Impact of Percutaneous Coronary Intervention for Left Anterior Descending Artery Chronic Total Occlusion

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Background

1. Chronic total occlusion (CTO) intervention is still challenging because of the limited procedural success rate and high target lesion failure.

2. The impact of percutaneous coronary intervention (PCI) for chronic total occlusion (CTO) in patients (pts) with left anterior descending artery (LAD) is not clear.

Purpose

The aim of this study was to evaluate the 12-month clinical outcomes between PCI and optimal medical therapy (OMT) for LAD-CTO pts.

Methods

1. Study Population

A total of 218 consecutive LAD-CTO pts were divided into 2 groups according to treatment strategy.

2. Study Groups

LAD CTO with PCI group (n=117)

LAD CTO with OMT group (n=101)

Methods

3. Antiplatelet Regimen

1) All pts received Aspirin; 100 mg orally.
2) All pts received Clopidogrel (Plavix®) preloaded 300-600 mg before PCI, followed by daily administration of 75 mg and encouraged to continue at least for 1 year.
3) Usage of adjunctive Cilostazol to dual antiplatelet regimen (asprin + clopidogrel) was depending on physician's discretion. Cilostazol was administered by 200mg post-loading and then 100mg bid for at least one month

Methods

4. Antithrombotic therapy used for PCI

1) Enoxaparin (Clexane®); 60mg bid before PCI and after PCI during the hospital stay (within 7 days).

2) Unfractionated Heparin; a bolus of 50 U/kg prior to PCI for 1st one hour

3) GP IIbIIIa blocker (Reopro®); depend on physician's discretion.

Methods

5. PCI Procedure

1) A variety of atheroablative devices were not utilized and mostly simple predilation or was performed to get an adequate luminal diameter which was necessary to accommodate the unexpanded DES and their delivery system.
2) Thrombus aspiration or mechanical thrombectomy were performed if clinically indicated.

6. Study Endpoints

; Six-month angiographic and 1-year clinical outcomes were compared between the two groups.

Statistics

1. All statistical analyses were performed using SPSS 20.0.
2. Continuous variables were expressed as means ± standard deviation and were compared using Student's t-test.
3. Categorical data were expressed as percentages and were compared using chi-square statistics or Fisher's exact test.
4. A *P*-value of 0.05 was considered statistically significant.

Results

Baseline Clinical Characteristics (1)

Variables, n (%)	PCI (n=117)	OMT (n=101)	p-Value
Gender (male)	84 (71.7)	68 (67.3)	0.474
Age	60.5 ± 11.5	66.1 ± 10.1	<0.001
LVEF%	48.3 ± 12.8	45.9 ± 15.4	0.242
Myocardial Infarction	32 (27.3)	19 (18.8)	0.138
STEMI	13 (11.1)	9 (8.9)	0.591
NSTEMI	19 (16.2)	9 (8.9)	0.107
Prior MI	14 (11.9)	9 (8.9)	0.464
Prior PCI	22 (18.8)	12 (11.8)	0.160
Prior CABG	1 (0.8)	2 (1.9)	0.477
Hypertension	74 (63.2)	67 (66.3)	0.634
Diabetes	39 (33.3)	37 (36.6)	0.610
Insulin	12 (10.2)	8 (7.9)	0.551
Hyperlipidemia	32 (27.3)	33 (32.6)	0.392
CVA	7 (5.9)	13 (12.8)	0.079
Hemorrhagic	1 (0.8)	2 (1.9)	0.477
Ischemic	6 (5.1)	11 (10.8)	0.114
Peripheral vascular disease	4 (3.4)	6 (5.9)	0.375
Chronic kidney disease	4 (3.4)	5 (4.9)	0.571

Baseline Clinical Characteristics (2)

Variables, n (%)	PCI (n=117)	OMT (n=101)	p-Value
Smoking history	61 (52.1)	47 (46.5)	0.409
Current smoker	53 (45.2)	31 (30.6)	0.027
Quit smoker	8 (6.8)	16 (15.8)	0.034
Congestive heart failure	13 (11.1)	23 (22.7)	0.021
NYHA Class			
class 1	66 (56.4)	59 (58.4)	0.060
class 2	32 (27.3)	21 (20.7)	
class 3	12 (10.2)	10 (9.9)	
class 4	7 (5.9)	11 (10.8)	
CCS class			
class 1	20 (17.0)	66 (65.3)	
class 2	35 (29.9)	19 (18.8)	
class 3	40 (34.1)	11 (10.8)	
class 4	22 (18.8)	5 (4.9)	

