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Second-generation Drug-eluting Stenting vs Coronary Artery Bypass Grafting for Coronary CTO

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Background/Aims: Limited data are available regarding the long-term clinical outcomes of percutaneous coronary intervention (PCI) using second-generation drug-eluting stent (DES) versus coronary artery bypass grafting (CABG) in patients with coronary chronic total occlusion (CTO). We compare the long-term clinical outcomes of patients with CTO and multivessel coronary artery disease (CAD) treated with PCI using second-generation DES versus CABG. **Methods:** Between January 2008 and February 2012, we analyzed data from 423 consecutive patients undergoing successful revascularization for CTO and multivessel CAD. Patients treated with PCI using second-generation DES (n=232, 2nd DES-PCI group) were compared with those treated with CABG (n=191, CABG group) in terms of death or myocardial infarction (MI) and major adverse cardiac and cerebrovascular event (MACCE). Inverse probability of treatment weighting (IPTW) was also performed. **Results:** During a median follow-up duration of 30 months, in multivariate analysis, there was no significant difference of death or MI (hazard ratio [HR]: 0.97; 95% confidence interval [CI]: 0.39 to 2.39; *p*=0.939) and MACCE (HR: 1.03; 95% CI: 0.53 to 2.01; *p*=0.938) between the 2nd DES-PCI group and the CABG group. After IPTW adjustment, the incidence of death or MI (HR: 0.97; 95% CI: 0.39 to 2.39; *p*=0.939) and MACCE (HR: 1.03; 95% CI: 0.53 to 2.01; *p*=0.938) were still similar in both two groups. **Conclusions:** The efficacy of PCI using second-generation DES was comparable to that of CABG in patients with CTO and multivessel CAD.

Table 1. Baseline Clinical Characteristics

	2nd DES group n = 232	CABG group n = 191	*p value*
Age *(years)*	63.1 ± 11.1	62.9 ± 9.9	0.821
Male	186 (80.2)	160 (83.8)	0.340
Diabetes mellitus	97 (41.8)	112 (58.6)	0.001
Hypertension	151 (65.1)	122 (63.9)	0.795
Dyslipidemia	118 (50.9)	70 (36.6)	0.003
Current smoker	77 (33.2)	57 (29.8)	0.462
Chronic renal failure	16 (6.9)	17 (8.9)	0.444
Acute coronary syndrome	82 (35.3)	34 (17.8)	<0.001
Previous MI	33 (14.2)	31 (16.2)	0.567
Previous CVA	15 (6.5)	15 (7.9)	0.580
Previous PCI	43 (18.5)	30 (15.7)	0.444
LVEF *(%)*	56.5 ± 13.1	52.0 ± 14.3	0.001
Concomitant medications			
Aspirin	222 (95.7)	172 (90.1)	0.022
Statins	185 (79.7)	149 (78.0)	0.664
Beta blockers	141 (60.8)	14 (75.4)	0.001
ACE inhibitor/ARBs	140 (60.3)	35 (18.3)	<0.001

Data are presented as n (%) or mean ± standard deviation.

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; CABG = coronary artery bypass grafting; CVA = cerebrovascular accident; DES = drug-eluting stent; LVEF = left ventricular ejection fraction; MI = myocardial infarction; PCI = percutaneous coronary intervention.

Table 2. Angiographic Characteristics

	2nd DES group n = 232	CABG group n = 191	*p value*
CTO location			
RCA	96 (41.4)	118 (61.8)	<0.001
LM	0 (0)	0 (0)	
LAD	92 (39.7)	68 (35.6)	0.392
LCx	77 (33.2)	83 (43.5)	0.030
Multiple CTOs	50 (21.6)	70 (36.6)	0.001
Abrupt stump	67 (28.9)	88 (46.1)	<0.001
Bridge collaterals	56 (24.1)	85 (44.5)	<0.001
Calcified CTO	28 (12.1)	55 (28.8)	<0.001
[1]Proximal to mid CTO	169 (72.8)	139 (72.8)	0.987
[2]Well-developed collateral	75 (46.0)	82 (42.9)	0.561
SYNTAX score	22.2 ± 9.5	29.8 ± 10.6	<0.001
SYNTAX score ≥24	66 (40.5)	131 (68.6)	<0.001

Data are presented as n (%) or mean ± standard deviation.

