Impact of Statin Therapy on Chronic Total Occlusion Patients without Mechanical Revascularization

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Nothing to disclose

Background

1. Many of studies showed that Statin can reduce the incidence of cardiovascular events among patients (pts) with coronary artery disease (CAD).

N Engl J Med 2005; 352:1425-1435
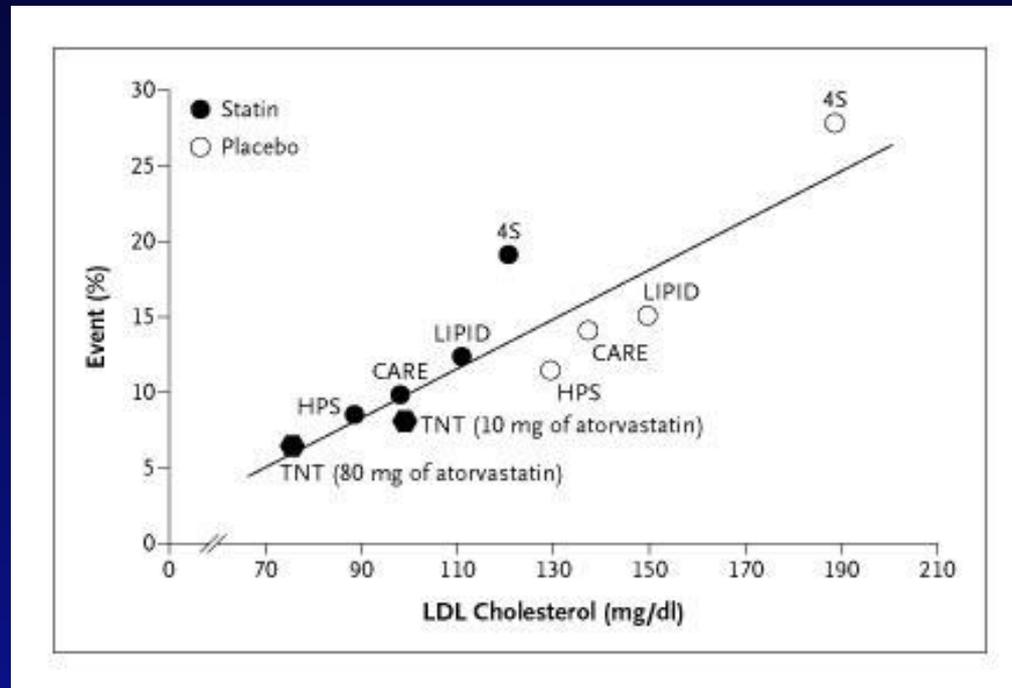
Background

2. The success rate of percutaneous coronary intervention (PCI) for chronic total occlusion (CTO) lesions have been increased by the advancement of operator's skill, experience with intervention techniques and device technology .

JACC Cardiovasc Interv. 2010 Feb;3(2):143-51

3. Several studies demonstrated that successful CTO intervention was associated with improved survival rates and angina symptom relief when compared with the failed CTO intervention.

J Am Coll Cardiol. 2001 Aug;38(2):409-14.

Background

4. CTO patients without mechanical revascularization were substantial proportion in all CAD.

Table 1 Chronic total occlusion prevalence, location and treatment applied in different studies n (%)