Baseline Lesion Characteristics

Variables, n (%)	PCI (n=117)	OMT (n=101)	p-Value
De novo	110 (94.0)	97 (96.0)	0.496
Significant lesion site			
Left Main (>50%)	2 (1.7)	15 (14.8)	<0.001
LAD (>70%)	117 (100.0)	101 (100.0)	-
LCX (>70%)	29 (24.7)	57 (56.4)	<0.001
RCA (>70%)	16 (13.6)	57 (56.4)	<0.001
RAMUS (>70%)	3 (2.5)	4 (3.9)	0.560
Non CTO procedure	40 (34.1)	38 (37.6)	0.598
Failed CTO procedure	0 (0.0)	27 (26.7)	<0.001
CTO lesion site			
LAD	117 (100.0)	101 (100.0)	-
LCX	2 (1.7)	14 (13.8)	0.001
RCA	6 (5.1)	19 (18.8)	0.002
RAMUS			
CTO location			
Ostium to proximal	49 (41.8)	65 (64.3)	NS
Mid	66 (56.4)	36 (35.6)	
Distal	2 (1.7)	0 (0.0)	
Collateral (>grade1)	69 (58.9)	76 (75.2)	0.011
Collateral Grade			
Geade0	9 (7.6)	8 (7.9)	NS
Geade1	39 (33.3)	17 (16.8)	
Geade2	30 (25.6)	46 (45.5)	
Geade3	39 (33.3)	30 (29.7)	

Baseline Laboratory Findings

Variables, n (%)	PCI (n=117)	OMT (n=101)	p-Value
Hemoglobin	13.4 ± 1.7	13.0 ± 1.7	0.082
Total cholesterol	166 ± 37	164 ± 44	0.693
Triglyceride	147 ± 81	127 ± 75	0.092
HDLc	42 ± 9	44 ± 11	0.222
LDLc	111 ± 39	105 ± 36	0.376
Fasting glucose	124 ± 43	118 ± 48	0.380
Hb A1c	6.4 ± 1.1	6.5 ± 1.4	0.600
hsCRP	14.1 ± 45.8	11.5 ± 24.1	0.676
ESR	29 ± 27	35 ± 31	0.214
Fibrinogen	380 ± 153	361 ± 192	0.620
CKMB	9.4 ± 23.1	18.5 ± 51.9	0.220
Troponine T	0.25 ± 0.81	0.80 ± 2.84	0.235
Myoglobin	188 ± 511	117 ± 210	0.494
BNP	2982 ± 7533	3947 ± 8778	0.545
Creatinine	0.90 ± 0.39	1.01 ± 0.24	0.143
Uric acid	5.50 ± 1.78	5.32 ± 1.58	0.671

LV Function Change

Left Ventricular Ejection Fraction (LVEF), %	PCI (n=117)	OMT (n=45)	p-Value
Initial -LVEF%	45.6 ± 13.1	44.5 ± 14.5	0.242
FU - LVEF%	48.7 ± 13.1	45.4 ± 13.7	0.242
Paired t-test (p-Value)	**0.002**	0.622	0.092

Twelve-month Clinical Outcomes

Variables, n (%)	PCI (n=116)	OMT (n=84)	P-Value (Unadjusted)	P-Value (Adjusted)	Adjusted OR (96% C.I)
Mortality	5 (4.3)	7 (8.3)	0.237	0.187	1.92 (0.43-8.57)
Cardiac death	4 (3.4)	4 (4.7)	0.640	NS	
Non cardiac death	1 (0.8)	2 (2.3)	0.383	NS	-
Myocardial infarction	6 (5.1)	4 (4.7)	0.895	0.129	6.81 (0.7-81.3)
Q-wave MI	5 (4.3)	3 (3.5)	0.792	NS	-
Non-Q wave MI	1 (0.8)	1 (1.1)	0.818	NS	-
Revascularization	10 (8.6)	4 (4.7)	0.291	0.768	1.23 (0.30-4.94)
TLR	8 (6.8)	0 (0.0)	0.014	0.679	1.52 (0.20-11.2)
TVR	10 (8.6)	2 (2.3)	0.067	0.572	1.53 (0.34-6.82)
Non TVR	0 (0.0)	2 (2.3)	0.095	NS	-
All MACE	15 (12.9)	10 (11.9)	0.829	0.633	1.35 (0.39-4.70)
TLR-MACE	12 (10.3)	5 (5.9)	0.272	NS	-
TVR-MACE	15 (12.9)	8 (9.5)	0.456	NS	-

Adjusted by gender, age, myocardial infarction, hypertension, diabetes, chronic kidney disease, current smoker, multivessel disease, collateral vessels(≥grade 2), and failed CTO procedure.

Results (1)

1. At baseline, the OMT group had a higher prevalence of elderly, congestive heart failure, left main disease, multivessel disease, multivessel CTO, LCX-CTO, RCA-CTO, and well-developed collaterals (≥grade 2), whereas the PCI group had a higher prevalence of current smokers.

2. Although the LV function was not different in between PCI and OMT strategy at baseline and follow up, the LV function improvement was significant in PCI group.

Results (2)

3. At univariate analysis (before adjustment), the PCI group had a higher incidence of repeat PCI, especially TLR.

4. Clinical outcomes at 12 months after baseline adjustment by multivariate analysis showed similar major hard endpoints including mortality, myocardial infarction, revascularization and major adverse cardiac events (Table).

Conclusion

1. In our study, PCI seems to be associated with significant LV function improvement as compared with OMT strategy in pts with LAD CTO.
2. However, major clinical outcomes were not different between two strategies.
3. Long-term follow up with a larger study population will be necessary for definite conclusion.