

Transradial primary percutaneous coronary intervention — experience from a tertiary care cardiac centre

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Abstract

Objective: To determine the outcomes of primary percutaneous coronary intervention via transradial approach in a tertiary care cardiac centre.

Methods: The study retrospectively reviewed the medical records of 160 consecutive patients who presented to Tabba Heart Institute, a private-sector facility in Karachi, between January 2009 and January 2011 with acute ST-elevation myocardial infarction and treated with primary percutaneous coronary intervention via transradial approach. The primary end-points were in-hospital mortality and procedural success. Secondary end-points were access site bleeding complication and 30-day outcomes (mortality, myocardial infarction and congestive cardiac failure).

Results: The mean age of the patients was 55.9 ± 11.7 years and 126 (79%) were males. The procedural success was 98% (n=157). Three (1.8%) patients died during hospitalisation. Forearm haematoma (>5cm) was observed in three (1.8%) patients. No mortality was observed in 30-day follow-up after discharge, while myocardial infarction and congestive cardiac failure were 1.25% (n=2) and 4% (n=6) respectively.

Conclusions: High procedural success and favourable clinical outcomes matching the international data can be achieved in our patients undergoing primary percutaneous coronary intervention via transradial approach.

Keywords: Percutaneous coronary intervention, Myocardial infarction, Reperfusion. (JPMA 63: 731; 2013)

Introduction

The treatment of acute myocardial infarction (AMI) via mechanical reperfusion strategy was advocated in 1983 by Hartzler et al.¹ Currently primary percutaneous coronary intervention (PPCI) is the treatment of choice for patients with ST elevation myocardial infarction (STEMI).² Worldwide the most common route for PPCI is transfemoral due to vast experience and availability of pre-designed equipment for such an approach. However, its major drawback is puncture-site haemorrhagic complications.³

Transradial approach is a growing route for coronary angiography and angioplasty in current practice of interventional cardiology. Use of radial approach is estimated to be around 10% of PPCI worldwide and is rapidly increasing.⁴ Transradial intervention (TRI) has been criticised because of longer procedure time and lower success rate compared to the femoral approach in the beginners due to a definite learning curve for the operator.⁵ Once the technique has been correctly acquired, procedural success is high and it can be utilised as a route of first choice for most patients. A local study had shown 97% success rate of the radial

approach.⁶

The main advantage of TRI is the low rates of access-site bleeding complications which make it the route of choice in high-risk patient's i.e. hypertensive, women, low body weight and patients treated with IIb/IIIa receptor antagonist.⁷

Procedural success and safety data on primary PCI via transradial approach is limited and in many early studies, STEMI was considered part of the exclusion criteria for primary PCI.⁸ No formalised guidelines exist regarding the development of TRI-AMI programme, but in most centres it emerges as an outgrowth of the standard elective TRI programme.

A study from China showed procedural success rate of 96.5% in patients undergone PPCI via transradial approach, with 1.8% local radial access-site haematoma.⁹ Similarly, a study from Spain showed a 96% procedural success without any access-site bleeding complication.¹⁰

At the study centre, transradial approach for diagnostic and coronary intervention is being used for the last three years. We started with diagnostic procedures, gradually switched to elective TRI and later started PPCI via transradial approach.

Few local studies were found regarding outcomes of

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elective TRI in our population.⁶ However, no local study was found after an extensive literature looking at PPCI via transradial approach. This provides a very strong rationale to conduct such a study to determine the outcome of primary PCI via transradial approach in our population and compare it with international data.

Patients and Methods

The study retrospectively reviewed medical records of 160 consecutive patients presented to the Emergency Department (ED) of Tabba Heart Institute, Karachi from January 2009 to January 2011 with STEMI and chest pain of <12 hours duration. Patients with cardiogenic shock were excluded from the study. All patients underwent PPCI via transradial approach as a mode of reperfusion.

All patients in ED received aspirin 300mg, clopidogrel 600mg, parenteral beta blockers as per indications and initial weight-based bolus of unfractionated heparin.

