Evaluation of Effective Factors in Success Rate of Intervention on CTO

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Abstract- Chronic total occlusion (CTO) intervention is still a challenging problem. The aim of this study is to determine factors that affect PCI results. Method and Results: The study was conducted on 72 patients in two centers. CTO angioplasty was done by the antegrade approach from the femoral and/or radial approach. The role of age, gender, anatomical variations such as calcification, length of the lesion, proximal bending, retrograde filling and occluded coronary artery (LAD, CCK or RCA), and wires were assessed. The success rate was 79.6%, and presence of calcification was an important factor in CTO PCI. Operator's experience, use of appropriate equipment and calcification are important factors in predicting a successful PCI.

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Introduction

Chronic total occlusion has been found to be present in 15-30% of all patients referred to coronary angioplasty (1). Chronic total occlusion is defined as total occlusion with TIMI flow and duration of >3 months or the presence of bridging collaterals.

The traditional factors predicting procedure success are long duration of occlusion, absence of antegrade and retrograde flow, stump occlusion, presence of bridging collateral, long occlusion length, calcification, tortuosity or bending and experience of operator (2).

The failure rate of CTO PCI was up to 15-40% in the past (3,4), but with increment of experience of operators and skills and availability of dedicated equipment success rate improved to 85-88%. Previous reports have shown that successful CTO PCI can reduce the need for subsequent CABG and improve the patient's survival (4,5).

Intervention on CTO has several potential advantages including symptom relief, less subsequent procedures, improve/preservation LV function, better tolerance of events in other coronary distribution and reduced mortality (9).

Similar to non-chronically occluded vessels, revascularization of CTO may be considered in the presence of angina or ischemia related to the corresponding territory (10). Ad hoc PCI is not recommended for CTOs. Bilateral angiography, IVUS, guide anchoring, retrograde approach and specific wiring manipulation techniques can be very helpful.

Materials and Methods

Number of 72 Patients with diagnosis of CTO were enrolled in this cross-sectional study between 2012 and 2013 in two cardiology centers, 54 patients from Modarres Hospital (75%) and 18 patients from Iranmehr hospital (25%) Tehran, Iran. The diagnosis of CTO was based on TIMI flow and duration of obstruction for > 3 months or presence of bridging the collateral (6-8). The duration of obstruction is calculated from the last showing CTO (in patients who had undergone angioplasty) or from the onset of symptoms suggesting ischemic heart disease in those without the previous angiography. Angiography is performed using the femoral and or radial approach by antegrade method and in some patients, bilateral angiography was done.

Selection of guiding catheter, access site, and guide wires were based on operator's decision. Successful

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procedure is considered as successful guide wire passage and re-establishment of antegrade flow.

Successful and unsuccessful cases were registered. The role of age, gender, affected vessel, calcification, length of lesion, retrograde flow, proximal bending, access site, kind of guide wire, approach (antegrade or retrograde), support, successful wiring and stenting, kind of stent and complication were investigated.

Statistical analysis

Data are shown as mean ± SD. The role of age, gender and other related factors were evaluated using fisher exact test. *P*.value >0.05 was considered as significant.

Results

This study was performed on 72 appropriate candidates including 59 male (82%) and 13 female (18%) patients. The patient's demographic and basic characteristics are described in table 1.

Table 1. Basic characteristics of the participants

Basic characteristics		N (%)
Gender	Male	59(82)
	Female	12 (18)
Coronary artery	LAD	32(45)
	LCX	10 (14)
	OM	23(32)
	RCA	17(24)
	PDA	1(1)
CTO	< 20 mm	19 (26.4)
	> 20 mm	53 (73.6)
Access	Radial	3 (4)
	Femoral	69 (96)
Calcification	Yes	34 (47.2)
	No	38 (52.8)
Prox bending	Yes	17 (24)
	No	55 (76)
Retrograde runoff	Yes	3 (4)
	No	69 (96)
Wiring	Successful	58(80.6)
	Unsuccessful	14(19.4)
Stenting	Successful	57 (79.2)
	Unsuccessful	15(18.8)
Support	Fine cross	33 (45.8)
	Balloon	17 (23.6)
	No support	22 (3.6)
Complication	No Complication	66(91.7)
	Dissection	6(8.3)
	Tamponade	0(0)
	Perforation	0(0)

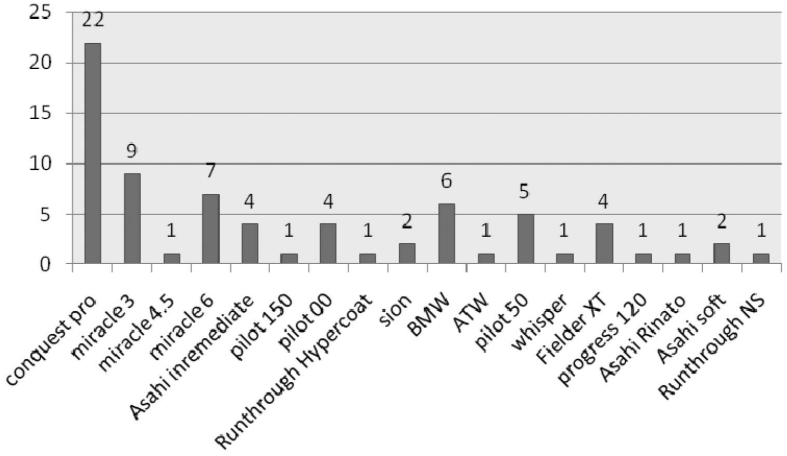

Figure 1. Type of wires used for angioplasty

As shown in table 1, prevalence of occluded vessels is as following: LAD 32/72 (45%), LCX 10/72 (14%), OM 23/72 (32%), RCA 17/72 (24%) and PDA 1/72 (1%). The length of CTO was more than 20mm in 53 patients (73.6%) and less than 20mm in 19 patients (26.4%). The access site was femoral in 69 cases (96%) and redial in 3 cases (4%). Calcification was seen in 34 cases (47.2%). The presence of proximal bending or tortuosity was seen in 55 cases (76%). The retrograde filling was seen in 69 cases (96%). The successful distal true lumen wiring was done in 58 cases (80.6%), and unsuccessful wiring was performed in 14 cases (19.4%). The successful stenting was done in 57 cases (79.2%).

