

EDITORIAL COMMENT

Bioresorbable Coronary Devices

Advances Illuminated by Imaging*



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The past 4 decades have witnessed amazing and once unimaginable advances in the management of cardiovascular diseases. However, the trajectory of progress has rarely been linear and the path often strewn with obstacles. Experience has taught us that innovations often beget unforeseen problems. This lesson was quickly learned from the introduction of surgically implantable prosthetic valves, in which optimism that valve replacement had “solved” the scourge of stenosis and regurgitation was tempered by realization that these devices had created the unexpected chronic condition of “prosthetic valve disease,” characterized by the maladies of valve thrombosis, complications of anticoagulant agents, prosthetic endocarditis, and patient-valve mismatch (1).

The saga of percutaneous management of coronary artery disease (CAD) is similarly punctuated by thrilling advances subdued by unanticipated consequences. Bare metal stents (BMS) were introduced with the expectation that they would obviate the challenges of acute closure and restenosis that limited balloon angioplasty. The hope that BMS might be a “free lunch” was dashed when the “bill came due” with recognition of their attendant complications of acute stent thrombosis (ST) and later in-stent restenosis (ISR). These limitations gave birth to drug-eluting stents, which although a major advance, unfortunately proved to be less than a “pure cure,” reducing but not eliminating ST and ISR, and compelling the burdens of prolonged dual antiplatelet therapy (DAPT).

Thus, metallic coronary stents constitute both a remedy and a “disease.” However, as emphasized in

the paper by Garcia-Garcia et al. (2) in this issue of *JACC*, the advent of bioresorbable coronary stress may represent a paradigm shift that cuts the “ Gordian knot ” that inextricably linked stents to metallic-induced complications and encumbrances. This elegant treatise was written by a premier group of researchers expert in imaging assessment and interventional management of CAD and pioneers in coronary device therapeutics. The format of the paper synergistically melds 2 fields of innovation, coronary imaging and therapeutics, highlighting the nexus through which advances in direct coronary imaging have informed and facilitated the development of these novel bioresorbable vascular scaffolds (BRS).

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This piece comprehensively reviews the distinct designs and benefits of the BRS, focusing on the compelling clinical advantages these devices may offer. As eloquently emphasized, BRS represent a “revolutionary change in applying local coronary therapies” and offer the “unique ability to provide a temporary scaffold that is necessary to maintain the patency of the vessel after intervention, releasing antiproliferative drugs and then they gradually degrade, liberating the vessel from its cage, permitting the restoration of vascular physiology and integrity.” The paper reviews data to support the novel and provocative concept that implantation of BRS rather than permanent metallic cages may facilitate restoration of “vessel vasomotor tone, adaptive shear stress, late luminal enlargement, and late expansive remodeling.” Of great practical impact, they emphasize that “advantages over metallic stents include reduced thrombotic propensity, which will hopefully mitigate the burdens of DAPT” (2).

An enlightening component of the present paper is the contrapuntal weaving of the importance of advances in direct coronary imaging to development of coronary therapeutics. The paper will be valued as a scholarly primer on “methods and parameters” relevant to assessing CAD and stents in general, and

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specifically as pertains to BRS. Direct coronary imaging modalities, from light to sound based, are considered in great detail, with emphasis on how the morphological and functional parameters they provide not only delineate CAD pathophysiology but importantly the manner in which they illuminate the mechanisms, strengths, and limitations of novel coronary interventions. Specifically, they illustrate how advanced coronary imaging is essential to appreciation of the assessment of BRS with respect to how “design, degradation rate, loss of mechanical properties, coating, and drug deliverability may affect its safety and efficacy.”

This paper raises 2 additional potential advantages of BRS that may have enormous clinical impact. Explicitly, the researchers emphasize the superior radiological “transparency” of BRS, which may facilitate evaluation of suspected recurrent ischemia (particularly when and if advances fulfill the promise of reliable computed tomography angiography [CTA]-myocardial perfusion assessment). BRS “imagability” by CTA may also impart an attractive advantage for pharmacological and device trials that require serial coronary imaging. Implicitly, another potential BRS application may be as the device basis for therapeutic strategies designed to prevent acute myocardial infarction and sudden coronary death by pre-emptive

stenting of non-flow-limiting but “vulnerable” plaques (3). BRS properties and promises of healing with a resultant repaved “golden tube,” enhanced vessel segment elasticity and vasomotion, and the potential of lesser ISR and stent failure may have implications for this “holy grail” for heart attack. Clearly, future studies will be necessary to determine if such promise can be fulfilled.

The researchers should be congratulated for this erudite treatise that ignites excitement for the benefits of BRS and serves as an “instructional manual” for the toolbox for assessing these novel coronary devices. The material is authoritative, insightful, and practical. The paper highlights how innovations in therapeutic coronary devices are intimately linked to advances in direct coronary imaging: Without the latter, the development of and benefits derived by the former would be less robust. This paper will serve as a basis of reference for clinicians in the care of their patients and for clinical researchers designing approaches to studies of future coronary devices.

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