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EDITORIAL

Interventional Cardiology: A Field of Continuous Transformation

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INTRODUCTION

Interventional cardiology (IC) continues to evolve rapidly—marked by relentless innovation, continuous adaptation, and a commitment to advancing the boundaries of patient care. In the coronary field, recent years have seen remarkable progress, particularly in lesion preparation and modification techniques, enabling the management of increasingly complex coronary pathology. Intravascular imaging modalities are now more widely available, offering higher resolution and improved usability across multiple platforms. Concurrently, advancements in plaque characterization are ongoing. With the refinement of microcatheters, guidewires, and adjunctive technologies—and perhaps most notably, the growing global expertise in chronic total occlusion recanalization—more operators are successfully treating occlusions that were previously deemed intractable. Drug-coated balloons exemplify this spirit of innovation. Originally validated in the treatment of in-stent restenosis, Drug-coated balloons offer a stent-free therapeutic option. More recently, their promising application in *de novo* coronary lesions[1] has opened new avenues, potentially signaling a paradigm shift in coronary intervention strategy.

The structural heart disease domain is experiencing a parallel transformation. Transcatheter aortic valve replacement, once limited to patients deemed high-risk or inoperable, has now touched the lives of many. A growing body of evidence supports its expanding use in patients at lower surgical risk.[2,3] Transcatheter edge-to-edge repair for mitral and tricuspid regurgitation is becoming increasingly commonplace. Importantly, these advances represent just a fraction of ongoing innovation. Despite that the existing devices continue to undergo refinement, novel technologies targeting the mitral, tricuspid, and pulmonary valves are progressing through preclinical development and early clinical trials.[4]

However, innovation in IC extends beyond catheters and valves. As in all facets of medicine—and indeed, daily life—digital technologies and artificial intelligence (AI) are increasingly being integrated into our field. These tools are beginning to transform imaging, diagnostics, and clinical decision-making.[5] AI-powered platforms now assist in procedural planning, whereas machine learning algorithms analyze intracoronary imaging and physiological data to offer real-time procedural guidance. Simulators enhanced by AI are improving IC training and education. Together, these advancements hold immense potential to improve procedural precision, efficiency, and ultimately, patient outcomes.[5-7] We now stand at the threshold of an era in which AI could aid in predicting procedural success, optimizing device selection, and personalizing care. Nonetheless, the promise of AI also brings new challenges. A recent study revealed that although interventional cardiologists generally have a positive outlook on AI, many feel underprepared to incorporate it into their practice. Only a small fraction currently use it in daily clinical workflows.[8] This indicates that acquiring AI competency may soon become an essential part of our professional skillset—akin to learning new interventional techniques or devices. Notably, some AI systems have already demonstrated the ability to pass IC exams. Although they still perform below IC fellows—particularly on questions requiring interpretation or nuanced clinical reasoning[9]—their ability to generate sophisticated responses is remarkable.[10] In a field defined by rapid change, it would be shortsighted to underestimate the transformative potential of AI. Crucially, AI is not here to replace clinicians, but to augment their capabilities. The future likely lies in human–AI collaboration rather than competition.[11] However, when that future arrives—which may be sooner than anticipated—it will demand that we lead with the irreplaceable human elements of care: empathy, clinical intuition, and the doctor–patient relationship. These humanistic aspects will remain essential to delivering high-quality, patient-centered care.[12] At the same time, the introduction of AI raises important ethical and regulatory considerations. Issues of data privacy, algorithmic bias, responsibility for AI-supported decisions, and the need for rigorous and transparent validation frameworks are pressing.[12,13] These concerns will continue to shape discussions around the safe and effective implementation of AI in cardiovascular medicine.

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In conclusion, the dynamic evolution of IC is both exhilarating and challenging. While we navigate the influx of novel devices, techniques, and digital tools, we must also address the complex questions they raise. This dual reality underscores the importance of lifelong learning, multidisciplinary collaboration, and ethical foresight. As the field continues to transform, our most valuable asset will be our willingness to evolve-to lead with responsibility, to embrace innovation with discernment, and to help shape the future of patient care.

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