Research Highlights

Highlights from the latest articles in interventional cardiology



Utility of the SYNTAX score for predicting outcome after percutaneous coronary intervention

Evaluation of: Articles [2-7].

With the technical advances in the field of percutanenous coronary intervention (PCI), an increasing number of complex multivessel or left main coronary lesions that have traditionally been surgically revascularized are now being considered for PCI. The SYNTAX score was developed in 2005 by a group of interventional cardiologists and cardiac surgeons as an angiographic tool grading the anatomical complexity of coronary lesions, aiming to aid in the decision making of the optimal revascularization strategy [1]. The scoring system integrates several pre-existing classifications, including the American Heart Association (AHA) classification of coronary tree segments, the Leaman score, the American College of Cardiology/AHA lesion classification system, the total occlusion classification system and the Duke and International Patient Safety Classification system for bifurcation lesions. An algorithm assesses the coronary tree dominance, number of lesions and specific lesion characteristics through a series of questions, and a final SYNTAX score can be computed [101].

Several trials have demonstrated the prognostic utility of the SYNTAX score in predicting clinical outcomes in patients undergoing PCI. Valgimigli *et al.* found that, among patients undergoing PCI for three-vessel disease, those with high SYNTAX scores had higher rates of major adverse cardiac events (MACE) at 1 year when compared with those with intermediate or low SYNTAX scores [2]. In the SYNTAX trial by Serruys *et al.*, patients with left main or three-vessel coronary artery disease were randomized

to receive PCI or coronary artery bypass grafting (CABG) [3]. When examining the outcomes of MACE or cerebrovascular events at 1 year, although CABG demonstrated favorable results, the PCI group also had impressive outcomes (17.8 vs 12.4%; p = 0.002). While SYNTAX score was not predictive of outcomes in patients undergoing CABG, the higher SYNTAX score predicted higher MACE when compared with intermediate or low SYNTAX scores in patients undergoing PCI for their complex coronary lesions. In both studies, the discriminatory capacity of the SYNTAX score was only apparent in the high versus intermediate or low tertiles of SYNTAX scores.

Other studies tested the usefulness of the SYNTAX score in predicting outcomes in patients undergoing CABG. While Birim et al. found that a high SYNTAX score is predictive of higher MACE among patients undergoing CABG for left main disease [4], another study showed that there was no significant difference in outcomes among SYNTAX scores in patients who underwent CABG for three-vessel disease [5]. More recently, Capodanno et al. applied the SYNTAX score to 255 patients who underwent left main PCI with drug-eluting stents [6]. At 1-year follow-up, the primary end point of cardiac death was 2.5, 1.1 and 13.1% among the patients of the lowest (SYNTAX ≤18), intermediate (SYNTAX $18 \le 27$) and highest tertile (SYNTAX) >27) scores. The secondary end point of MACE occurred in 7.4% in the lowest tertile, 21.4% in the intermediate tertile and 20.4% in the highest tertile SYNTAX scores. In a classification tree analysis, SYNTAX score was found to be the best predictor of outcome, with a

Shih-Fan Chen, Keith Somma, Ray V Matthews & Leonardo C Clavijo†

+Author for correspondence: Interventional Cardiology, University of Southern California, CA, USA Tel.: +1 323 442 6130 Fax: +1 323 442 6133 Iclavijo@usc.edu



NEWS & VIEWS - Research Highlights



score of 34 being the optimal number to distinguish between low- and high-risk of MACE. Similar to other studies, this study also showed that the discriminatory capacity of the SYNTAX score is best between the lowest and highest tertiles.

In another study, Capodanno et al. tested the SYNTAX score threshold of greater than 34 in predicting outcomes of PCI versus CABG for patients with left main coronary artery disease [7]. Among the 819 patients studied, 24.9% of patients treated with PCI and 42.8% of patients treated with CABG had a SYNTAX score greater than 34. At 2-year follow-up, patients with a SYNTAX score greater than 34 were found to have better outcomes when their left main coronary disease was treated with CABG rather than PCI, with reduced mortality of 8.5 versus 32.7% (p < 0.001). In the subgroup analysis, patients with isolated ostial or shaft left main lesion, PCI also resulted in a higher mortality rate if their SYNTAX score was greater than 34. Complete revascularization was found to be an independent predictor of mortality, and this was achieved in a higher portion of patients who received CABG than PCI.

Conclusion

The SYNTAX score has been shown to be a useful prognostic tool in assessing patients undergoing PCI for complex coronary lesions. Since it has been demonstrated that the discriminatory capacity of this score is poor between low and intermediate tertiles, it was important that Capodanno et al. identified a SYNTAX score of 34 as the cut-off for high-risk patients. These studies not only provided evidence that complex coronary lesions traditionally treated with surgery can now have comparable outcomes with PCI, they also identify the complex circumstances where CABG is superior to PCI. While larger studies should be carried out to further validate its prognostic utility, the SYNTAX score appears to be a promising tool in this era of expanding percutaneous coronary techniques.

Financial & competing interests disclosure

The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties.

No writing assistance was utilized in the production of this manuscript.

Bibliography

2

3

6

- Sianos G, Morel MA, Kappetein AP *et al.*: The SYNTAX score: an angiographic tool grading the complexity of coronary artery disease. *EuroIntervention* 1, 219–227 (2005).
- Valgimigli M, Serruys PW, Tsuchida K *et al.*: Cyphering the complexity of coronary artery disease using the SYNTAX score to predict clinical outcome in patients with three-vessel lumen obstruction undergoing percutaneous coronary intervention. *Am. J. Cardiol.* 99, 1072–1081 (2007).
- Serruys PW, Morice MC, Kappetein AP *et al.*: Percutaneous coronary intervention versus coronary-artery bypass grafting for severe coronary artery disease. *N. Engl. J. Med.* 360(10), 961–972 (2009).
- 4 Birim O, Gameren M, Bogers AJ et al.: Complexity of coronary vasculature predicts outcome of surgery for left main disease. Ann. Thorac. Surg. 87, 1097–1104 (2009).
 - Lemesle G, Bonello L, de Labriolle A *et al.*: Prognostic value of the SYNTAX score in patients undergoing coronary artery bypass grafting for three-vessel coronary artery disease. *Catheter Cardiovasc. Interv.* 73, 612–617 (2000).
 - Capodanno D, Di Salvo ME, Cincotta G et al.: Usefulness of the SYNTAX score for predicting clinical outcome after percutaneous coronary intervention of unprotected left main coronary artery disease. *Circ. Cardiovasc. Intervent.* 2, 302–308 (2009).
 - Capodanno D, Capranzano P, Di Salvo ME et al.: Usefulness of SYNTAX score to select patients with left main coronary artery disease to be treated with coronary artery bypass graft. J. Am. Coll. Cardiol. Intv. 2, 731–738 (2009).

Website

101 SYNTAX score www.syntaxscore.com