug eluting stent and 146(34.6%) were bare metal stent.

Procedural Outcomes

Around 19.8% of the procedure had to be switched from radial to femoral access in which 10% were due to failure to puncture. While 9.8% of the patient had tortuosity of brachial and axillary artery and guide catheter could not be crossed or could not be selectively engage into the coronary arteries (right and /or left).

The radial artery access for the percutaneous coronary intervention was started at Shahid Gangalal National Heart Centre, Kathmandu in 2007. Out of the total 160 coronary intervention done in 2007, 10(6.25%) were through radial access. The Fig. 1 shows that the radial access for percutaneous coronary intervention was 12.35% (2008), 6.9% (2009), 3.7% (2010), 13.57% (2011) and 32.07% (2012).

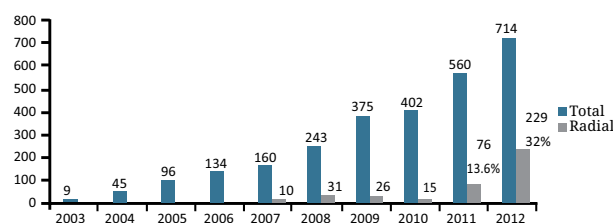


Fig. 1:

Trend of PCI –proportion of radial PCI total PCI

From 2007 to 2011 was a learning curve period showing a lower trend for radial access. 2012 showed dramatic increase of the radial access up to 32% of total percutaneous coronary intervention. In the nationwide data in 2012, radial artery access was used for percutaneous coronary intervention in 43.5% of the patient (figure 2).

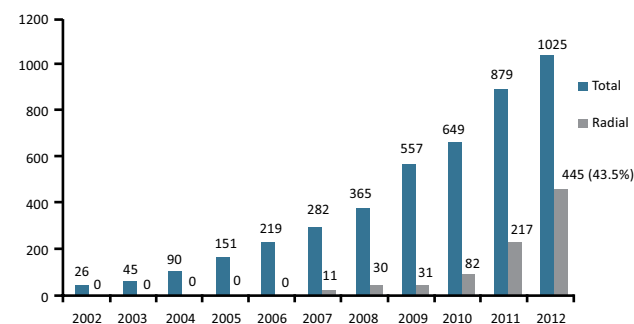


Fig. 2:

Trend of PCI in Nepal –proportion of radial PCI total PCI

The indication wise distribution of the radial percutaneous coronary intervention is shown in figure 3. The radial access started in 2007. In 2011, first primary percutaneous coronary intervention was done through transradial approach. In 2012, out

of 229 radial coronary intervention 44 (19.2%) was primary percutaneous coronary intervention for acute myocardial infarction, whereas 172 (75.1%) were elective procedure and rescue intervention was in 13 (5.7%) of the patients.

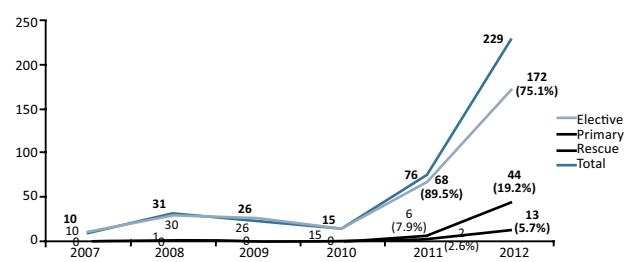


Fig. 3:

Primary, elective and rescue PCI by radial access

Complications: The most common complication was bruise (10.2%) at the access site and pain at forearm (10%), followed by hematoma in 3.7% of the patients. Absent radial pulse was noted in 2.1% of the patients. One patient developed compartment syndrome.

DISCUSSION

The transradial approach to percutaneous coronary intervention was started on July, 2007 at Shahid Ghalgal National Heart Centre. After four years, first primary percutaneous coronary intervention was performed through the radial artery access. In this retrospective study, rising trends in the proportion of the radial percutaneous coronary intervention was observed with 6.9% in 2007 to 32.07% in 2012 which is consistent with the situation in other countries. In UK, proportion of Radial percutaneous coronary intervention raised from 10% in 2004 to 58% in 2011 however in US there is low rate of radial procedures even though it shows a rising trend from 2% in 2009 to 11% in 2011⁶. An estimated 20% of procedures are performed by this route worldwide (29% if the US is excluded from the estimate). There is considerable variation across the countries. Central and South America have a lower rate of radial use, estimated at 15%, whereas in countries like Norway, Malaysia, and Bulgaria have high rates of transradial access (70–80%). In a retrospective study, conducted in a North Indian tertiary care centre from April 2004 to December 2011, 25.4% of percutaneous coronary intervention were performed by transradial route⁷. Overall in Asia total 42% of percutaneous coronary intervention is performed by transradial access.⁶

The mean age in Indian study was 56.97 ± 9.70 years,⁷ whereas in our study the age ranged from 36 to 78 years. Male to female ratio in our study was 4.4:1 (81.6%: 18.4%) which similar to Indian study 86%:14%. In the same study, among 2246 patients undergoing transradial percutaneous coronary intervention, single vessel intervention was 79.22%. Study from Pakistan showed among the transradial percutaneous coronary intervention, single vessel coronary intervention was 68 (80%) and multivessel

coronary intervention 20%.⁸ In our study most of the patients 366 (94.8%) had single vessel coronary intervention and only 21 (5.42%) had multivessel coronary intervention. Tewari *et al* had percutaneous intervention to Left anterior descending artery in 57.90%.⁷ Similarly, in our study PCI to Left anterior descending artery was the most common in 173 patients (42.5%) followed by right coronary artery in 129 patients (31.7%) and then left circumflex artery in 105 patients (25.8%). Four hundred and twenty two stents were deployed. Among them drug eluting stent was in 276 (65.4%) and bare metal stent in 146 (34.6%) of cases.

