

To Evaluate the Technical Success of Percutaneous Coronary Intervention of Chronic Total Occlusion

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ABSTRACT

Aim: To evaluate technical success of percutaneous coronary intervention of chronic total occlusion.

Methods: This observational study was carried out at Sademan Provincial Hospital, Quetta within six months from 4th January till 3rd July 2015. Seventy patients fulfilling inclusion and exclusion criteria were included after taking informed consent on a consent form. A proforma used for data collection included parameters of the study. All patients were given local anesthesia at the site of arterial puncture that was radial or femoral. If the angioplasty guide wire failed to progress, or complications occurred such as coronary dissection, perforation or hemodynamic instability the procedure was abandoned and declared unsuccessful. Selection of angioplasty guide wires and supporting balloons was at the discretion of PCI operators. Operators progressed from soft to stiff wires.

Results: Mean age of patients was 52.7±9.9, mean height was 167.22±6.4 cm and mean weight was 76.3±9 kg. Out of 70 patients 57 (81.4%) were male, 13 (18.6) were female. Regarding coronary artery risk factors 22 (31.4%) were diabetic, 39(55.7%) hypertensive, 34(48.6%) smokers, 17(24.3%) with family history of ischemic heart disease and 13(13%) had previous history of ischemic heart disease. Diseased artery was LAD in 32 (45.7%), LCX in 9(12.9%) and RCA in 29 (41.4%). TIMI III flow achieved 54(77%) and technical success was 54(77%). Predictors of successful PCI stump shape was tapering in 46(65.7%) and flat in 24(34.3%). Length of lesion was <10mm in 4(5.7%), 10-20mm in 30(42.9%), >20mm in 36 (51.4%).

Conclusion: The technical success of coronary interventions is variable and operator dependent.

Keywords: Coronary, Intervention, PCI, Predictors

INTRODUCTION

Atherosclerotic disease is the most prevalent cause of death worldwide¹. Coronary artery disease is one of the most rampant non-communicable diseases in the world. It begins indolently as a fatty streak in the lining of the artery that soon progresses to narrow the coronary arteries and impair myocardial perfusion. Often the atherosclerotic plaque ruptures and causes sudden thrombotic occlusion and acute ST-elevation myocardial infarction (STEMI), non-ST-elevation MI (NSTEMI) or unstable angina (UA). This phenomenon is called acute coronary syndrome (ACS) and is the leading cause of death globally^{2,3}.

Primary percutaneous coronary intervention (PCI) is at present the most effective procedure for reducing the mortality rate of patients with acute myocardial infarction (AMI)⁴. Advanced age remains a predictor of adverse outcomes attending PCI even in the contemporary era in which DES are available⁵. Trends in cardiovascular diseases and their risk factors differ among different geographical areas⁶. Compared to developed countries, ACS patients in

Arabian Gulf countries present at a relatively young age and have higher rates of metabolic syndrome features⁷. Females tend to have a poor prognosis when they develop acute ST-elevation MI, which requires treatment with 1-PCI⁸. Compared with the early 1990s, catheter-based revascularization is currently more commonly used for patients with acute myocardial infarction, prior bypass surgery, or severe left main narrowing. These trends are likely due to the proliferation of new devices, especially intracoronary stents, since the mid 1990s⁹. Despite the rise in the rate of percutaneous coronary interventions since 1991, there has been no significant decline in the rate of CABGs performed. However, there is a significant shift to more complex operations¹⁰.

PATIENTS AND METHODS

This study was conducted in the Cardiology Department, Sandeman Provincial Hospital, Quetta over a period of six months from 4th January till 3rd July 2015. It was an observational study and the patients were selected by non probability, purposive sampling and informed consent was obtained. The patients included in this study had chronic total occlusion having TIMI flow 0-1 degree undergoing

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percutaneous coronary interventions. The patients having renal dysfunction (raised Serum creatinine >1.4), history of prior PCI and history of prior CABG were excluded. Seventy patients fulfilling inclusion and exclusion criteria were included after taking informed consent on a consent form . A proforma was used for data collection which included parameters of study. Duration of occlusion was defined as the elapsed time, in months, from the onset of symptoms (acute myocardial infarction or change of anginal pattern) or on coronary angiography. All patients received a loading dose of 300 mg of clopidogrel and then 75 mg/d for 9 months in addition to 150 mg/d aspirin. All the PCIs of CTOs were performed by experienced cardiologist. Local anesthesia was given at the site of arterial puncture that was radial or femoral. A fluoroscopy time of 30 minutes was allocated to wire the lesion. If the angioplasty guide wire failed to progress, or complications occurred such as coronary dissection, perforation or there was hemodynamic instability the procedure was abandoned and declared unsuccessful. Selection of angioplasty guide wires and supporting balloons was at the discretion of PCI operators. Operators progressed from soft to stiff wires. Balloon pre-dilatation was mandated before stent placement. Stent assignment was blinded to both the physician and the patient. Bare metal and drug eluting stents were used of available lengths 10-40 mm lengths and 2.5, 3.0, and 3.5 mm diameters. They were identical in appearance. Post dilation was done to optimise angiographic deployment. During the procedure, intravenous heparin boluses were administered. The procedure was concluded on achievement of the primary end point (procedural success) or any of the Secondary end points (failure of guide wire to cross the lesion, perforation, dissection, peri-procedural instability or death. Data was analysed on SPSS version 14.0. Nominal variables were presented as the frequencies and percentages and continuous variables were expressed as the mean ± standard deviation. Since it was an observational study so no test of significance were applied.

