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2022 Symposium Presentation

Revascularization in Cardiogenic Shock: Residual Syntax Score and Chronic Total Occlusions

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Abstract

The residual syntax score (rSS) is strongly associated with outcomes in patients with stable coronary artery disease. In patients with acute myocardial infarction-associated cardiogenic shock (AMI-CS), the correlation or association of the rSS, mortality risk, and revascularization strategy has not yet been elucidated and needs more investigation. The SHOCK trial demonstrated that patients with left main and severe triple-vessel disease, who underwent coronary artery bypass grafts, had improved outcomes and higher 1-year survival rates than those with initial medical stabilization. However, it is unclear which is the superior technique for achieving complete revascularization. In contrast to the SHOCK trial's results, the CULPRIT-MI trial indicated that multivessel intervention had no impact on patient outcomes. Patients with AMI-CS usually have high rSSs due to their complex multivessel disease. Thus, the rSS may be more of a surrogate for the kind of disease than the strategy employed. We, therefore, hypothesize that lowering the rSS might lead to better outcomes. In addition, as there is currently no data confirming an effective targeted strategy, reintroduction of the bypass surgery should be considered.

Keywords: multivessel coronary artery disease, coronary artery bypass graft, percutaneous coronary intervention, myocardial infarction

Background

Findings from a randomized trial showed that the mortality in patients having acute myocardial infarction-associated cardiogenic shock (AMI-CS) was consistently high (40% to 50%), and early revascularization appeared to be the only beneficial therapy.¹ Of note, multivessel coronary artery disease (CAD) is observed in 75% of AMI-CS cases.² Physicians rely on risk assessment scores to curb this devastating disease and determine treatment plans. The SYNTAX score (SS) assesses the extent of CAD by quantifying the disease based on lesion number, location, and complexity.³ The residual syntax score (rSS), which is derived

from the SS score, quantifies the residual CAD after percutaneous coronary intervention (PCI) and coronary artery bypass graft (CABG) and acts as an independent predictor for clinical adverse events.^{4,6} Although the rSS is strongly associated with outcomes in patients having CAD and acute coronary syndrome, its importance in patients with cardiogenic shock remains uninvestigated.

Clinical Trials

SHOCK Trial

The relevance of the rSS in the setting of cardiogenic shock started with the SHOCK trial in the mid-1990s. At the

time of the SHOCK trial, the application of balloon angioplasty was ubiquitous in early revascularization, while stents were minimally used.⁷ Specifically, the SHOCK trial was designed to compare the survival advantage of initial medical stabilization versus emergency revascularization in patients with AMI-CS.⁸ Most patients enrolled in the trial had double- or triple-vessel disease; very few had single-vessel disease. All the patients with left main and triple-vessel disease opted for coronary artery bypass graft (CABG), and most had good outcomes. This trial demonstrated that emergency revascularization was associated with higher 1-year survival rates compared with initial medical stabilization. Indeed, patients with CABG had good outcomes despite being sicker from more extensive coronary disease. The subsequent questions are: (1) Is it important to achieve complete revascularization as CABG can in this setting? and (2) Is this benefit due to more complete revascularization with a CABG strategy?

CULPRIT Trial

In contrast to the findings of the SHOCK trial, the CULPRIT-MI study demonstrated that multivessel intervention had no impact on outcomes in the AMI-CS population.⁹ In fact, multi-vessel intervention resulted in worse outcomes. The CULPRIT-MI study included an assessment of the rSS and its impact. Patients with cardiogenic shock had very high rSSs because they had complex multivessel disease. After PCI, whether in a multivessel approach or deferred approach, the amount of residual ischemia was still high.

Comparing the rSS with the baseline SS, it was apparent that the rSS increased when the baseline SS increased. Although the rSS was anticipated to be lower in the multivessel group, it was not impacted by the initial revascularization strategy. The rSS appeared to be a surrogate for the kind of disease rather than a reflection of the employed strategy. Indeed, the rSS was strongly associated with poorer outcomes; i.e., patients had higher 30-day mortality when their rSS increased. This finding raises the question: Should mechanical devices and other supportive devices be used to do more complex remote revascularization in the setting of cardiogenic shock? Although it is logical to hypothesize that patient outcomes would be improved when the rSS is lower, this hypothesis has yet to be proven.

Case Study

Consider the following situation:

A 60-year-old male patient was admitted with chest pain caused by an AMI. He had a right bundle branch block and a left anterior hemiblock. His electrocardiogram showed that he had sinus tachycardia and an acute ST elevation in the anterior precordial leads, along with PR prolongation. The patient's coronary angiography revealed a diffuse disease in the right coronary artery, but there was no flow-limiting lesion. There

was poor flow on the left side due to a blocked circumflex vessel and a compromised left anterior descending (LAD) artery. The LAD was opened, but should the circumflex vessel be opened?

