

Prognostic impact of implementation of heart team approach on cardiovascular outcomes in patients with complex coronary artery disease

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INTRODUCTION

There are 3 main treatment strategies for patients with stable coronary artery disease (CAD), also named as chronic coronary syndrome, including medical treatment, percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG). Several factors, such as disease severity, co-morbidities, and feasibility or risks of revascularization, should be considered in the choice between PCI and CABG. Calculation of SYNTAX score and EuroSCORE is highly recommended for trade-off of interventional and surgical risks and guidance of choosing revascularization strategy. Nevertheless, PCI is more acceptable and clinically adopted in the real world setting even for patients with complex CAD. Therefore, international guidelines strongly recommended heart team approach (HTA) with shared decision making for patients with complex CAD to minimize referral bias and improve guideline adherence as so to be responsive to patient preferences, needs, and values. Interdisciplinary heart team discussion has been shown to improve appropriate use of PCI with superior judgment of grafting success for planning CABG and provide reproducible and consistent recommendation in patients with complex CAD, defined as left main disease or SYNTAX score >33 . However, to the best of our knowledge, there is no study to compare cardiovascular outcomes between complex CAD patients with HTA and those without.

METHOD

Our cardiovascular team has been engaging disease-specific care certification program for CAD handled by Joint Commission Taiwan since years ago. This program includes interdisciplinary healthcare, case management, and continuous data collection to report quality indicators and review the performance of the indicators for quality improvement, etc. Herein, we retrospectively evaluated a prospective cohort including 753 patients who had being enrolled in the case management program of the disease-specific care certification for CAD in our hospital from January 2019 to April 2022 and was diagnosed as complex CAD by invasive coronary angiography, and investigated the effect of a comprehensive quality improvement activity on activation of HTA and behavior change of choosing revascularization in patients with left main disease or SYNTAX score >33. Finally, we evaluated long-term cardiovascular outcomes (primary composite endpoint: death, myocardial infarction, or unplanned coronary revascularization) in patients with left main disease or SYNTAX score >33 undergoing HTA or not.

CONCLUSIONS

A comprehensive quality improvement activity will improve heart team activation with changes in revascularization pattern and subsequent better cardiovascular outcomes in patients with complex CAD.

RESULTS

We found that implementation of the quality improvement program would result in a significant improvement in the activation of HTA (before: 26.4%; during: 68.6%, after 61.7%, $P < 0.001$) (Table 1) and a significant increase in the final choice of CABG (before: 11.1%; during: 16.8%, after 20.4%, $P = 0.006$). (Table 2) There were 448 patients (59.6%) undergoing HTA in total. Some baseline characteristics were significantly different between HTA and non-HTA groups, including younger age and a lower level of EuroSCORE II, a higher prevalence of three-vessel disease and cigarette smoking, and a lower prevalence of history of PCI or CABG in the HTA group. (Table 3) Among treatment strategies, CABG was recommended more in the HTA group than in the non-HTA group (75.5% vs. 37.2%, $P < 0.001$); however, patients/family usually chose PCI finally either in the HTA (62.7%) or non-HTA group (82.6%). Nevertheless, more patients/family still chose CABG as the treatment strategy in the HTA group than in the non-HTA group. (26.8% vs. 7.2%, $P < 0.001$). (Table 4) During mean 487.14 ± 377.69 days follow-up, the primary composite endpoint was achieved in 213 patients. HTA was associated with a lower risk of primary composite endpoint, total death, myocardial infarction, or unplanned coronary revascularization (18.1% vs. 42.4%, $P < 0.001$; 10.9% vs. 21.7%, $P < 0.001$; 3.8% vs. 9.2%, $P = 0.002$; 8.7% vs. 22.7%, $P < 0.001$, respectively). (Table 5) By using multi-variate analysis, some independent predictors of the primary composite endpoint were identified, including HTA (odds ratio 0.514, 95% confidence interval 0.375-0.704, $P < 0.001$). (Table 6)

Table 1. Activation of HTA during different time periods with respect to the implementation of quality improvement program

	Before quality improvement (n = 72)	During quality improvement (n = 137)	After quality improvement (n = 543)	P value
Activation of HTA	26.4%	68.6%	61.7%	< 0.001

HTA, heart team approach.

Table 2. Choice of revascularization strategy during different time periods with respect to the implementation of quality improvement program

	Before quality improvement (n = 72)	During quality improvement (n = 137)	After quality improvement (n = 543)	P value
CABG	11.1%	16.8%	20.4%	0.006
PCI	76.4%	75.2%	68.9%	
Hybrid (PCI followed by CABG)	2.8%	1.5%	0	
Medical treatment	9.7%	6.6%	10.7%	

CABG, coronary artery bypass grafting; PCI, percutaneous coronary intervention

Table 3. Baseline characteristics, clinical and angiographic parameters between groups assigned to HTA or non-HTA