[1]We abbreviated "CTO of the proximal to middle portions of the vessel" as "Proximal to mid CTO".

[2]We abbreviated "Rentrop grade 3 collateral flow" as "Well-developed collateral".

CTO = chronic total occlusion; CABG = coronary artery bypass grafting; DES = drug-eluting stent; LAD = left anterior descending artery; LCx = left circumflex artery; LM = left main artery; RCA = right coronary artery; SYNTAX = the

Table 3. Clinical outcomes for adjusted hazard ratios and Inverse-Probability-of-Treatment Weighting Method

	2nd DES group n = 232	CABG group n = 191	[1]adjusted HR (95% CI)	*p value*	HR after IPTW (95% CI)	*p value*
Death or MI	8 (3.4)	13 (6.8)	0.69 (0.29 - 1.63)	0.399	0.72 (0.26 - 1.95)	0.518
Death	6 (2.6)	13 (6.8)	0.52 (0.20 - 1.31)	0.165	0.54 (0.18 - 1.63)	0.278
Cardiac death	2 (0.9)	6 (3.1)	0.45 (0.11 - 1.81)	0.259	0.39 (0.07 - 2.15)	0.281
MI	3 (1.3)	1 (0.5)	4.28 (0.46 - 39.74)	0.202	2.94 (0.22 - 39.85)	0.418
CVA	3 (1.3)	10 (5.2)	0.31 (0.08 - 1.13)	0.077	0.60 (0.15 - 2.44)	0.477
Repeat revascularization	20 (8.6)	1 (0.5)	19.56 (2.59 - 147.82)	0.004	28.66 (3.50 - 235.06)	0.002
[2]MACCE	28 (12.1)	21 (11.0)	1.32 (0.74 - 2.35)	0.341	1.49 (0.76 - 2.91)	0.244

Data are presented as n (%).

[1]Adjusted covariates include diabetes mellitus and SYNTAX score ≥24.

[2]MACCE was defined as a composite of death, MI, CVA or repeat revascularization.

CABG = coronary artery bypass graft surgery; CI = confidence interval; CVA = cerebrovascular accident; DES = drug-eluting stent; HR = hazard ratio; IPTW = inverse probability of treatment weighting; MI = myocardial infarction; MACCE = major adverse cardiac and cerebrovascular event; SYNTAX = the Synergy Between PCI with Taxus and Cardiac Surgery.

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Early diagnosis of Iron overloads cardiomyopathy with magnetic resonance imaging T2*

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A 43-year-old female refer to the general surgery with dyspnea and elevated cardiac enzymes. She received a liver transplant two months ago and was taking immunosuppression agents. Transthoracic echocardiography showed a mildly dilated left ventricle (LV) and global hypokinesia with an LV ejection fraction of 29.3%. LV contractile function has been decreased compared to baseline study. (EF 61.7 -> 29.3%). Coronary angiography was normal and we performed treatment for heart failure. Patient tacrolimus trough concentration was 23.4 ng/mL (range 5-20 ng/mL), the drug suspected to cause cardiomyopathy, was discontinued and replaced with Everolimus. Magnetic resonance imaging was performed to confirm the tacrolimus induced cardiomyopathy. But LV myocardium appeared diffusely dark on gradient-echo sequences with T2*(T2 star), consistent with severe myocardial iron deposition. (Figure 1). Dark signal intensity of the liver region of interest(ROI), gradient-echo sequences with T2* consistent with severe iron overload of these organs. Laboratory studies revealed: serum ferritin 4,982 ng/mL (13–150ng/mL) and iron levels of 230 mcg/dL (50–150 mcg/dL). We considered chelation therapy but improved with deferasirox therapy. Our case study shows that cardiac MRI sequences may assist in the initial diagnosis of cardiomyopathy due to iron deposition. We conclude that cardiac MRI can be used as a non-invasive alternative to biopsy in patients with iron overloads cardiomyopathy.