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Chronic Total Occlusion-Angioplasty with Antegrade Approach: A two-Year Experience in "Modarres Hospital", A Tertiary University Hospital, Tehran, Iran

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Abstract

Introduction: New techniques for the percutaneous treatment of coronary chronic total occlusions (CTO) have had a high success rate since a few years ago, so the interest for this treatment has been increasing these days.

Methods: The current observational study was performed in Modarres hospital as a tertiary referral center. All the patients with documented stable angina who had failed to response to full guideline-mediated medical therapy, referred to our hospital, were candidates for coronary angiography. Antegrade strategy was applied for all these patients. The length of the lesion, the fluoroscopy time of the CTO angioplasty, consumed contrast volume, the number of guide wires used, whether a corsair or tornus micro-catheter was used or not, and the success rate of the angioplasty were documented for further analysis.

Results: A total of 47 patients with documented stable angina were finally included. The median age was 59 (45-78) and 70.2% were male. The mean length of the lesion was 34.0 ± 1.1 .The mean fluoroscopy time and contrast volume were 57.9 ± 3.2 minutes and 525.9 ± 20.9 mL, respectively. In average, 2.2 guide wires were used. Corsair and tornus micro-catheters were applied in 30 (63.8%) and 5 (10.6%) of the cases, respectively. Seven complications (all including coronary dissection) occurred. In-hospital major adverse cardiac events (MACE) rate was 10.6%, all of which were non-Q wave myocardial infarction. The success rate was 85.1%. The higher number of used wires, use of corsair, and tornus micro-catheter were not significantly concordant with success rate (P-value > 0.05); in addition, longer lesions was not concordant with unsuccessfulness rate (P-value > 0.05).

Conclusions: Patient selection for CTO-angioplasty should be performed more carefully. Patients' quality of life and risk of probable procedural complications and future cardiac events should be assessed to decide the best treatment approach. Radiation exposure, contrast consumption and fluoroscopy time are recommended to be monitored during the procedure and thresholds should be defined to enhance safety and efficacy.

INTRODUCTION

Coronary chronic total occlusions (CTOs) are described by substantial atherosclerotic plaque burden within the artery, due to complete obstruction of the vessel. While the period of occlusion is challenging to define on clinical fields, a total occlusion should be present for at least three months to be delineated a proper CTO [1]. The presence of a CTO is one of the most frequent aims for Coronary artery bypass grafting (CABG) referral. Percutaneous coronary intervention (PCI) of chronic total occlusions has traditionally been restricted by technical success rates of 50% to 70%, despite being accomplished in greatly selected cases [2, 3].

New techniques and devices increase the interest for the per-

cutaneous treatment of coronary CTOs with a higher success rate than a few years ago. Percutaneous treatment for these lesions improves the symptoms and prognosis of patients in the stable phase of coronary disease. Current advances in interventional guide wires, catheters, and innovative methods have resulted in noteworthy progresses in success ratios with percutaneous coronary intervention [4-6]. In the present observational study, we explain our experiences in CTO PCI in a single center of PCI and describe data in a two-year period.

METHODS

The current observational study was performed in Modarres hospital as a tertiary referral center from September 2013 to December 2015. All the patients with documented stable angina who had failed to response to full guideline-mediated medical therapy, referred to our hospital, were candidates for coronary angiography. In addition, every patient with any type of acute coronary syndrome was excluded from the study. Standard angiography was conducted in an elective state for patients with femoral approach and if the angiography revealed CTO lesion criteria in one vessel territory, those cases were considered as final included patients in the study. The Institutional Review Board approved the study protocol and patients provided informed written consents.

Antegrade strategy was applied for all the patients. Length of the lesion, fluoroscopy time of the CTO angioplasty, consumed contrast volume, the number of guide wires used, whether or not corsair or tornus micro-catheter was used, and the success rate of the angioplasty were documented for further analysis. SPSS statistical software version 20.0 for windows (SPSS Inc., Chicago, IL) was applied. Independent sample t-test was used for quantitative studies. P values less than 0.05 were considered statistically remarkable.