Right radial access was taken for diagnostic angiogram followed by PPCI of the infarct-related artery. Coronary stenting, intracoronary nitroprusside and adenosine use were at the judgment of the operators. Dual anti-platelet therapy was continued as per standards. All patients were initially monitored in the coronary care unit (CCU) and later shifted to the coronary step-down unit. Routine clinical follow-up was done after one week and four weeks of discharge.

A proforma was designed to collect information including, age, gender, history of diabetes (defined as a fasting glucose ≥ 126 mg/dl or on treatment), hyperlipidaemia (fasting cholesterol ≥ 200 mg/dl or on treatment), hypertension (systolic blood pressure $\geq 140/90$ mmHg or on treatment), smoking, left ventricular function (visually estimated, using either echocardiography or left ventriculography). Angiographic and procedural details (culprit vessel, use of coronary stents and glycoprotein (GP) IIb/IIIa inhibitors) were also collected. Timing variables were computed including time to presentation which was defined as the time from symptom onset until arrival at the hospital. Door-to-balloon time was the time from arrival at the hospital until first balloon inflation in the cardiac catheterisation laboratory. Procedural success was defined as achievement of vessel patency to a residual $\leq 30\%$.

Primary end points were in-hospital mortality and procedural success. Secondary end points were access-site bleeding complication (significant forearm haematoma was defined as >5 cm in diameter or requiring transfusion) and 30-day outcomes (mortality, myocardial infarction defined as recurrence of clinical

symptoms or new electrocardiographic changes and new elevation of creatine kinase MB fraction) and congestive cardiac failure (defined as a history of paroxysmal nocturnal dyspnoea, dyspnoea on exertion or pulmonary congestion on chest X-ray).

All the variables were entered into SPSS 14 for data analysis. Descriptive statistics were computed and presented as means and standard deviations for continuous variables like age, left ventricular ejection fraction (LVEF) and median for onset of pain to ED in minutes, door-to-balloon time in minutes. Categorical variables were reported in frequencies and percentages for gender, hypertension, diabetes mellitus, hyperlipidaemia, procedural success, in-hospital mortality and 30-day outcome variables, including myocardial infarction and congestive heart failure.

Results

The mean age of the 160 study patients was 55.9 ± 11.7 years; 126 (79%) were males and 34 (21%) were females. There were 67 (42%) diabetics and 107 (66%) hypertensives. The median time from the onset of symptoms to presentation was 130 minutes and the mean door-to-balloon time was 85 ± 18 minutes. Of the total, 96 (60%) patients received GP IIb/IIIa inhibitor (Table-1). Left anterior descending (LAD) artery was the most infarct-related artery ($n=96$; 60%) followed by right coronary artery ($n=45$; 28%) and left circumflex artery, ($n=19$; 12%)

Table-1: Baseline characteristics.

Baseline demographic and clinical characteristics	N= 160 (%)
Age (mean / SD) (years)	55.9 $\pm$ 11.7
Male (Gender)	126 (79)
Past medical history	
Hypertension	107 (66)
Diabetes mellitus	67 (42)
Smokers	72 (45)
Hyperlipidemia	96 (60)
Family history of coronary artery disease	77 (48)
Admission characteristics	
Anterior myocardial infarction	96 (60)
Killip class I	112 (70)
Left ventricular ejection fraction <40%	48 (30)
Timing variables	
Onset of pain to ED time (minutes) median	135
Door to Balloon time (minutes) mean	85 $\pm$ 18
Radial artery access time (seconds) mean	40 $\pm$ 15
Glycoprotein IIb / IIIa inhibitors	
IIb/III inhibitors used in	96 (60)
Started in Emergency Department	39 (41)
Started in Catheterisation laboratory	57 (59)

ED: Emergency Department.

Table-2: Angiographic and procedural characteristics.

Culprit vessel	N= 160 (%)
Left Anterior Descending	96 (60)
Left Circumflex	19 (12)
Right Coronary Artery	45 (28)
Use of stents	152 (95)
Bare metal stents	94 (62)
Drug eluting stents	58 (38)
Type of contrast used:	
Ionic	13 (8)
Non-ionic	147 (92)

Table-3: Outcomes.

