

Stenting: the Latest Frontier in Percutaneous Intervention

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Patients with coronary artery disease are living in a more hopeful age than their counterparts from even a decade ago. The development of promising devices made it possible for physicians to perform complex percutaneous coronary interventions (PCI) on patients who were once considered too old or too sick for treatment.

However, as exciting as these advances are to cardiologists and patients alike, they are not without controversy. PCI with stents has saved or improved countless lives, but in some cases has created options that, while promising, have not resulted in definitive advances in treatment. Do advances in technology justify performing a procedure if it hasn't proven to affect morbidity and mortality? In this issue of the *Methodist DeBakey Cardiovascular Journal*, we will explore the latest research in stenting for a variety of indications and discuss new and upcoming technologies.

We start by tackling the most pressing question: Does stenting prolong life, or does it simply treat symptoms? Suzanne Arnold, M.D., attempts to answer this quandary in her opening review on current indications for stenting. We know that PCI is an effective treatment for acute myocardial infarction, but there is persistent debate about its efficacy in the treatment spectrum for heart disease. Arnold, who practices at Saint Luke's Mid America Heart Institute in Missouri, explores the impact of stenting in various clinical scenarios—ST elevation myocardial infarction (STEMI), non-STEMI, stable coronary artery disease, and high-risk ischemia—to determine whether stenting truly affects morbidity and/or mortality (and, if so, under what conditions) or if it primarily helps manage symptoms.

Next, Drs. Sanjog Kalra, Hemal Bhatt, and Ajay Kirtane examine the treatment of STEMI in the age of PCI. Although mechanical reperfusion with PCI has become the standard of care for STEMI, there is no clear consensus as to when stenting should be performed in patients with multivessel disease or the extent to which both culprit and nonculprit lesions should be treated. The authors highlight key data that support the use of mechanical reperfusion therapy in STEMI patients, examine the optimal timing for and extent of stent implantation in these patients, and explore the use of PCI for culprit-only versus multiple vessels in patients with STEMI.

Complex PCI is being performed on an older cohort of patients who have more comorbidities and more complex disease than in years past. As a result, interventionists are increasingly

relying on hemodynamic support devices to enhance safety and outcomes, particularly in high-risk patients with complex multivessel disease and acute myocardial infarction with cardiogenic shock. In their overview of mechanical support devices in high-risk PCI, Drs. Bhuvnesh Aggarwal, Neal Kleiman, and colleagues review the indications for several available mechanical support devices, examine the clinical data separating them, and present a practical approach for appropriate device and patient selection.

The next review delves into the various imaging techniques used in PCI. Coronary angiography has been the standard modality during PCI to assess the extent and severity of coronary artery disease, but it may fall short when determining a strategy and defining optimal outcomes. As an alternative, authors Daisuke Hachinohe, Azeem Latib, and colleagues present a comprehensive and practical approach to PCI using intravascular ultrasound (IVUS) and optical coherence tomography (OCT), which provide more precise planning and guidance. In addition, both modalities can help to accurately assess stent deployment and procedural complications after stent implantation. The authors explain how applications of intravascular imaging are helping to optimize stent placement and outcomes and reduce long-term complications.

This issue then veers from stenting to examine another potential mechanical reperfusion therapy. Bioresorbable scaffolds (BRS) were developed as an alternative to drug-eluting stents (DES) to enable vessel restoration and lower the risk of future adverse events, but the first generation devices raised concerns about their safety due to an increased risk of thrombosis. Also, limitations in first-generation BRS—bulky struts, prolonged resorption time, lack of x-ray visibility, and limited tolerance to postdilation—have hindered their real-world application and negatively affected their safety performance. Based on the literature and their own clinical experience, Drs. J. Ribamar Costa, Jr. and Alexandre Abizaid discuss various approaches to optimize BRS implantation, the drawbacks related to current-generation BRS, and potentially advantageous features of three next-generation scaffold systems.

Advances in coronary interventions are particularly evident with PCI for chronic total occlusion (CTO), which has been dubbed the final frontier in the evolution of percutaneous revascularization. Successful CTO PCI has been shown to offer complete revascularization while avoiding coronary bypass grafting, with technical success rates reaching

80% when performed by experienced operators. Despite improvements in its safety, questions remain about its survival benefit. Many believe it offers symptomatic benefits and improves quality of life, but this is based more on observational studies and registries rather than on findings from randomized clinical trials. CTO PCI is considered to be an expensive and technically difficult procedure with high complication rates, while the underlying CTO itself is often perceived as a benign and stable lesion, which begs the question: Is there a need for PCI revascularization if collateral arteries can provide adequate blood supply? Author

Alpesh Shah attempts to address this question by examining success rates and justification for CTO PCI and highlighting the growth related to operator skill, device technology, and technique refinement.

I hope that you will finish this issue with a better understanding of when and how to use the latest stenting technologies. For further discussion and CME opportunities, I encourage you to visit the journal's website at <http://journal.houstonmethodist.org>, where you can log in and use the "Dialogue with Authors" tool to have an open Q&A with the authors of this issue.