RESULTS

A total of 47 patients with documented chronic stable angina were finally included. The median age was 59 (45-78) and 70.2% of patients were male. All the lesions were type C with pre-procedure TIMI flow grade 0. The mean length of the lesion was 34.0 ± 1.1 .The mean fluoroscopy time and contrast volume were 57.9 ± 3.2 minutes and 525.9 ± 20.9 mL, respectively. In average, 2.2 (2-4) guide wires were used. Corsair and tornus micro-catheters were applied in 30 (63.8%) and 5 (10.6%) cases, respectively. Seven complications (all including coronary artery dissection) occurred. In-hospital major adverse cardiac events (MACE) rate was 10.6%, all of which were non-Q wave myocardial infarction. All the results are shown in Table 1. The success rate was 85.1%. Higher number of used wires, use of corsair, and tornus micro-catheter were not significantly concordant with success rate (P-value > 0.05); in addition, longer lesions was not concordant with unsuccessfulness rate (P-value > 0.05) (Table 1).

DISCUSSION

Improvement in symptoms, enhancement in left ventricular function, and increase in survival are the potential benefits of CTO PCI [3]. PCI for CTO is associated with a substantial use of laboratory catheterization supplies. Moreover, procedure and fluoroscopic times double, as time-consuming as those for PCI for non-CTO lesions; CTO PCI can also result in improvident use of laboratory catheterization supplies and interventionists time, which can reduce the patient flow through the laboratory [7]. Furthermore, the extent of equipment required for successful achievement of the process can be more than that of standard PCI, because interventionists will often need multiple guiding catheters, guide wires and other devices to execute the procedure [8].

The risk of radiation injury and contrast nephropathy potentially affect CTO-angioplasty. In our center, the mean fluoroscopy time of 57.9 ± 3.2 minutes and contrast volume of 525.9 ± 20.9 mL were relatively higher than the average CTO angioplasty in other centers, which should be considered in further procedures to be reduced [9, 10]. The rate of complications and in-hospital major cardiac events in our center were comparable with other centers' results [9, 11, 12]. Coronary dissection consisted of all the CTO-angioplasties in our center.

Table1: Results of CTO-angioplasty with Ante Grade Approach

Characteristics	N = 47
Mean age	59 (45-78)
Sex (male)	32 (70.2)
Mean fluoroscopy time (minutes)	57.9 ± 3.2
Mean contrast volume (ml)	525.9 ± 20.9
Sheath size	
7French	30 (63.8)
6French	17 (36.2)
Number of guide-wires used	2.2 (2- 4)
Use of Corsair micro catheter	30 (63.8)
Use of Tonus micro catheter	5 (10.6)
Left coronary guiding catheter	
Extra backup (XB)	44 (93.6)
Left Amplatz	2 (4.3)
Left Judkins	1 (2.1)
Right coronary guiding catheter	
Left Amplatz	46 (97.9)
Right Judkins	1 (2.1)
Success rate	40 (85.1)
In-hospital MACE*	5 (10.6)
Complications**	5 (10.6)

Values are presented as No (%), mean (range) and mean ± SD.
MACE: major adverse cardiac events
*All were non-Wave MI
**All were coronary artery dissection

Considerable scholar and economic resources have been provided in the effort to conquer the complexity in crossing CTOs with a wire. Special new designed wires and techniques have been explained. A range of devices have been demonstrated in an effort to overcome wire-crossing complexity [13-15]; however, as a vague result, use of corsair or tornus micro-catheter were not significantly concordant with success rate in our observational study; although, we should judge about this result with caution because of our relatively small sample size. While the antegrade strategy was applied

for all the patients in our study, the success rate was relatively prominent. CTO PCI is speedily developing into its own field of interventional cardiology. Improving success necessitates long-term promise to master the extensive variety of accessible techniques, each of which may offer the only way to success in distinct cases.

Our study was a single center study. As it is known, CTO angioplasty is less popular in comparison with CABG of these lesions, even regarding some escalation in trends to CTO-PCI in recent years. This study could be considered as a pilot study and a new window for future large and multicenter studies, which will reveal more detailed results. Moreover, valuable clinical and systematic reviews could be published from results of various centers. It is recommended for future large sample-size studies to have long duration follow-ups.

Treatment of CTO lesions has developed in recent years as a consequence of a rebellion in medical equipment, which facilitates these patients to be treated with success rates higher than a few years ago. However, patient selection for CTO-angioplasty should be performed more carefully. Patients' quality of life and risk of probable procedural complications and future cardiac events should be assessed to decide the best treatment approach. Radiation exposure, contrast consumption and fluoroscopy time are recommended to be monitored during the procedure and thresholds should be defined to enhance safety and efficacy.