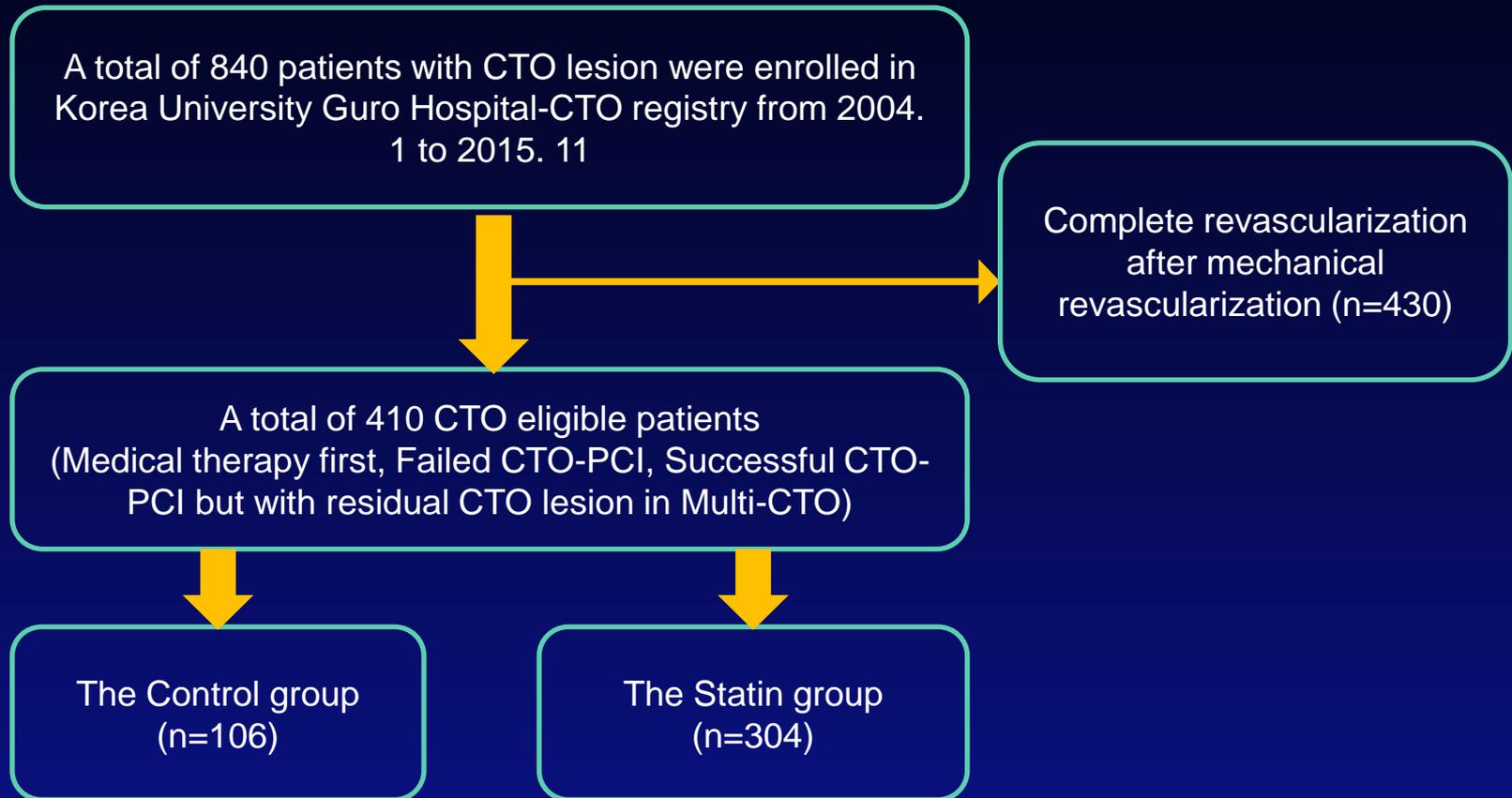| Ref.	Type of study	Population	CTO prevalence	CTO location			Medical treatment	PCI	CABG
				RCA	LAD	LCA			
Kahn et al[2], 1993	Retrospective	333	101 (35)	58%	18%	24%	-	-	-
		Coronary disease (stenoses ≥ 50%)							
Christofferson et al[3], 2005	Retrospective	6581	1612 (25)	49.4%	22%	28.60%	49%	11%	40%
		Underwent coronarography because of suspected CD							
		3087	1612 (52)						
		Coronary disease (stenoses ≥ 70%)							
Srinivas et al[4], 2002	Retrospective	1761	545 (31)	-	-	-	-	14.50%	-
		Multivessel disease							
Yamamoto et al[5], 2013	Prospective	15263	2491 (19)	44.9%	41.10%	28.50%	-	61.18%	-
		First revascularization procedure							
Fefer et al[6], 2012	Prospective	14439	2630 (18.2)	46.9%	19.86%	15.43%	64%	10%	26%
		Underwent coronariography because of suspected CD							
Jeroudi et al[7], 2013	Prospective	1015	319 (31.34)	-	-	-	19% (61)	50% (161)	30% (97)
		Coronary disease (stenoses ≥ 50%)							

Background

There were limited data regarding the impact of statin therapy in particularly CTO patients without mechanical revascularization.

