

Research Challenges and Machine Learning Solution in Predicting Procedural Success of Mitral Transcatheter Edge-to-Edge Repair

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Abstract:

Mitral valve regurgitation (MR) is associated with significant mortality and morbidity. Mitral transcatheter edge-to-edge repair (mTEER) has emerged as a guideline-recommended treatment option for high-risk patients with severe degenerative and functional MR. However, despite the increasing adoption of mTEER, many patients present with anatomical features that do not align with optimal outcome criteria, adding unpredictability to the procedure. Although overall success rates are improving, accurately predicting procedural outcomes remains challenging due to the complex interplay of anatomical, procedural, and patient-specific factors.

To address these challenges, we propose a machine learning-based solution for outcome prediction. Our study makes the following major contributions: (i) We created a novel dataset from 467 patients who underwent mTEER surgery, including echocardiogram videos and patient reports with Transesophageal Echocardiography (TEE) measurements, marking the first dataset of its kind in this field; (ii) we conducted a benchmark study using six machine learning algorithms and two deep learning models to predict mTEER outcomes; and (iii) the findings from this study establish a baseline for predicting mTEER surgery outcomes, providing a foundation for further research and performance optimization.