

PCI TO CHRONIC TOTAL OCCLUSION, LIAQUAT NATIONAL HOSPITAL EXPERIENCE

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SUMMARY

BACKGROUND

PCI of chronic total occlusion represents 10%- 20% of all angioplasty procedures and poses a management dilemma for the interventional cardiologist. Percutaneous coronary interventions in chronic total occlusions have been associated with lower success rate. We therefore studied percutaneous interventions in chronic total occlusions done during year 2004 at Liaquat National Hospital Karachi.

METHODS

All patients with chronic total occlusion undergoing percutaneous coronary interventions were included during year 2004. Data was analyzed using SPSS 10. Version.

RESULTS

57 patients with chronic total occlusions underwent PCI out of them 31.58% are female and 68.42% are male. There was no periprocedural or in hospital complications. 49.1% patients had multivessel disease. 33.33% left anterior descending artery lesion, 29.82% right coronary lesion, 24.56% circumflex lesion and 12.28% obtuse marginal lesion. Predilation was done in all cases using various size balloons. Various wires were used and in most cases more than one wire were used. Cypher, Taxus and driver stents were used for stenting. 75.4% are successful while 24.6% were unsuccessful.

CONCLUSION

Revascularization success rate for CTO in our study was 75.4% that was comparable to other data worldwide. The most common reason for procedural failure included the inability to cross the occlusion with guidewire (57.14%), failure to cross the occlusion with a balloon (28.57%) and failure to dilate the stenosis (12.28%).

INTRODUCTION

Percutaneous coronary intervention of chronic total occlusion is one of the major challenges in interventional cardiology. The true prevalence of CTO in the general population is unknown because a certain proportion of patients with CTO are either asymptomatic or minimally symptomatic and never undergoes Coronary angiogram. The primary success rate is relatively low due to inability to cross the occlusion with the guidewire¹. Moreover, the overall procedure and fluoroscopy times are longer and

equipment use higher than with PCI of non-occluded Vessels². The rationale to reopen a chronic total occlusion is either the relief of clinical symptoms, improvement of impaired left ventricular function³ and possible favorable effect on survival⁴. Among patients with successfully recanalized occlusions, those with persistently patency and normal flow had better global function and less ventricular dilatation than patients without patent vessel. The Survival and Ventricular Enlargement (SAVE) Investigators noted that persistent occlusion of the infarct related artery after MI was associated with a relative risk of 1.47 in adjusted 4 year mortality, implying that successful restoration of late infarct artery patency may improve long term outcomes⁵. The initial descriptions of angioplasty of total occlusions were published in 1982⁶. In most studies of patients undergoing coronary angioplasty of chronic total occlusions

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before 1988, procedural success ranged from 53% to 68%. Since then, reports of procedural success > 70% have become common.

Subsequently, there have been several studies dealing with primary success, safety and technical factors⁷. Several reports have shown that the immediate success has improved over time, along with the increased experience and skill of the operators⁸ and the availability of new specialized guidewires or more sophisticated technologies for crossing occluded arteries⁹. We performed a crosssectional, observational study on patients treated with PCI of CTO in our Cath Lab during 2004.

METHODS

STUDY DESIGN

From January 2004 to December 2004 crosssectional observational study was conducted at Liaquat National Hospital Cath Lab. All consecutive patients scheduled to undergo PCI on a CTO of a native coronary artery were considered for enrollment. The exclusion criteria were the estimated duration of a CTO < 3 months or an acute MI within previous 3 months. NO predefined inclusion or exclusion criteria were considered and treating physician decided the indication for PCI.

The aim of study was to investigate the procedural success of PCI of CTO, periprocedural complications and in hospital major adverse cardiac events (MACE).