Purpose

  This study is to evaluate the impact of statin therapy on major clinical outcomes of CTO patients without complete mechanical revascularization

Methods

1. Study Population

A total of 840 patients with CTO lesion were enrolled in Korea University Guro Hospital-CTO registry from 2004. 1 to 2015. 11

Complete revascularization after mechanical revascularization (n=430)

A total of 410 CTO eligible patients
(Medical therapy first, Failed CTO-PCI, Successful CTO-PCI but with residual CTO lesion in Multi-CTO)

The Control group
(n=106)

The Statin group
(n=304)

Methods

2. Study Definitions

1) CTO lesion is defined as a complete obstruction of the coronary vessel by thrombolysis in myocardial infarction (TIMI) flow grade 0 for at least 3 months.

2) Patients were excluded if they had CTO lesion in small vessel (RVD, ≤ 2.5mm) or located on the side branch vessels such as an acute marginal, diagonal, septal and obtuse marginal artery.

3. Study Endpoints
; The clinical outcomes were compared between the two groups up to 5 years.

Statistics

1. All statistical analyses were performed using SPSS 24.0.

2. Continuous variables were expressed as means $\pm$ 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

Variable, n(%)	Control (n=106)	Statin (n=304)	P-value
Sex	69 (65.1)	221 (72.7)	0.138
Age	67.5±9.8	65.7±10.7	0.122
Myocardial infraction	13 (12.3)	73 (24)	0.011
STEMI	4 (3.8)	34 (11.2)	0.023
Prior myocardial infarction	14 (13.2)	29 (9.5)	0.289
Prior percutaneous coronary intervention	14 (13.2)	37 (12.2)	0.781
Prior coronary artery bypass graft	1 (0.9)	5 (1.6)	0.605
Hypertension	71 (67)	206 (67.8)	0.882
Diabetes Mellitus	53 (50)	126 (41.4)	0.126
Dyslipidemia	20 (18.9)	113 (37.2)	0.001
Cerebrovascular accidents	21 (19.8)	32 (10.5)	0.014
Peripheral vascular disease	20 (18.9)	30 (9.9)	0.015
Chronic kidney disease	8 (7.5)	24 (7.9)	0.909
Smoking	49 (46.2)	172 (56.6)	0.066
Current Smoking	34 (32.1)	113 (37.2)	0.346
Heart Failure	22 (20.8)	48 (15.8)	0.242
Left ventricular ejection fraction	46.5±13.2	48.9±12.6	0.123

Laboratory findings and discharge medications

Variable, n(%)	Control (n=106)	Statin (n=304)	P-value
Hemoglobin	12.5±1.8	13.1±1.9	0.023
Glucose	125.8±57.4	131.1±56	0.482
Creatinine	1.4±1.1	2.0±6.6	0.542
Total cholesterol	167.8±39.3	167.6±44.1	0.976
Triglyceride	143.1±145.2	139.5±102.1	0.814
HDL-cholesterol	44.7±15.1	41.9±10.9	0.169
LDL-cholesterol	100.4±36.5	106.5±36.8	0.337
hsCRP	10.6±22.9	9.1±20.3	0.647
AST	24.6±12.6	42.5±63.9	< 0.001
ALT	23.6±21.8	33.6±61.6	0.130
ALP	78.7±31.9	76.6±32.1	0.616
HbA1c	6.7±1.3	6.6±1.3	0.529
CK-MB	4.3±4.2	18.4±49.8	< 0.001
Troponin-T	0.2±0.8	0.4±1.1	0.378
BNP	3394.1±6516.2	2535.4±6176.2	0.497
Discharge medication			
Angiotensin converting enzyme inhibitors	22 (20.8)	123 (40.5)	< 0.001
Angiotensin receptor blockers	27 (25.5)	85 (28)	0.620
Beta blockers	49 (46.2)	153 (50.3)	0.467
Dihydropyridine calcium channel blocker	19 (17.9)	44 (14.5)	0.396
Non-dihydropyridine calcium channel blocker	27 (25.5)	83 (27.3)	0.714
Diuretics	27 (25.5)	94 (30.9)	0.290
Nitrate	47 (44.3)	173 (56.9)	0.025