For guide wire support, a fine cross was used in 33 cases (45.8%) and balloon in 17 cases (23.6%) and no any supporting in 22 cases (30.6%).

Six patients had complications including dissection (8.3%) which one of them died due to tamponade.

The used guide wires in our study are shown in Figure 1. In our study the guide wires that successfully crossed, the lesions were conquest pro 12 and Miracle series. The stenting of lesion was done with DES in 94.4% and BMS in 5.6% of patients respectively which was shown in table 2.

Table 2. Kind of stents used in patients

Stent	N (%)
Xience	15(69.4)
Promus	23(4.2)
Biomatrix	15(16.7)
Cypher	9(2.8)
BMS	4(5.6)
Taxus	1(1.3)
Resolute integrity	4(5.6)
Nobori	1(1.3)
Total	72(100)

Discussion

Our study demonstrated a success rate of 80.6% for CTO angioplasty. In another study which was previously conducted by taherkhani *et al.,* in our center, success rate was 65.6% (11).

In a study by Kilian *et al.*, which was performed, in September 2005 PCI was done on 100 patients suffering from CTO, and success rate was 79% in patient's group in comparison with 98% success rate in control group. This study has shown that CTO angioplasty is a safe procedure with an acceptable success rate, which is consistent with our findings (12).

In another study, carried out by saito *et al.,* in 2003, the use of tapered tip guide wire such as conquest had increased the success rate from 67% to 81% (7).

In another study carried out by Han Ya-Ling in 2006 the relationship between the lesion's characteristics and the procedural success was 88.9%, however, the duration of obstruction, tortuosity, length of lesion (15mm>), presence of collateral bridging, absence of a district stump, or moderate to severe calcification and CTO location were factor related to procedure failure (13).

By improving the operator's skills and increasing the number of cases, the only factors associated with CTO angioplasty failure are severe calcification and tortuosity or severe bending at the site of obstruction (6).

We found no significant association between successful wiring and standing with age, gender length of lesion, proximal bending, occluded vessel, retrograde run off, access site and support but significant association was found between success rate and calcification (67.6% and 89.5%) and presence and absence of calcification respectively (P=0.02; CI 95%=0.07-0.08; odd ratio=0.2).

In line with previous studies, our study showed an association between success rate and rigid wires usage such as conquest pro 12 and Miracles series.

In summary, operator's experience and skills, available dedicated equipment and presence of calcification are important factors in successful CTO PCI.

References

1. Chistofferson RD, Lehmann KG, Martin GV, et al. Effect of Chronic Total Coronary Occlusion on Treatment Strategy. AM J Cardiol 2005:95(9):1088-91.
2. Nguyen T, Hu D, Kim MH, et al, editors. Practical Handbook of advanced interventional cardiology: Tips and Tricks. 4th ed. Manhattan: Wiley-Blackwell; 2013: p. 207.
3. Lane RE, Ilsley CD, Wallis W, et al. Percutancous coronary intervention of a circum flex chronic total oculusion using all EpiCardial collateral retrograde approach. Catheter Cardiovasc Interv 2006;69(6):842-4.
4. Pedro A.Lemos, MD. Intraplaque contrast injection for the recanalization of total occlusions: the drop that hollows out the stone? Catheter Cardiovasc Interv 2008;71(1):27.
5. Juero JA, Marso SP, Jones PG, et al. Procedural outcomes and long – term survival among patients undergoing percutaneous Coronary intervention of s chronic total occlusion in native coronary arteries: A 20 year experience. J Am Coll Cordial 2001;38(2):409-14.

6. Nauyen T, Colombo A, Hu D, et al, edition. Practical handbook of Advanced interventional cardiology. 3rd ed. Manhattan: Wiley-Blackwell; 2008; p. 173-204.
7. Sito S. Different strategies for retrograde Approach in coronary angioplasty for chronic total occlusion. Catheter Cordiovasc Interv 2008:71(1):8-19.
8. Ge JB, Zhang F, Ge L, et al. Wire trapping technique combined with retrograde approach for recanalization of chronic total occlusion. Chin Med J 2008;121(17):1753-6.
9. Giora Weisz. New insight into the importance of incomplete revascularization. tctmd. (Accessed in March 20, 2014, http://www.tctmd.com/show.aspx?id=398&ref_id=114080).
10. Carlo Di Mario,MD,FRCP,FESC,FACC,Royal Bromton Hospital,London,Joint 2010 ESC-WACTs Guidelines on Myocardial Revascularisation,TCT 2012. (Accessed in March 20, 2014, http://www.sha-education.com/sites/all/sha23_presentations/28-1-2012/019007.pdf).
11. Taherkhani M, Namazi MH, Safi M, et al. The evaluation of chronic total occlusion angioplasty results, in patients suffering from coronary artery disease. Pak Heart J 2012;45(3):191-5.
12. Kilian JG, Celermajer DS, Adams MR. Safety of coronary anjioplasty to chronic total occlusions. Int J Cardiol 2005;103(3):256-8.
13. Han YL, Wang SL, Jing QM, et al. Percutaneous coronary intervention for chronic total occlusion in 1263 patients:a single center report. Chin Med J 2006;119(14):1165-70.