Clinical and Electrocardiographic Predictors of Outcome in Patients with Coronary Chronic Total Occlusion

Hilal B. Al Saffar, Zaid A. Mustafa Al- Najjar

Abstract

Background: Chronic total occlusions (CTOs) are considered as the most complex lesions to treat via percutaneous coronary intervention (PCI), due to the indications, costs and technical difficulties related to these procedures. As a consequence, only about 10% of all CAD patients, clinically eligible for CTO-PCI, are currently being treated via PCI. The majority is treated either medically or via coronary artery bypass graft (CABG) surgery.

Aims of the study: estimate the success rate and clinical predictor of outcome in patients with chronic total occlusion.

Patients and methods: One hundred patients with chronic total occlusion were enrolled in this study for the period October 2014 - May 2015 were enrolled who were attending Iraqi center for heart disease. Descriptive analyses were performed using SPSS Statistics to assess the relationship between procedural success and any of the demographic and/or clinical characteristics. The level of significance was set at 95% or higher.

Results: Sixty-one patients out of 100 patients (61%) had a successful PCI. Univariate analyses showed significant differences for gender and Electrocardiography with success rate.

Conclusion: From this study we can concluded that female gender ,ECG changes and single vessels diseased artery were the early predictor for success of chronic total occlusion.

*Assistant prof. cardiology , college of medicine , University of Baghdad

** Interventional cardiologist , Medical city of Baghdad

Introduction

Coronary heart disease (CHD) is the most common cause of death in the world, around one in five men and one in seven women die from the disease. Despite advances in disease prevention, coronary artery disease remains a major cause of illness and death. Cholesterol plaque can build up in the arteries of the heart and cause ischemia which means the heart is not getting enough blood flow and oxygen. If a plaque blocks an artery, a heart attack can result(1).

Coronary CTO is characterized by heavy atherosclerotic plaque burden within the artery, resulting in complete (or nearly complete) occlusion of the vessel. Although the duration of the occlusion is difficult to determine on clinical grounds, a total occlusion must be present for at least 3 months with TIMI 0 flow to be considered a true CTO(2) .

The procedural success in CTO procedures are considerably lower, the intervention time

much longer, radiation exposure higher, and contrast administered in a considerable amount in comparison to non- totally occluded coronary vessels or acutely occluded arteries, therefore CTO angioplasty often is avoided by interventional cardiologist(3).

In terms of predicting patient benefit, We should treat patients with CTO as any other CAD patients, provided the operator ıs experienced enough and that the expected success rates are ın the range of 80 %. In a meta-analysis of CTO recanalization, successful attempts were associated with symptomatic relief(4).

Presence of a total occlusion was the strongest independent predictor of incomplete revascularization after PCI (hazard ratio [HR], 2.70; 95% confidence interval [CI], 1.98-3.67; P<.001)(5). However, CTO PCI success was only 49.4% in the SYNTAX trial, likely reflecting the limited experience in CTO PCI of many participating centers and the limited availability of CTO crossing techniques (patients were enrolled between 2005 and 2007, before the development of retrograde(6,7) and limited antegrade dissection/reentry techniques(8,9)).

Aim of the Study:

The present study aims to predict expected success rates in patients with CTO depending on clinical and ECG parameters attending Iraqi center for heart disease.

Patients and methods

Cross sectional observation study which recurrent 100 cases who were enrolled from patients who had appointment for CTO revascularization at Iraqi center for heart disease, medical city, Baghdad, for the period from the 1st of October,2014 to 1st of May 2015.

Exclusion criteria: Patients who had one or more of the following were excluded:-

Estimated duration of total occlusion less than 3 months.

Stent ISR.

Statistical Analysis: The obtained data were processed by applying SPSS impacted program version 19.

Result

The present study included a sample of 100 patients during the study period, The mean age of patients was 58.7±10 years and the success rate of studied sample were 6.

Mean age of males patients (57.6±10 years) compared with the females' mean age (62.6±8 years).Male patients represented 78% of the sample while female was 22%.There were no statistically significant association between the age of the patients and with the success rate(P = 0.922). The success rate in female was higher than male with significant difference (p=0.001).