RESULTS

Results were compiled after studying the specific variables. 70 patients were included in this study that fulfilled inclusion criteria. Mean age of patients was 52.7±9.9, mean height was 167.22±6.4cm and mean weight was 76.3±9kg. Out of 70 patients 57(81.4%) were male 13(18.6) were female. Regarding coronary artery risk factors 22(31.4%) were diabetic, 39(55.7%) hypertensive, 34(48.6%) smokers, 17(24.3%) with family history of ischemic heart

disease and 13(13%) had previous history of ischemic heart disease. Diseased artery was LAD in 32(45.7%), LCX in 9(12.9%) and RCA in 29(41.4%). Regarding lesion characteristics of CTO, distal vessels visualized in 56(80%), antegrade flow was found in 45(64.3%), retrograde flow 25(35.7%) and calcification found in 9(12.9%). Regarding procedural characteristics JR Guider was used in 42(41.4%) and EBU-3.5 Guider was used in 41(58.6%). Wire crossed with balloon support in 54(77%). TIMI III flow achieved 54(77%) and technical success was 54(77%), Residual stenosis >30% was found in 16(22.9%). Predictors of successful PCI Stump shape was Tapering in 46(65.7%) and Flat in 24(34.3%). Collaterals were found in 36(51.4%), bridging collaterals were in 13(18.6%), side branch collaterals were in 42(60%) Length of lesion was <10mm in 4(5.7%), 10-20mm in 30(42.9%), >20mm in 36 (51.4%).

Table 1: Baseline characteristics (n = 70)

Characteristics	No.	%
Mean age (years)	52.7±9.9	
Gender		
Male	57	81.4
Female	13	18.6
Hypercholesterolemia	-	-
Smoking	34	48.6
Diabetes mellitus	22	31.4
Hypertension	39	55.7
Previous MI	13	----
Family history of IHD	17	24.3

Table 2: Angiographic variables

Variables	No.	%
Height mean (cm)	167.22±6.4	
Weight mean (kg)	76.3±9	
Diseased vessel		
LAD	32	45.7
LCX	9	12.9
RCA	29	41.4

Table 3: Angiographic lesion characteristics of CTO

Variables	No.	%
Distal vessels visualized	56	80.0
Antegrade flow	46	64.3
Retrograde flow	25	35.7
Calcification	9	12.9

Table 4: Procedural characteristics

Variables	No.	%
Guider used		
JR-4	29	41.4
EBU-3.5	41	56.6
Wire crossed with balloon support	54	77.0
TIMI III flow achieved	54	77.0
Technical success	54	77.0
Residual stenosis >30%	16	22.9

DISCUSSION

The mean weight of the patients included in our study tended to be obese and this has also been found by other workers¹¹. Indeed high body mass index has been associated with acute myocardial infarction^{12,13}. There was preponderance of male patients and this is also consistent with international studies¹⁴. The frequency of smoking in our study was less than quoted in studies conducted in Thailand¹⁵. It has been suggested that smoking and other risk factors differ by geography and race¹⁶. More than half of the patients in our study were diabetic and diabetes is a major risk factor as documented by Kimura and workers¹⁷. Almost half of the patients were hypertensive while it has been shown by workers that women requiring coronary intervention are more likely to be hypertensive¹⁸. Family history has been consistently described as a risk factor for coronary artery disease and has been found in our study as well¹⁹. For this reason in Israel, those with family history are screened for hyperlipidemia more frequently²⁰. Patients with previous history of coronary artery disease and previous intervention are more likely to get another coronary intervention²¹.

In our study LAD was involved in 45% of patients, while in Japan found it to be 44%^{22,23}. Others like Jim et al have found it to be 87%²⁴, Lam et al²⁵ found it to be 48%. Thus the involvement varies according to the study and geography. In our study the frequency of LCX was found less than in other studies conducted in Thailand.²⁶ Moreover LCX coronary artery disease has been associated with less favourable outcome²⁷, and it is more commonly associated with congenital anomalies.²⁸ In our study RCA was the main artery involved in 48% of cases while in another series it was involved in only 35%.²⁹ As mentioned earlier it may be due to geographical or racial factors.

Distal vessels were visualised in 54% of cases, while it was 100% in other case series³⁰. Antegrade flow may be a cause of poor visualization and was found in 64.3%³¹. The absence of antegrade flow in a coronary artery during an intervention is an ominous finding requiring diagnosis of the underlying cause and rapid treatment to limit myocardial necrosis³². Our study found that retrograde flow was 35% that was less than other international studies³³, the reasons of which are poorly understood. Our TIMI success was 77% while it has been found 92.3% for females and 86.9% for the males.⁸ In other international studies the presence of coronary CT angiography-visible linear intrathrombus enhancement within the occluded segment predicts better outcome of PCI in CTOs³⁴, while in our study the predictors of successful PCI stump shape was

tapering in 46(65.7%) and flat in 24(34.3%). Our findings have been supported by other studies such as by Soon et al³⁵. The importance of collaterals is well documented in literature^{36,37} and in our study it was found to be 51%. The length of lesion is a risk factor for restenosis³⁸ and was found in 51% of our patients.

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