

# Cardiovascular disease: Innovations in devices and techniques

Innovations are dominating the early part of the 21st century and the impact on cardiovascular medicine has been especially remarkable. Keeping up and evaluating the relevance of these innovations and the role in patient care is a constant challenge and opportunity for providers and scientists alike.

This *Cleveland Clinic Journal of Medicine* supplement on cardiovascular disease presents healthcare providers with evidenced-based reviews of important innovations and a glimpse into their potential for an exciting future.

In this supplement, Amar Krishnaswamy, MD, and colleagues look to new frontiers in valve replacement therapies. The success of transcatheter aortic valve replacement has led to extending the technique to the mitral valve. While technical challenges exist with transcatheter mitral valve replacement, methods to overcome these challenges are feasible. The authors review the various valve devices currently under development and examine their potential implications in practice.

The introduction of stents in percutaneous coronary interventions has been one of the most revolutionary innovations in cardiovascular medicine, resulting in impressive outcomes during the past few decades. Despite the dramatic advancement, persistent rates of restenosis and thrombosis continue to cause substantial morbidity and mortality. Stephen Ellis, MD, and Haris Riaz, MD, discuss the evolution of stent design from bare-metal stents through drug-eluting stents and their impact on outcomes. The evolution continues with the development of bioresorbable polymers and stents without polymers. The authors consider the promise of these innovations, especially bioresorbable stents, to further reduce restenosis and stent thrombosis.


Erich Kiehl, MD, and Daniel Cantillon, MD,

present information about the latest innovation in cardiac pacing—leadless pacemakers. The first leadless pacemaker was approved earlier this year. In over 50 years of use of transvenous pacemakers, long-term complications have primarily involved the endovascular leads and surgical pocket. The authors discuss the promise of leadless cardiac pacing using catheter-based delivery of a self-contained device in the right ventricle to favorably reduce these complications, as well the current limitation of single-chamber pacing and possible future directions.

Innovations in monoclonal antibody therapy have resulted in a new class of biologic drugs to lower low-density-lipoprotein (LDL) in the blood—PCSK9 inhibitors. These new biologics target the overexpression of the PCSK9 protein in the liver, thereby increasing LDL receptors available to metabolize and remove LDL from the blood. Khendi White, MD, Chaitra Mohan, MD, and Michael Rocco, MD, discuss potential candidates for recently approved PCSK9 inhibitor therapy.

Ellen Brinza, MS, and Heather Gornik, MD, discuss new findings in our understanding of fibromuscular dysplasia (FMD). This uncommon nonatherosclerotic disease leads to narrowing, dissection, or aneurysm of medium-sized arteries. FMD is caused by abnormal development of the arterial cell wall and can cause symptoms if narrowing or a tear decreases blood flow through the artery. The authors discuss evaluation, management, and surveillance strategies as well as important lifestyle modifications and appropriate treatment of symptoms.

We hope this presentation of recent innovations in cardiovascular medicine is useful and informative to you and your clinical practice.



**Maan A. Fares, MD**  
Heart and Vascular Institute  
Cleveland Clinic

Dr. Fares reported no financial interests or relationships that pose a potential conflict of interest with this article.

doi:10.3949/ccjm.83.s2.01