Method for predictive patient-specific transcatheter heart valve planning

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Technology description

The Need

Transcatheter heart valve replacement (TAVR) has become the preferred therapy - over open heart surgery - for high-risk patients with aortic valve disease. In addition, its success is expanding indications for TAVR to lower-risk patients. While concerns about complications such as stroke and paravalvular leaks have been largely overcome, life-threatening events such as coronary obstruction remain an issue. Coronary obstruction can occur in either the right or left coronary artery and may be more prevalent with balloon expandable prostheses. Existing TAVR planning tools are primarily focused on making the required anatomical measurements for proper choice of the valve prosthesis. A robust means of predicting coronary obstruction that enables choice of replacement valve to avoid this complication will therefore be of interest to interventional cardiologists.

The Technology

Researchers at The Ohio State University, led by Dr. Prasad Dasi, have developed a predictive model to screen patients for coronary obstruction during TAVR by first acquiring the patient's pre-TAVR CT angiographic images. Patient-specific data regarding the geometry of the aortic root and heart valve is acquired from these images and 3D geometry of that portion of the patient's anatomy is constructed. A physics-based model is then created that simulates the final leaflet positions after stent expansion post implantation. This final "deformed geometry" can predict the percentage of coronary ostia obstruction. This modeling system will allow surgeons to evaluate the TAVR procedure risk and will assist them in choosing a suitable prosthetic heart valve that minimizes this complication risk.
A method for predicting coronary blockage in advance of transcatheter valve replacement.

Application area

Pre-operative planning for transcatheter aortic valve replacement
Pre-operative planning for transcatheter mitral valve replacement and other, forthcoming transcatheter valve replacement procedures

Advantages

Allows choice of replacement valve design with minimal risk for coronary obstruction.
Rigorous physics-based model accurately simulates the final position of the valve leaflets after new valve is implanted, which is essential for estimating the likelihood of obstruction.

Institution

Ventech Solutions

Inventors

Lakshmi Dasi
Amirsepehr Azimian