Angiographic and Procedural characteristics

Variable, n(%)	Control (n=106)	Statin (n=304)	P-value
De Novo CTO	104 (98.1)	292 (96.1)	0.314
Multi-vessel disease	79 (74.5)	256 (84.2)	0.026
Number of Vessel	2.1±0.8	2.3±0.7	0.061
LM lesion (>50% stenosis)	12 (11.3)	36 (11.8)	0.886
LAD (>70% stenosis)	67 (63.2)	231 (76)	0.011
LCX (>70% stenosis)	73 (68.9)	211 (69.4)	0.917
RCA (>70% stenosis)	78 (73.6)	237 (78)	0.358
RAMUS (>70% stenosis)	5 (4.7)	15 (4.9)	0.929
Multi-vessel CTO	79 (74.5)	256 (84.2)	0.026
Number of CTO vessel	18 (17)	56 (18.4)	0.740
LAD CTO	29 (27.4)	88 (28.9)	0.755
LCX CTO	36 (34)	105 (34.5)	0.914
RCA CTO	59 (55.7)	164 (53.9)	0.760
RAMUS CTO	0 (0)	5 (1.6)	0.184
Well developed collateral flow	93 (87.7)	242 (79.6)	0.062
Failed CTO procedure	10 (9.4)	57 (18.8)	0.026

Clinical outcomes up to 5 years

Variables, %	Control (n=106)	Statin (n=304)	P-value	Hazard Ratio	95% C.I
Death	10 (9.4)	23 (7.6)	0.980	1.01	0.45-2.26
Cardiac Death	6 (5.7)	11 (3.6)	0.344	0.57	0.18-1.81
Myocardial Infarction	9 (8.5)	11 (3.6)	0.049	0.38	0.15-1
STEMI	2 (1.9)	5 (1.6)	0.872	0.86	0.14-5.15
Cerebrovascular Accident	2 (1.9)	4 (1.3)	0.874	0.86	0.13-5.6
Revascularization	11 (10.4)	41 (13.5)	0.670	1.16	0.58-2.34
Target lesion (CTO vessel)	2 (1.9)	13 (4.3)	0.269	2.35	0.52-10.73
Target vessel (CTO vessel)	2 (1.9)	15 (4.9)	0.203	2.66	0.59-11.99
Non-target vessel (Non-CTO vessel)	11 (10.4)	36 (11.8)	0.890	0.95	0.47-1.94
Total MACE	21 (19.8)	61 (20.1)	0.848	1.05	0.62-1.79
TLR MACE	9 (8.5)	25 (8.2)	0.806	1.11	0.49-2.49
Total death or myocardial infarction	16 (15.1)	29 (9.5)	0.257	0.68	0.35-1.32

Adjusted by gender, age, myocardial infarction, hypertension, diabetes, dyslipidemia, heart failure, chronic kidney disease, peripheral artery disease, cerebrovascular accident, current smoker and multi-vessel disease

Summary

1. At baseline, the statin group had a higher prevalence of myocardial infarction (MI), dyslipidemia, multi-vessel disease (MVD), LAD lesion, failed PCI, angiotensin converting enzyme inhibitors and nitrate.

2. Whereas the control group had a higher prevalence of cerebrovascular accident and peripheral artery disease.

3. After baseline adjustment by cox proportional hazards regression, clinical outcomes up to 5 years showed that the statin group was associated with lower incidence of the myocardial infarction (MI).

Conclusion

In our study, we found that the *statin therapy* in patients with CTO lesions treated with optimal medical therapy without revascularization was associated with *reduced incidence of MI* up to 5 years.

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