

Usefulness of the Baseline Syntax Score to Predict 3-Year Outcome After Complete Revascularization by Percutaneous Coronary Intervention

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Although we strive to achieve complete revascularization (CR) in those receiving percutaneous coronary intervention, it is uncertain which of these patients are at increased risk of clinical events. In this study, we aimed to investigate whether the baseline SYNTAX score (bSS) can predict adverse clinical events in patients receiving CR. From the Efficacy of Xience/Promus Versus Cypher in Reducing Late Loss After Stenting registry, the 3-year patient-oriented composite end point (POCE; all cause death, any myocardial infarction, and any revascularization) was compared according to bSS tertiles ($1 \leq \text{low bSS} < 6$, $6 \leq \text{mid-bSS} < 10$, $\text{high bSS} \geq 10$). Of the 5,088 patients, CR was achieved in 2,173 by percutaneous coronary intervention. The 3-year POCE increased significantly along with bSS tertile (7.3% vs 8.4% vs 14.8%, $p < 0.001$). Multivariate analysis showed that, despite having the same residual SS of 0, the bSS was an independent predictor of 3-year POCE (hazard ratio 1.038, 95% confidence interval 1.018 to 1.058, $p < 0.001$ per bSS point). In subgroup analysis, bSS was a predictor for 3-year POCE in multivessel diseases (hazard ratio 1.029, 95% confidence interval 1.004 to 1.054, $p = 0.025$ per bSS point), whereas in single-vessel diseases, the discriminative value of bSS was less significant. Also the clinical SYNTAX score, which added age, creatinine level, and ejection fraction to the bSS, was superior to the bSS in predicting 3-year POCE (area under the curve 0.595 vs 0.649, $p = 0.008$). In conclusion, the bSS was an independent predictor of long-term clinical outcomes in patients receiving CR, especially in those with multivessel coronary artery disease. Adding clinical factors to the bSS could increase the predictive power of clinical outcomes. © 2016 Elsevier Inc. All rights reserved. (Am J Cardiol 2016;■:■-■)

Complete revascularization (CR), defined as revascularization of all diseased coronary artery segments, can often be achieved leading to improved clinical outcome in patients with coronary artery disease.^{1,2} In addition, the degree of incompleteness of revascularization was correlated with an incremental increase in adverse events.^{2,3} The beneficial effect of CR is thought to be from reduction or elimination of ischemia.⁴ Despite the benefits of CR,^{5,6} it is unknown which subgroup of patients will fare well and which are at increased risk of adverse events in the long term. In the present study, using the SYNTAX score (SS),^{7,8} we examined whether the baseline SYNTAX score (bSS) could predict clinical outcomes in those who received CR.

Methods

Extended description of study methods is presented in the online [Supplementary Appendix](#).

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See page 5 for disclosure information.

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The Efficacy of Xience/Promus Versus Cypher in Reducing Late Loss After Stenting (EXCELLENT) registry was a multicenter registry enrolling patients from 29 centers in Korea to compare the efficacy of everolimus-eluting stents (Xience/Promus) versus sirolimus-eluting stents (SES; Cypher) in all comers who underwent percutaneous coronary intervention (PCI) with unrestricted drug-eluting stent use.⁹ The study protocol was approved by the ethics committee at each participating center and was conducted according to the principles of the Declaration of Helsinki. All patients provided written informed consent for participation in the registry.

Independent quantitative analysis of baseline coronary angiographic images and calculation of the SS were performed by 3 specialized quantitative coronary angiography technicians at the Seoul National University Hospital Cardiovascular Clinical Research Center Angiographic Core Laboratory. CR was defined as a residual SS of 0. For calculation of the clinical SYNTAX score (cSS), the SS was multiplied with the value of the modified "Age, Creatinine, and Left Ventricular Ejection Fraction (ACEF)" score, which was retrospectively calculated, based on the patients' left ventricular ejection fraction, age, and creatinine clearance derived using the Cockcroft-Gault equation.⁷

The primary analysis end point was the 3-year patient-oriented composite end point (POCE). POCE was defined

Table 1

Baseline clinical and angiographic characteristics of complete revascularization patients according to bSS tertile