	HTA (n = 448)	Non-HTA (n = 304)	P value
Age, yr	66.8 ± 10.7	68.9 ± 11.0	0.009
Male gender	78.8%	77.6%	0.704
Left main disease	49.1%	44.7%	0.239
TVD	99.6%	97.7%	0.035
SYNTAX score	41.7 ± 7.7	40.8 ± 7.7	0.122
EuroSCORE II	3.6 ± 6.1	5.4 ± 9.7	0.010
ACS	40.4%	40.5%	0.987
Cigarette smoking	21.2%	13.5%	0.007
Diabetes mellitus	67.2%	63.5%	0.294
Hypertension	73.0%	72.0%	0.774
Hyperlipidemia	66.1%	67.4%	0.697
History of CVA	11.6%	13.5%	0.442
History of PAD	7.4%	9.5%	0.288
History of old MI	11.6%	14.5%	0.248
Previous PCI	24.3%	36.8%	<0.001
Previous CABG	2.9%	15.5%	<0.001
LV systolic dysfunction	20.3%	15.8%	0.117
CKD	37.5%	35.2%	0.520
ESRD	21.7%	23.0%	0.656

ACS, acute coronary syndrome; CABG, coronary artery bypass grafting; CKD, chronic kidney disease; CVA, cerebrovascular accident; ESRD, end-stage renal disease; HTA, heart team approach; LV, left ventricular; MI, myocardial infarction; PAD, peripheral artery disease; PCI, percutaneous coronary intervention; TVD, three-vessel disease.

Table 4. Treatment strategy between groups assigned to HTA or non-HTA

	HTA (n = 448)	Non-HTA (n = 304)	P value
Initial recommendation			
CABG	75.5%	37.2%	<0.001
PCI	21.0%	57.2%	
PCI or CABG	1.6%	0.7%	
Medical	2.2%	4.9%	
Final choice			
CABG	26.8%	7.2%	<0.001
PCI	62.7%	82.6%	
Hybrid (PCI followed by CABG)	0.2%	1.0%	
Medical	10.3%	9.2%	
Deployment of DES	51.3%	67.4%	<0.001

CABG, coronary artery bypass grafting; DES, drug-eluting stent; HTA, heart team approach; PCI, percutaneous coronary intervention.

CABG, coronary artery bypass grafting; DES, drug-eluting stent; TAVI, transcatheter aortic valve implantation; PCI, percutaneous coronary intervention.

Table 5. Clinical outcomes between groups assigned to HTA or non-HTA

	HTA (n = 448)	Non-HTA (n = 304)	P value
Primary composite endpoint	18.1%	42.4%	<0.001
Secondary endpoints			
Total death	10.9%	21.7%	<0.001
Myocardial infarction	3.8%	9.2%	0.002
Unplanned coronary revascularization	8.7%	22.7%	<0.001

HTA, heart team approach.

Table 6. Predictors of primary composite endpoint by uni-variate and multi-variate analyses

	Uni-variate analysis		Multi-variate analysis	
	OR (95% CI)	P value	OR (95% CI)	P value
HTA	0.381 (0.289-0.504)	<0.001	0.514 (0.375-0.704)	<0.001
Age	1.027 (1.014-1.041)	<0.001	1.020 (1.005-1.036)	0.011
Male gender	0.741 (0.545-1.006)	0.054	-	NS
Left main disease	1.299 (0.990-1.704)	0.059	-	NS
TVD	1.561 (0.388-6.284)	0.531		
SYNTAX score	1.015 (0.998-1.032)	0.091	1.031 (1.013-1.050)	0.001
EuroSCORE II	1.028 (1.019-1.038)	<0.001	1.024 (1.011-1.037)	<0.001
ACS	1.189 (0.906-1.560)	0.213		
Cigarette smoking	0.470 (0.302-0.732)	0.001	-	NS
Diabetes mellitus	1.411 (1.039-1.917)	0.027	1.523 (1.050-2.210)	0.027
Hypertension	0.856 (0.634-1.157)	0.313		
Hyperlipidemia	0.577 (0.436-0.762)	<0.001	0.609 (0.448-0.828)	0.002
History of CVA	1.620 (1.122-2.339)	0.010	-	NS
History of PAD	2.807 (1.951-4.040)	<0.001	-	NS
History of old MI	1.489 (1.039-2.132)	0.030	-	NS
Previous PCI	1.924 (1.463-2.530)	<0.001	-	NS
Previous CABG	1.404 (0.918-2.149)	0.118		
LV systolic dysfunction	1.399 (1.009-1.941)	0.044	-	NS
CKD	1.670 (1.273-2.191)	<0.001	-	NS
ESRD	2.754 (2.075-656)	<0.001	2.647 (1.871-3.764)	<0.001
Final choice of CABG	0.245 (0.140-0.430)	<0.001	0.343 (0.186-0.632)	0.001
DES deployment	1.112 (0.841-1.470)	0.457		

ACS, acute coronary syndrome; CABG, coronary artery bypass grafting; CI, confidence interval; CKD, chronic kidney disease; CVA, cerebrovascular accident; DES, drug-eluting stent; ESRD, end-stage renal disease; HTA, heart team approach; LV, left ventricular; MI, myocardial infarction; OR, odds ratio; PAD, peripheral artery disease; PCI, percutaneous coronary intervention; TVD, three-vessel disease.

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