

Exploratory Evaluation Of Zero Contrast Percutaneous Coronary Intervention With Cmr Fluoroscopic Fusion And Ivus

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Objective

To evaluate the feasibility and clinical implications of integrating cardiac magnetic resonance (CMR)-derived three-dimensional (3D) coronary angiography with intraprocedural two-dimensional (2D) fluoroscopic imaging and intravascular ultrasound (IVUS) guidance for zero-contrast percutaneous coronary intervention (PCI) in patients with contrast agent hypersensitivity.

Methods

We present a case of a 54-year-old female with coronary artery disease who developed anaphylactic shock during prior left anterior descending artery (LAD) stent implantation for severe stenosis. Six months post-discharge, she experienced recurrent exertional angina. Given her contrast allergy history, a zero-contrast PCI strategy was implemented. Preoperative non-contrast whole-heart coronary imaging was acquired via a 1.5T Philips Ingenia CMR system using the 3D-BTFE sequence, with subsequent 3D reconstruction delineating cardiac anatomy and coronary vasculature. The CMR-derived 3D coronary model was coregistered with live 2D fluoroscopy on the GE Healthcare workstation to generate a hybrid 3D vascular roadmap. IVUS-guided real-time lesion localization enabled complete avoidance of iodinated contrast throughout the procedure.

Results

IVUS identified diffuse in-stent neointimal hyperplasia with 80% luminal stenosis in the proximal LAD. The stenosis was sequentially dilated using an NSE 2.75 × 13 mm scoring balloon (12-14 atm), a Quantum Maverick 3.0 × 12 mm balloon (10 atm), and a Restore 3.0 × 30 mm drug-coated balloon (6 atm, maintained for 60 seconds). Post-procedural IVUS re-evaluation demonstrated significant reduction in stenosis and marked improvement in lumen area. The patient was discharged asymptomatic on postoperative day 1 and remained symptom-free at 30-day follow-up.

Conclusions

This case demonstrates that multimodal integration of CMR-fluoroscopy fusion imaging and IVUS enables precise zero-contrast PCI by combining non-invasive coronary roadmap reconstruction with real-time intracoronary functional assessment. This paradigm eliminates contrast-associated risks while maintaining procedural efficacy, offering a viable therapeutic alternative for high-risk populations. The synergistic use of advanced imaging modalities may redefine precision strategies in complex coronary interventions.