Variable	Baseline SYNTAX score			P value
	1 ≤ - <6 (n=832)	6 ≤ - <10 (n=692)	≥10 (n=649)	
Age (years)	61.7±10.6	60.4±11.1	61.9±11.6	0.657
Body Mass index (kg/m ²)	25.01±3.93	24.81±3.04	24.61±3.07	0.029
Male	520 (67.4%)	481 (69.5%)	469 (72.3%)	0.050
Previous Percutaneous coronary intervention	122 (15.8%)	79 (11.4%)	88 (13.6%)	0.925
Previous Coronary artery bypass graft surgery	6 (0.8%)	3 (0.4%)	13 (2.0%)	0.031
Previous Myocardial infarction	55 (7.1%)	38 (5.5%)	53 (8.2%)	0.778
Previous Cerebrovascular accident	41 (5.3%)	23 (3.3%)	42 (6.5%)	0.719
Previous chronic heart failure	12 (1.6%)	7 (1.0%)	10 (1.5%)	0.903
Peripheral Vascular Disease	6 (0.8%)	5 (0.7%)	5 (0.8%)	0.839
Diabetes Mellitus	246 (31.9%)	171 (24.7%)	230 (35.4%)	0.223
Hypertension	474 (61.5%)	386 (55.8%)	348 (53.6%)	0.002
Chronic renal failure	14 (1.8%)	15 (2.2%)	17 (2.6%)	0.304
Dyslipidemia	296 (38.4%)	246 (35.5%)	222 (34.2%)	0.921
Smoking*	31.3% / 17.4% / 49.2%	29.2% / 19.8% / 48.6%	35.7% / 16.5% / 45.9%	0.599
Chronic obstructive pulmonary disease	26 (3.4%)	21 (3.0%)	19 (2.9%)	0.626
Family history of Coronary artery disease	30 (3.9%)	43 (6.2%)	35 (5.4%)	0.163
Ejection fraction	62.2±9.7 %	61.6±10.0 %	57.5±12.0 %	<0.001
Clinical diagnosis [†]	39.7% / 42.5% / 8.6% / 9.3%	37.6% / 40.5% / 9.8% / 12.1%	29.0% / 34.4% / 11.0% / 25.7%	<0.001
Acute coronary syndrome	489 (60.4%)	427 (62.4%)	459 (71.1%)	<0.001
Number of Vessel disease [‡]	75.8% / 18.9% / 5.3%	70.1% / 23.1% / 6.8%	40.7% / 39.2% / 20.1%	<0.001
Total stent length (mm)	23.8±8.9	24.9±10.8	30.5±16.2	<0.001
Number of stents per lesion	1.1±0.3	1.1±0.4	1.3±0.6	<0.001
Number of stents per patient	1.1±0.3	1.2±0.5	1.7±0.8	<0.001
Laboratory tests				
WBC (/μL)	7640±2740	7230±2950	8450±3380	<0.001
Hemoglobin (g/dL)	13.7±1.8	13.8±1.8	13.8±2.8	0.193
Total cholesterol (mg/dL)	174±44	181±64	179±44	0.087
Triglyceride (mg/dL)	145±94	142±94	148±106	0.542
Low density lipoprotein (mg/dL)	105±37	110±60	110±41	0.064
High density lipoprotein (mg/dL)	44±12	44±12	43±17	0.099
Creatinine (mg/dL)	1.04±0.78	1.10±1.11	1.08±0.75	0.334
C reactive protein (mg/dL)	3.20±18.61	4.82±34.16	6.23±35.62	0.114

Values reported as n (%) or mean ± SD.

* Smoking: Current/ex-/never smoker.

[†] Clinical diagnosis: Stable angina, Unstable angina, Non-ST elevation myocardial infarction, ST elevation myocardial infarction.[‡] Number of vessel disease: 1 vessel disease/2 vessel disease/3 vessel disease.

Table 2

Clinical outcomes in complete revascularization patients according to baseline SYNTAX score tertile

Variable	1 ≤ baseline SYNTAX score <6 (n=832)	6 ≤ baseline SYNTAX score <10 (n=692)	baseline SYNTAX score ≥10 (n=649)	P value
3-year POCE*	61 (7.3%)	58 (8.4%)	98 (15.1%)	<0.001
All cause death	25 (3.0%)	20 (2.9%)	36 (5.5%)	0.014
Cardiac death	12 (1.4%)	12 (1.7%)	18 (2.8%)	0.070
Revascularization	35 (4.2%)	38 (5.5%)	62 (9.6%)	<0.001
Target lesion revascularization	23 (2.8%)	23 (3.3%)	36 (5.5%)	0.015
Non-target lesion revascularization	12 (1.4%)	15 (2.2%)	26 (4.0%)	0.006
Myocardial infarction	2 (0.3%)	3 (0.4%)	4 (0.6%)	0.533
Target lesion failure [†]	34 (4.1%)	33 (4.8%)	54 (8.3%)	0.001
Non-Target lesion failure	27 (3.2%)	25 (3.6%)	44 (6.8%)	0.002

Values reported as n (%).

* POCE: patient oriented composite endpoint, including all cause death, all cause myocardial infarction and revascularization.

[†] Target lesion failure: cardiac death, target vessel myocardial infarction, target lesion revascularization.

as a composite of all-cause death, any myocardial infarction (MI, including nontarget vessel territory), and any repeat revascularization (including all target and nontarget vessels,

regardless of percutaneous or surgical methods). Secondary analysis end points were target lesion failure (TLF, a composite of cardiac death, target-vessel MI, and target lesion

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