The failure to complete PCI from radial access has been relatively high and related to radial artery spasm, radial loops, subclavian artery tortuosity and dilated aortic root. Radial access for PCI has a learning curve period and failure rate is high during this period. With experience, failure rate could be reduced from 10% to 1% after 1000 cases⁹. Radial versus femoral access for coronary angiography and intervention in patients with acute coronary syndromes (RIVAL) study showed that among the patient having radial access, the PCI success was in 95.4% whereas the access site crossover was 7.6%.¹⁰ A study in India showed among 2246 patient undergoing transradial PCI Crossover to contralateral access site was 26 (1.16%) and crossover to another access site was 35 (1.56%) Another study showed transradial coronary angioplasty was successful in 94.3% and failed in 6.8% patients,⁸ The reasons for failure were radial artery spasm 2 (2.4%), tortuous subclavian artery 1 (1.2%), difficulty engagement of guide and poor guide support 2 (2.4%). In our study 19.8% of the procedure had to be switched from radial to femoral access in which 10% were due to failure to puncture while 9.8% of the patient had tortuosity of the brachial and axillary artery. The learning curve for the radial access for PCI is steep which explains the high initial failure rate.

In our study, the most common complication was bruise (10.2%) at the access site followed by forearm pain (10%) and then the hematoma in 3.7% of the patient. Likewise, in study by Khan M *et al*, one patient (0.37%) suffered minor forearm haematoma, asymptomatic radial artery occlusion occurred in 4 (1.5%), absent radial pulse was noted in 2.1% of the patient.⁸ Tewari *et al* noticed 120 (5.34%) of the patients had loss of radial pulse.⁷ The compartment syndrome in forearm occurred in one patient due to puncture by standard guidewire which was detected late. He underwent surgery (fasciotomy) and was discharged later. Overall the complication of the procedure was low and acceptable.

Limitation of study: Being the retrospective study those complication which are not documented might have been missed. Due to the steep learning curve, failure rate at initial period of radial PCI is higher in our study compared to studies in experienced centre. Currently with experience in 2012 about 10.8% patients switched from radial access to femoral access due to difficult or unfavourable anatomy or due to

failure to puncture. This will reduce further with more operator experience. The study includes radial percutaneous coronary intervention by all operators at Shahid Gangalal National Heart Centre. Some operators perform over 80% of intervention through radial access while others perform less than 50% through radial access thus resulting in various success rates.

Radial percutaneous intervention has shown increasing trends. Initial high failure rate is due to operator learning curve period. With experience currently more cases (32%) of PCI (primary, elective and rescue) are done through radial access with low and acceptable complications.

REFERENCES

1. Gruntzig A. Transluminal dilatation of coronary artery stenosis. *Lancet* 1978; 1: 263.
2. Campeau L. Percutaneous radial artery approach for coronary angioplasty. *Cathet Cardiovasc Diagn* 1989; 16: 3-7.
3. Kiemeneij, F *et al.* Transradial artery coronary angioplasty. *Am Heart J* 1989; 129:1-7.
4. Kiemeneij, F *et al.* Percutaneous transradial artery approach for coronary Palmaz-Shatz stent implantation. *Am Heart J* 1994; 128:167-74.
5. Rao S V, Mauricio G, David E, K *et al.* The Transradial Approach to Percutaneous Coronary Intervention Historical Perspective, Current Concepts, and Future Directions. *J Am Coll Cardiol* 2010; 55: 2187 -2195.
6. Ronald P C, Jennifer A T, Rao SV *et al.* Transradial Arterial Access for Coronary and Peripheral Procedures: Executive Summary by the Transradial Committee of the SCAI Catheterization and Cardiovascular Interventions 2011: 1-17.
7. Tewari S, Sharma N, Kapoor A *et al.* Comparison of transradial and transfemoral artery approach for percutaneous coronary angiography and angioplasty: A retrospective seven-year experience from a north Indian center. *Indian heart J* 2013; 65: 378-87.
8. Khan M, Qadir F, Hanif B *et al.* To determine the safety and success of transradial coronary angiography and angioplasty — A local experience. *J Pak Med Assoc* 2010; 10: 809-13.
9. Louvard Y, Pezzano M, Scheers L *et al.* Coronary angiography by a radial approach: feasibility, learning curve. One operator's experience. *Arch Mal Coeur Vaiss* 1998; 91: 209-15.
10. Jolly S S, Yusuf S, Cairns J *et al.* Radial versus femoral access for coronary angiography and intervention in patients with acute coronary syndromes (RIVAL): a randomised, parallel group, multicentre trial. *Lancet* 2011; 377: 1409–20.