DEFINITIONS

A CTO was defined as obstruction of a native coronary artery with no luminal continuity and Thrombolysis in Myocardial Infarction (TIMI) flow grade 0 or 1¹⁰. The duration of occlusion had to be more than 3 months, estimated from clinical events such as myocardial infarction, sudden onset or worsening of symptoms or proven by previous angiography¹¹. Technical success was defined as restoration of TIMI flow grade 2 or 3 with residual stenosis <15%. Procedural success was defined as technical success without in hospital MACE. Major Adverse Cardiac Events (MACE) were defined as death, Q wave MI, Non-Q wave MI, urgent CABG or urgent PCI.

INTERVENTIONAL TECHNIQUE

The operators perform the procedure according to their standard practices via femoral approach. All procedural, technical details and the choice of devices were left to operator's judgment.

STATICAL ANALYSIS

Continuous data were presented as mean \pm standard deviation. Descriptive statistics were used to calculate various frequencies and percentages.

RESULTS

Between January 2004 and December 2004 57 PCI to CTO done at Liaquat National Hospital Cath Lab.

Baseline Characteristic

The baseline characteristics of the patients are shown in TABLE 1

Table 1

	ALL PATIENTS n= 57	CTO SUCCESS n= 43	CTO FALIURE n= 14
Age (yrs means +/- SD	56.19+/- 10.19		
Male	39 (68.42%)	29(74.35%)	10(25.64%)
Female	18(31.58%)	14(77.77%)	4(22.22%)
Diabetes	37(64.00%)	25(67.56%)	12(32.43%)
HTN	44(77.20%)	37(84.09%)	7(15.90%)
Hyperlipidemia	40(70.17%)	26(65.00%)	14(35.00%)
Smoking	30(52.63%)	30(100%)	0
Prior MI	39(68.42%)	29(74.35%)	10(25.64%)
Prior CABG	7 (12.30%)	5(71.42%)	2(28.57%)
Prior PCI	15(26.31%)	10(66.66%)	5(33.33%)
Multivessel disease	28(49.10%)	24(85.71%)	4(14.28%)

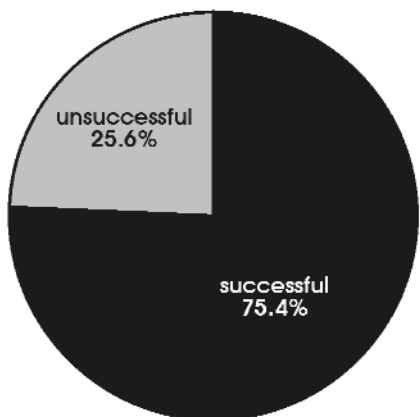
The majority of patients had history of previous myocardial infarction in the region of myocardium supplied by the target vessel. About one half of patients presented with multivessel disease.

Procedural Outcome and In Hospital complications

Technical and procedural success was obtained in 75.4% of patients as shown in graph 1. Among failed

procedures, inability to cross the lesion with a guidewire, inability to cross with a balloon and inability to dilate were the reasons of failure in 57.14%, 28.57%, and 12.28% respectively.

**Graph 1
Procedural Outcome**



CTO Characteristics

33.33% had lesion in Left anterior descending artery, 29.82% had lesion in Right coronary artery, 24.56% had lesion in circumflex artery, and 12.28% had lesion in obtuse marginal artery. Most patients presented with TIMI flow grade 0. Success rate per artery was given in table 2.

Table 2

ARTERY	TOTAL NO n=57	SUCCESSFUL n=43
LAD	19 (33.33%)	16 (84.21%)
RCA	17 (29.82%)	13 (76.47%)
Cx	14 (24.56%)	9 (64.29%)
OM	7 (12.28%)	5 (71.43%)

Procedure related Characteristics

A total of 94 guidewires with different mechanical properties were used. Different sizes of balloons were used and most of the time multiple wires and balloons were used for single lesion. Procedure related characteristics are given in TABLE 3 and 4.