The results showed that most of study sample (59%) was non-smokers and 14% were ex-smokers. Current smoker’s patients composed 27% of the sample. However, no

statistical significant difference was detected with the success rate(p=0.661).

More than one thirds of the sample of patients (45%) were diabetic, and two thirds of the sample of patients (60%) had hypertension, with no statistical difference with success rate neither with diabetic(p=0.821) or hypertension(p=0.867).

Most of patients (47%) elicited normal ECG findings. Among abnormal ECG result, ischemic change was the most frequent recorded sign (53%).There is a high success rate among patients with normal ECG changes (p=0.011).

Only 15 % of study sample had EF equal or less than 40% had success rate 40% with no significant difference(P = 0.671).

Half of the study sample (51%) showed total LAD, one thirds (34%) of them had total RCA, while, 15% had total LCX results among the study with no significant difference (p = 0.253) with success rate.

More than half of study sample (56%) had single affected vessels. Similarly forty- four percent (44%) of study sample multivessels disease. There was a significant difference (p = 0.04) with success rate among patients with single or multi vessels diseased arteries.

The most common cause of incomplete results (69%) was wire crossing difficulty. However, stent or balloon causes was detected in 21% and 10% of patients respectively.

Discussion

In a meta-analysis of 16 articles involving 6,695 cases in successful CTO recanalization (CTO success group) and 2,370 cases in failed CTO recanalization (CTO failure group) were established Low CTO success was associated with older age, multivessels diseases(10).

the success rate was higher in females (91%) than in male (53%) with a significant association (p=0.001), might probably due to limited studied sample.

Although smoking is consider as a risk factor for atherosclerosis and multi vessels disease, but the current study cannot prove the association of smoking with the success rate 63% (p=0.661).

Such results regarding successful revascularization agree with study for success rate of percutaneous coronary intervention of chronic total occlusion in Ibn Al- Baitar hospital for cardiac surgery and AL-Nassyeria cardiac center by Ghazi F. Haji in 2012 when he studied (80) Patients with CTO(11),They included 62 men and 18 women, and he found that the success rate was higher in female in comparison to male with statistical significant difference (p=0.032), also he concluded that there was no significant difference between the success rate of PCI and patient age, diabetes mellitus, hypertension, smoking and clinical presentation.

Forty –five percent of the studied sample were diabetics, 62% of them had successful results (p= 0.821), in agreement with current studies that do not show differences in DM prevalence between successful and failed

CTO-PCI, (12,13,14) a multinational CTO registry has found similar procedural success rates in patients with and without DM, in spite of the higher clinical risk profile of the DM group.

Abnormal resting ECG changes show significant association with failure of revascularization (p=0.011), This may be an early predictor for association of ECG with success rate, this results need further evaluation. the success rate for patients had normal ECG 72% in comparison to the success rate for patients who had ischemic changes in their ECG (51%).

Eighty- five of studied sample had ejection fraction more than 40%,and 65% of them showed complete revascularization (p=0.671),while the success rate were 40% in patients had ejection fraction equal or less than 40 this reflect that LV function and not play a role in successful results, this result might explain by the fact that only 15% of our sample had ejection fraction ≤ 40 . Bahram Sohrabia et al(15) in 2013 found no significant association with success rate and ejection fraction.

In single diseased vessel the success rate reach to 70% with significant difference (0.04), this result agree with Syrseloudis et al(16) who found that multivessels disease were significant predictors of failure for PCI in CTO lesion.

Although PCI of studied sample were managed by trained and skilled doctors, (39%) did not complete their revascularization, the success rate of studied sample were 61%.In most studies were published within the last 6 year, the pooled angiographic success rate increased with time (68.2% between 2000-2002 to 79.4% between 2009 and 2011). Mehran et al in 2011 recorded that success rate were 68% in his study(17).

The current study found that 39% of studied sample underwent limited recanalization. Two –thirds of failed cases(69%) were due to un successful wire crossing ,21% due to un applicable stent while 10 % belong to balloon causes.

