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Dalin Tang* (`dtang@wpi.edu`), 100 Institute Road, Math Dept, Worcester, MA 01609, and **Chun Yang**, **Tal Geva** and **Pedro del Nido**. *Two-Layer Human Right Ventricle Models with Patch and Anisotropic Material Properties for Ventricle Remodeling and Pulmonary Valve Replacement Surgical Optimization: Flow and Stress Analysis.*

Conventional pulmonary valve replacement (PVR) surgery has yielded mixed results, with many of the patients seeing little improvement in right ventricular (RV) function. An image-based modeling procedure is introduced to provide accurate assessment of RV function and test the hypothesis that more aggressive scar tissue removal using computer-aided surgery design and optimized post-operative RV morphology and patch design may lead to improved recovery of RV function. Pre- and post-operative cardiac magnetic resonance (CMR) imaging data from patients who underwent PVR were acquired for model construction. CMR-based anisotropic fluid-structure interaction models with two-layer structure for RV and LV wall and tissue fiber orientation were constructed and validated by CMR data. Computational simulations with different surgical options (virtual surgery) were performed to assess RV cardiac function, flow pattern and stress/strain conditions. Our initial results indicated that computationally optimized small patch model with aggressive scar tissue trimming yielded 10% improvement in RV ejection fraction ratio, and 20-40% lower stress/strain level in the patch region, compared with the conventional patch design. This research was supported by NIH/NHLBI grant R01HL089269. (Received September 04, 2009)