Table 3

WIRE USED	
Meditronic Gt fusion	55 (58.51%)
Schinobi	20 (21.28%)
Meditronic direct	15 (15.95%)
Cougar XT	4 (4.25%)

Table 4

STENT USED	
Cypher	26(60.46%)
Taxus	10(23.25%)
Driver	7(16.27%)

DISCUSSION

This study was designed to look at the state of the art PCI in CTO. CTO are the most frequently identified yet least likely to be treated lesion subset in interventional cardiology today. CTO s are more prevalent in elderly according to data from 1997-1999 National Heart Lung and Blood Institute (NHLBI) registry¹² but in our study the mean age of patients was 56.19+/- 10.19 years showing that the disease occur more earlier in our setup and its more serious. In NHLBI Dynamic registry total occlusion of Right coronary artery was identified in 18.2%, 21.3%, and 22.8% of patients aged < 65 years, 65 to 79 years and >= 80 years respectively. The influence of patient's age on the rate of total occlusion was even more prominent in Left anterior descending artery (13.8%, 19.1%, 21.5% respectively) but not in the circumflex artery (11.0%, 13.2%, 12.7%, respectively). In our study no such relationship is found as 33.30% of patients had LAD disease, 29.80% had RCA disease and 24.60% had Cx disease and mostly below 60 years of age. This could be probably as 64% of our patients are diabetics and they are supposed to have severe disease at earlier age as compared to non-diabetics.

The technical and procedural success rate of PCI in CTO's has steadily increased over last 15 years because of greater operator experience, improvement in equipment and procedural techniques. In our study technical and procedural success was obtained in 75.40% of patients with no in hospital major adverse cardiac events (MACE). In a series of 1074 consecutive patients undergoing PCI, the primary

success rate was 90% in non occluded lesion, 78% in functional total occlusion (TIMI I), and 63% in true CTO¹³.The most common PCI failure mode for CTO's is inability to successfully pass guidewire across lesion. In a large series by Kinoshita et al¹⁴, reasons for procedural failure included inability to cross the lesion with guidewire (63% of cases), failure to cross the lesion with the balloon or dilate adequately (2%) and thrombus (1.2%).In our study the reason for procedure failure were almost same as other studies i.e. inability to cross the lesion with a guide wire (57.14%), inability to cross with balloon (25.57%), and inability to dilate the lesion(12.28%).

The success rate for percutaneous CTO recanalization have undoubtedly improved over the last 5 years, a major reason is the introduction of stiffer, more powerful and more supportive guidewires with greater torque response, tapered tip wires and wires with hydrophilic coatings. We have used multiple wires with different mechanical properties increasing the success rate of PCI.Highest number of Gt fusion wires were used (58.51%), then Schinobi (21.28%), and Medtronic direct (15.95%). We started with meditronic Gt fusion guidewire in almost all cases; schinobi was used for difficult lesion or lesions, which were not crossed with other wires.

In our study most of patients receive drug-eluting stents. Drug eluting stents produces favorable results as compared to Bare metal stents. Nakamura¹⁵ reported the results of a 5 center Asian registry in which 88 patients with successfully recanalized CTO's were treated with Sirolimus eluting stents. At 6 months, the major adverse Cardiac events rate was 4.5%, and the angiographic restenosis rate was 3.4%. In the international WISDOM registry, implantation of Paclitaxel eluting stents in 65 CTO s resulted in freedom from major adverse events and repeated intervention in 93.3% and 98.3% of patients, respectively at 12 months, with stent thrombosis occurring in only 1 patient¹⁶.

CONCLUSION

Management of patients with CTO remains a challenge. It is clear that total occlusion portends a worse prognosis than a patent vessel in patients with acute myocardial infarction. With emerging evidence that successful; percutaneous recanalization of

chronic coronary occlusions resulting improved survival, as well enhanced left ventricular function, reduction in angina, and improved exercise tolerance. PCI should be considered the preferred initial revascularization modality in patients in whom high procedural success rate may be anticipated. Fortunately with the tremendous progress in guidewire technology and introduction of dedicated devices for refractory occlusions has resulted in success rate of 80% to 90% in true CTO. Although success rates have continued to improve over time, attempted revascularization does not come without complication. With proper training and by carefully selecting the lesion attempted, aggressive intervention of CTO is justified.

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