James Sapontis et al(18)evaluated Clinical, angiographic, complication, and efficiency outcomes were compared between successful and failed cases. He found that the main cause of failure(70%) was due to inability to wire the lesion. Failure to cross a lesion with a balloon angioplasty is infrequent, accounting for failed PCI in 2% to 9% of cases(19).

Conclusion

From this study we can concluded that female gender ,ECG changes and single vessels diseased artery were the early predictor for success of chronic total occlusion.

References

1. Gibbons RJ, Balady GJ, Beasley JW, et al(1997). ACC/AHA Guidelines for Exercise Testing: a Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Exercise

Testing). J Am Coll Cardiol. 30:260-315.

2. Hendel, R. C.; Berman, D. S., Williams, K. A et al.; American College of Cardiology Foundation Appropriate Use Criteria Task Force; American Society of Nuclear Cardiology,"ACCF/ASNC/ACR/AHA/ ASE/SCCT/SCMR/SNM 2009 Appropriate Use Criteria for Cardiac Radionuclide Imaging". Journal of the American College of Cardiology.2009; 53(23): 2201–2229..
3. Di Mario C, Werner GS, Sianos G, Galassi AR, Büttner J, Dudek D et al. European perspective in the recanalization of Chronic Total Occlusions (CTO): consensus document from the EuroCTO Club. EuroInterv 2007;3:30-43.
4. Joyal D, Afilalo J, Rinfret S, Effectiveness of recanalization of chronic total occlusions: a systematic review and meta-analysis. Am Heart J 2010;160:179–87.
5. Farooq V, Serruys PW, Garcia-Garcia HM, et al. The negative impact of incomplete angiographic revascularization on clinical outcomes and its association with total occlusions: the SYNTAX (Synergy Between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery) trial. J Am Coll Cardiol. 2013;61(3):282-294.
6. Thompson CA, Jayne JE, Robb JF, et al. Retrograde techniques and the impact of operator volume on percutaneous intervention for coronary chronic total occlusions an early U.S. experience. JACC Cardiovasc Interv. 2009;2(9):834-842.
7. Karmpaliotis D, Michael TT, Brilakis ES, et al. Retrograde coronary chronic total occlusion revascularization: procedural and in-hospital outcomes from a multicenter registry in the United States. JACC Cardiovasc Interv. 2012;5(12):1273-1279.
8. Whitlow PL, Burke MN, Lombardi WL, et al. Use of a novel crossing and re-entry system in coronary chronic total occlusions that have failed standard crossing techniques: results of the FAST-CTOs (Facilitated Antegrade Steering Technique in Chronic Total Occlusions) trial. JACC Cardiovasc Interv. 2012;5(4):393-401.
9. Michael TT, Papayannis AC, Banerjee S, Brilakis ES. Subintimal dissection/reentry strategies in coronary chronic total occlusion interventions. Circ Cardiovasc Interv. 2012;5(5):729-738.
10. Li R, Yang S, Tang L, et al. Meta-analysis of the effect of percutaneous coronary intervention on chronic total coronary occlusions. J Cardiothorac Surg. 2014;9:41.
11. Ghazi F. Haji; 2012the success rate of percutaneous coronary intervention of chronic total occlusion in Ibn Al-Baitar hospital for cardiac surgery, AL-Kindy Col Med J 2012; Vol. 8 No.
12. Mehran R, Claessen BE, Godino C, et al. Long-term outcome of percutaneous coronary intervention for chronic total occlusions. JACC Cardiovasc Interv. 2011; 4:952-61.