The non-infarct zone was not studied in the CULPRIT nor the SHOCK trial. Therefore, we would like to assess the condition of the non-infarct zone to know whether it was ischemic, normal, or scarred. In the case of a wafer-thin inferior wall, the right coronary artery would not be opened despite the severe disease and circumflex distribution.

The LAD was opened up in an acute setting, but mitral regurgitation was not observed. Using extra time and dye to open the circumflex is not advisable in this scenario, but if this person had severe hypokinesis in that wall, opening the circumflex would have been considered.

This kind of practical judgment should be further considered in future clinical trials. The LAD was wired, ballooned, and subsequently stented in this specific case. The electrocardiogram revealed a second-degree AV block in the setting of an LAD infarction. The PR prolongation led to the suspicion of an impaired conduction system. In the case of anterior wall AMI, a wire should be very quickly placed in the patient, which was done. Eventually, the patient's condition improved and became stable after the LAD intervention.

Conclusion

The rSS appears to be related to baseline findings rather than the intended revascularization strategy. The rSS is associated with 30-day and 60-day mortality in patients with AMI-CS; however, no data confirm that a targeted strategy to achieve complete revascularization in patients with cardiogenic shock would improve outcomes. Thus, we advise that the role of bypass surgery in AMI-CS should be reconsidered.

References

- [1] Hochman JS, Lynn SA, Webb JG, et al. Early revascularization in acute myocardial infarction complicated by cardiogenic shock. SHOCK Investigators. Should We Emergently Revascularize Occluded Coronaries for Cardiogenic Shock. *N Engl J Med*. 1999;341(9):625-34. doi: 10.1056/NEJM199908263410901.
- [2] Thiele H, Desch S, Piek JJ, et al. Multivessel versus culprit lesion only percutaneous revascularization plus potential staged revascularization in patients with acute myocardial infarction complicated by cardiogenic shock: Design and rationale of CULPRIT-SHOCK trial. *Am Heart J*. 2016;172:160-9. doi: 10.1016/j.ahj.2015.11.006
- [3] Sianos G, Morel M-A, Kappetein AP, et al. The SYNTAX score: an angiographic tool grading the complexity of coronary artery disease. *EuroIntervention*. 2005;1(12):219-27.
- [4] Genereux P, Palmerini T, Caixeta A, et al. Quantification and impact of untreated coronary artery disease after percutaneous coronary intervention: the residual SYNTAX (Synergy Between

- PCI with Taxus and Cardiac Surgery) score. *J Am Coll Cardiol*. 2012;59(24):2165-74. doi: 10.1016/j.jacc.2012.03.010.
- [5] Farooq V, Serruys PW, Bourantas CV, et al. Quantification of incomplete revascularization and its association with five-year mortality in the synergy between percutaneous coronary intervention with taxus and cardiac surgery (SYNTAX) trial validation of the residual SYNTAX score. *Circulation*. 2013;128(2):141–51. doi: 10.1161/CIRCULATIONAHA.113.001803.
- [6] Qiu M, Li Y, Li J, et al. Impact of six versus 12 months of dual antiplatelet therapy in patients with drug-eluting stent implantation after risk stratification with the residual SYNTAX score: Results from a secondary analysis of the I-LOVE-IT 2 trial. *Catheter Cardiovasc Interv*. 2017;89(S1):565–573. doi: 10.1002/ccd.26948.
- [7] White HD, Assmann SF, Sanborn TA, Jacobs AK, Webb JG, Sleeper LA, Wong CK, Stewart JT, Aylward PE, Wong SC, Hochman JS. Comparison of percutaneous coronary intervention and coronary artery bypass grafting after acute myocardial infarction complicated by cardiogenic shock: results from the Should We Emergently Revascularize Occluded Coronaries for Cardiogenic Shock (SHOCK) trial. *Circulation*. 2005;112(13):1992-2001. doi: 10.1161/CIRCULATIONAHA.105.540948.
- [8] Sanborn TA, Sleeper LA, Webb JG, et al. Correlates of one-year survival inpatients with cardiogenic shock complicating acute myocardial infarction: Angiographic findings from the SHOCK trial. *J Am Coll Cardiol*. 2003;42(8):1373-9. doi: 10.1016/s0735-1097(03)01051-9.
- [9] Barthélémy O, Rouanet S, Brugier D et al.. Predictive Value of the Residual SYNTAX Score in Patients With Cardiogenic Shock. *J Am Coll Cardiol*. 2021; 77(2):144-155. doi: 10.1016/j.jacc.2020.11.025.