REFERENCES

1. Stone GW. Percutaneous Recanalization of Chronically Occluded Coronary Arteries: A Consensus Document: Part I. Circulation. 2005;112(15):2364-72. DOI: 10.1161/circulationaha.104.481283
2. Grantham JA, Marso SP, Spertus J, House J, Holmes DR, Rutherford BD. Chronic Total Occlusion Angioplasty in the United States. JACC: Cardiovascular Interventions. 2009;2(6):479-86. DOI: 10.1016/j.jcin.2009.02.008
3. Joyal D, Afilalo J, Rinfret S. Effectiveness of recanalization of chronic total occlusions: a systematic review and meta-analysis. Am Heart J. 2010;160(1):179-87. DOI: 10.1016/j.ahj.2010.04.015 PMID: 20598990
4. Prasad A, Rihal CS, Lennon RJ, Wiste HJ, Singh M, Holmes DR, Jr. Trends in outcomes after percutaneous coronary intervention for chronic total occlusions: a 25-year experience from the Mayo Clinic. J Am Coll Cardiol. 2007;49(15):1611-8. DOI: 10.1016/j.jacc.2006.12.040 PMID: 17433951
5. Mehran R, Claessen BE, Godino C, Dangas GD, Obunai K, Kanwal S, et al. Long-Term Outcome of Percutaneous Coronary Intervention for Chronic Total Occlusions. JACC: Cardiovascular Interventions. 2011;4(9):952-61. DOI: 10.1016/j.jcin.2011.03.021
6. Christofferson RD, Lehmann KG, Martin GV, Every N, Caldwell JH, Kapadia SR. Effect of chronic total coronary occlusion on treatment strategy. Am J Cardiol. 2005;95(9):1088-91. DOI: 10.1016/j.amjcard.2004.12.065 PMID: 15842978
7. Fefer P, Knudtson ML, Cheema AN, Galbraith PD, Osherov AB, Yalonetsky S, et al. Current perspectives on coronary chronic total occlusions: the Canadian Multicenter Chronic Total Occlusions Registry. J Am Coll Cardiol. 2012;59(11):991-7. DOI: 10.1016/j.jacc.2011.12.007 PMID: 22402070
8. Suero JA, Marso SP, Jones PG, Laster SB, Huber KC, Giorgi LV, et al. Procedural outcomes and long-term survival among patients undergoing percutaneous coronary intervention of a chronic total occlusion in native coronary arteries: a 20-year experience. J Am Coll Cardiol. 2001;38(2):409-14.
9. Suzuki S, Furui S, Kohtake H, Yokoyama N, Kozuma K, Yamamoto Y, et al. Radiation exposure to patient's skin during percutaneous coronary intervention for various lesions, including chronic total occlusion. Circ J. 2006;70(1):44-8. PMID: 16377923
10. Suzuki S, Furui S, Isshiki T, Kozuma K, Endo G, Yamamoto Y, et al. Factors affecting the patient's skin dose during percutaneous coronary intervention for chronic total occlusion. Circ J. 2007;71(2):229-33. PMID: 17251673
11. Javaid A, Buch AN, Satler LF, Kent KM, Suddath WO, Lindsay J, Jr., et al. Management and outcomes of coronary artery perforation during percutaneous coronary intervention. Am J Cardiol. 2006;98(7):911-4. DOI: 10.1016/j.amjcard.2006.04.032 PMID: 16996872
12. Keelan PC, Johnston JM, Koru-Sengul T, Detre KM, Williams DO, Slater J, et al. Comparison of In-Hospital and One-Year outcomes in patients with left ventricular ejection fractions ≤40%, 41% to 49%, and ≥50% having percutaneous coronary revascularization. Am J Cardiol. 2003;91(10):1168-72. DOI: 10.1016/s0002-9149(03)00261-3
13. Saito S, Tanaka S, Hiroe Y, Miyashita Y, Takahashi S, Satake S, et al. Angioplasty for chronic total occlusion by using tapered-tip guidewires. Catheter Cardiovasc Interv. 2003;59(3):305-11. DOI: 10.1002/ccd.10505 PMID: 12822146
14. Saito S. Different strategies of retrograde approach in coronary angioplasty for chronic total occlusion. Catheter Cardiovasc Interv. 2008;71(1):8-19. DOI: 10.1002/ccd.21316 PMID: 17985379
15. Kirtane AJ, Stone GW. The Anchor-Tornus technique: a novel approach to "uncrossable" chronic total occlusions. Catheter Cardiovasc Interv. 2007;70(4):554-7. DOI: 10.1002/ccd.21138 PMID: 17503510