13. Rathore S, Matsuo H, Terashima M, et al. Procedural and in-hospital outcomes after percutaneous coronary intervention for chronic total occlusions of coronary arteries 2002 to 2008: impact of novel guidewire techniques. JACC Cardiovasc Interv. 2009; 2:489-97.
14. Jones DA, Weerackody R, Rathod K, et al. Successful recanalization of chronic total occlusions is associated with improved long-term survival. JACC Cardiovasc Interv. 2012; 5:380-8.
15. Bahram Sohrabia, Samad Ghaffaria, Afshin Habibzadeha, d, Parastoo Chaichib, Amir Kamalifarc Outcome of Successful Versus Unsuccessful Percutaneous Coronary Intervention in Chronic Total Occlusions in One Year Follow-Up,2013, http://dx.doi.org/10.4021/cr258w
16. Syrseloudis D1, Secco GG, Barrero EAIncrease in J-CTO lesion complexity score explains the disparity between recanalisation success and evolution of chronic total occlusion strategies: insights from a single-centre 10-year experience. Heart. 2013 Apr;99(7):474-9
17. Mehran R1, Claessen BE, Godino C, Dangas GD, Obunai K, Kanwal S, Carlino M, Henriques JP, ; Multinational Chronic Total Occlusion Registry. Long-term outcome of percutaneous coronary intervention for chronic total occlusions. JACC Cardiovasc Interv. 2011 Sep;4(9):952-61. doi: 10.1016/j.jcin.2011.03.021.
18. James Sapontis et al, Georgios Christopoulos ,Procedural Failure of Chronic Total Occlusion Percutaneous Coronary Intervention: Insights from a Multicenter US Registry. Article first published online: 3 FEB 2015.
19. Stone GW, Reifart NJ, Moussa I, Hoye A, Cox DA, Colombo A et al. Percutaneous recanalization of chronically occluded coronary arteries: a consensus document: part II. Circulation 2005;112:2530-7.

Table (1): The success rate according to gender.

Result	Success		Total	P-value
Gender	No.	Rate		
Male	41	53%	78	0.001
Female	20	91%	22	
Total	61	61%	100	

Table (2):The success rate according to ECG change

Result	Success		Total	P-value
ECG change	No.	Rate		
Normal ECG	34	72%	47	P =0.011
Ischemic change	27	51%	53	
Total	61	61%	100	

***Table(3):The success rate according to* number of diseased artery.**

Result	Success		Total	P-value
Number of vessels	No.	Rate		
Single vessel	39	70%	56	P = 0.04
Two or more vessels	22	50%	44	
Total	61	61%	100	

Fig.(1): The success rate and failure rate of study sample

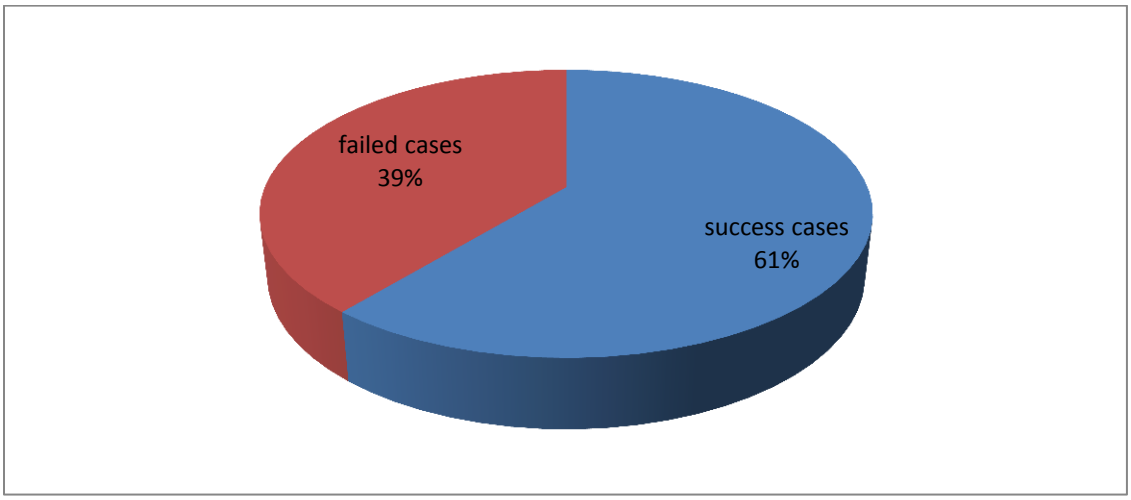

Fig.(2): The causes of failure