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SYNTAX SCORE: PREDICTING OUTCOMES AFTER PCI FOR CTO

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ABSTRACT

BACKGROUND: Dealing with complex chronic total occlusions (CTOs) in patients undergoing percutaneous coronary intervention (PCI), it is important to evaluate not only the CTO lesion itself but also atherosclerotic lesions of the whole coronary artery tree. The aim of this study was to evaluate the utility of the SYNTAX score in patients having CTO undergoing PCI.

METHODS: This retrospective study included 72 consecutive patients with CTO lesions who underwent PCI. Primary endpoints were procedural failure and major adverse cardiac events (MACE) within 30 days. The SYNTAX and J-CTO scores were assessed before the procedures, and patients were divided into 2 groups according to SYNTAX criteria: high (>22) and low (≤22).

RESULTS: Procedural success was obtained in 86.2% of patients. Patients with a high SYNTAX score had significantly lower procedural success than those with a low SYNTAX score (72.5% versus 90.2%, p<0.0001). There were 8.2% MACE in patients with high SYNTAX scores and 1.4% MACE in those with low scores. Both the SYNTAX and J-CTO scores had odds ratios of 3.31 (95%CI=1.42–7.72, *p*=0.005) and 3.62 (95% CI=1.22–10.64, *p*=0.017) for procedural failure. Higher SYNTAX scores were also an independent predictor of 30-day MACE after PCI (odds ratio 4.60, 95 %Cl 1.01–22.2), though the J-CTO score failed to predict the development of MACE.

CONCLUSION: The SYNTAX score appeared predictive of procedural failure in patients undergoing CTO-PCI, to a similar degree as with the established J-CTO score. High SYNTAX scores were strongly associated with an increased risk of 30-day MACE.

Keywords: CTO-PCI, SYNTAX, J-CTO

INTRODUCTION

In clinical practice, patients with a chronic total occlusion (CTO) represent roughly 20% of those undergoing percutaneous coronary interventions (PCI) [1-2]. Recently, attempting percutaneous coronary intervention for chronic total occlusion (CTO-PCI) has become widespread [3]. However, the appropriate indications for selecting patients who will undergo CTO-PCI have not been established yet, because CTO-PCI is still more complex than conventional procedures and there is no way for us to identify the patients who will obtain the maximum benefit. The SYNTAX score is an angiographic tool that can quantify the degree of atherosclerosis in the entire coronary arterial tree, including the culprit lesions [4]. This score can aid in the preprocedural risk stratification of patients with complex CTO lesions treated via modern PCI strategies. This study aimed to assess whether the SYNTAX score is associated with the clinical and procedural outcomes of patients with CTO and to evaluate the clinical outcomes at early 30 days MACE after CTO-PCI.

METHODS
Patient population

We retrospectively investigated 72 patients (72 CTOs) who underwent CTO-PCI. Patients with prior bypass surgery were excluded from this study because the SYNTAX score cannot be determined in those patients. Patients were divided into two groups of SYNTAX score, which were low (≤22, 46%), and high (>22, 54%). The evidence of myocardial ischemia was proven by echocardiography and stress tests with electrocardiography (ECG) and/or scintigraphy. The J-CTO score was calculated on the basis of five selected factors: previously failed lesion, blunt stump type, bending, calcification, and occlusion lesion greater than 20 mm [5].

Endpoints

The endpoints of this study were procedural failure (unsuccessful PCI) and major adverse cardiac events (MACE) within 30 days of the procedure. PCI success was defined as successful balloon dilatation of the lesion with or without stent placement and less than 40 % residual stenosis. MACE was defined as a composite of death, nonfatal myocardial infarction, and target vessel revascularization (including both repeat PCI and CABG). [6-7] The diagnosis of myocardial infarction required the presence of new Q waves on ECG and/or elevation of troponin I levels of at least five times over the upper limit of the normal range [8].

STATISTICAL ANALYSIS

The data are presented as mean ± standard deviation (SD) or as percentages (%). Differences between groups were assessed using either the unpaired two-tailed Student's t test or the chi-square test for continuous and categorical variables, respectively. Univariate and multivariate logistic regression analyses were used to assess the independent correlates of procedural failure and the 30-day MACE rate. All analyses were carried out with the IBM-SPSS statistics package, version 19 (IBM Corp., Armonk, N.Y.).

RESULTS

In the present study involving 72 patients treated with PCI for CTO, overall procedural success was achieved with 62 patients (86.2 %). Patients with a high SYNTAX score had significantly lower procedural success than those with a low SYNTAX score (72.5% versus 90.2% p< 0.0001). During the first 30 days after the procedure, there were 6 (8.2 %) and one (1.4%) MACE among patients with high and low SYNTAX scores, respectively ($p = 0.007$). The corresponding myocardial infarction rates were 5.6 % ($n = 4$) and 1.4 % ($n = 1$), respectively, although there was no difference in the development of Q-wave myocardial infarction. Several variables were associated with unsuccessful CTO-PCI on univariate analysis. After multivariate logistic regression, the SYNTAX score was identified as an independent predictor of unsuccessful PCI (SYNTAX score < 22, OR = 3.31, 95 % CI=1.42–7.72, p=0.005.). The J-CTO score was also identified as an independent predictor of unsuccessful PCI (OR =3.62, 95% CI=1.22–10.64, p=0.017) for a one-unit increase in the J-CTO score. The AUC analysis confirmed the discriminatory capacity of the SYNTAX score (C=0.687, p<0.0001) and the J-CTO score (C = 0.736, $p <$ 0.0001) to distinguish between patients with and without procedure failure. The 30-day MACE after PCI were associated with a higher SYNTAX score. The J-CTO score was not identified as a predictor of 30-day MACE. Multivariate analysis revealed that a SYNTAX score greater than 22 was independent predictor of 30-day MACE after PCI. The SYNTAX score demonstrated an adequate discriminatory capacity to distinguish between patients with and without 30-day MACE (C=0.75, p=0.001).

DISCUSSION

This study suggested that the assessment of lesion complexity with the SYNTAX score may be useful to identify CTO patients at a higher risk for cardiovascular events, and adding CTO-PCI to medical therapy might improve the outcome of patients with intermediate and high SYNTAX scores. The SYNTAX score could be a surrogate marker of the area at risk, and a higher score at the CTO site may be an indication for CTO-PCI because the effect of this procedure on long-term outcomes may depend on the specific score at the CTO site. The present study has several limitations. First, it was a single-center study with a small sample size. Therefore, confounding factors might have influenced the results; for example, certain specialized CTO techniques might have differed among operators, and we know that the success rate of CTO-PCI is highly operator dependent. Also, specialized CTO- PCI equipment such as guide-wires and microcatheters changed over the course of the study, since patients with CTO were enrolled.

CONCLUSION

In conclusion, the SYNTAX score was predictive of procedural failure in patients undergoing CTO-PCI. Furthermore, we observed that high SYNTAX scores were strongly associated with an increased risk of 30-day MACE. Although we did not provide insight into the long-term outcomes of patients with high SYNTAX scores, it seems that the SYNTAX score was useful for clinical decision making in patients with complex CTO to minimize PCI-related procedural complications and thrombotic events. All authors have no financial conflicts of interest to disclose concerning the manuscript.

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