Primary end-points	N= 160 (%)
Procedural Success	157 (98)
In-hospital Mortality	3 (1.8)
Secondary end-points	
Forearm haematoma	3 (1.8)
Death (30 day)	0
Myocardial infarction (30 day)	2 (1.2)
Congestive heart failure (30 day)	6 (4)

respectively (Table-2). Besides, 96 (60%) had anterior STEMI; 48 (30%) patients had LVEF <40%.

Procedure was successful in 157 (98%) patients. Stents were deployed in 152 (95%). Majority of patients (n=94; 62%) received bare metal stents. Forearm haematoma was observed in 3 (1.8%) patients. Three (1.8%) patients died during hospitalisation. No mortality was observed in 30-day follow-up after discharge, while myocardial infarction and congestive cardiac failure were noted in 2 (1.2%) and 6 (4%) patients respectively (Table-3).

Discussion

Primary PCI is now considered treatment of choice for patients with STEMI, provided skilled interventional cardiologist and catheterisation laboratory with surgical backup are available and the procedure can be performed timely.¹¹ A meta-analysis demonstrated that PPCI was better than thrombolytic therapy in reducing overall short-term mortality ($p<0.0002$), non-fatal reinfarction ($p<0.0001$), stroke ($p<0.0004$) and combined end point of death, non-fatal reinfarction and stroke ($p<0.0001$).¹²

Primary PCI was mainly carried out via transfemoral approach and many interventional cardiologists are reluctant to use the radial artery because of its relatively small calibre and a longer vascular access time which results in the delay of reperfusion time.¹³ TRI in elderly patients may be more difficult because of tortuosity or

stenosis of the upper limb arteries in these patients.¹⁴

Radial artery puncture and catheter manipulation is also a matter of concern because it requires a learning period to achieve competence. Once operators master the skills, this technical obstacle can be overcome. In general, it seems that increasing experience with the transradial approach is associated with decreased rates of procedure failure. In one observational study, an annual procedural volume >80 transradial cases correlated with significant reductions in access failure, sheath insertion time, and overall procedural time.¹⁵

In current interventional practice, procedural success rates are high and ischaemic complications are relatively rare. Thus, attention has turned to peri-procedural bleeding complications.¹⁶

Clinical success of primary PCI can be limited by haemorrhagic complications at puncture site. This is particularly a concern in high-risk patients receiving GP/IIb/IIIa inhibitors. In these cases, the low rate of local complications with TRI compared to the femoral approach has made TRI the procedure of choice. A growing body of evidence suggests that a procedural strategy using the transradial rather than the transfemoral approach for PPCI is associated with comparatively larger reductions in bleeding complications than those achieved with any anti-coagulant strategy.¹⁷ One study found that the transradial approach was associated with a 73% reduction in major bleeding compared with the transfemoral approach.¹⁸

Another study compared the radial and femoral routes in patients with AMI undergoing PPCI. It found that immediate procedural success was 96.1% vs 94.9%, major adverse cardiac events were 6.8% vs 8.5% in radial and femoral groups respectively. Access-site bleeding complications were present only in the femoral artery access group and in-hospital mortality was 3.9% in the radial group.¹⁰

A study showed that in-hospital mortality was 3.1% in patients who had undergone PPCI via transradial approach.¹⁹ Two other studies showed in-hospital mortality around 3%⁹ and 3.8%²⁰ in transradial PPCI.

TEMPURA study showed a procedural success of 96% and in-hospital mortality of 5.2% in patients undergoing PPCI via transradial approach.²¹ In-hospital mortality was 1.8% and procedural success was 98% in our study which is comparable to international data.

Access-site haematoma formation is an important bleeding complication associated with transradial approach. Significant forearm haematoma (>5cm) was

noted in 3.1% of patients undergoing PPCI in one study,¹⁹ while another study showed forearm haematoma in 1.8% of the patients.⁹ Significant forearm haematoma was observed in three (1.8%) of our patients.

Conclusion

The results of the study are encouraging and comparable to results from the Western centres. Despite the presence of learning curve if properly acquired, transradial intervention can be effectively performed. High procedural success and low bleeding complication make the transradial approach the route of choice in patients with STEMI.

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