THREE-DIMENSIONAL PRINTING FOR THE PREDICTION OF PERI-OPERATIVE AND POST-PROCEDURAL COMPLICATIONS IN TRANSCATHETER AORTIC VALVE IMPLANTATION

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ABSTRACT: Oral Presentation

Purpose: To assess Three-Dimensional(3D) printed models as a modality for improving patient outcomes in transcatheter aortic valve implantation (TAVI). To assess use of 3-D printed models for continuing education in the development of innovative surgical planning techniques. Aortic Stenosis (AS) is the most common cause of valvular dysfunction in the Western world. TAVI has been identified as the intervention of choice in certain patients. Improved pre-procedure visualization is likely to improve patient outcomes.

Methods: Data will be extracted from the Alberta Provincial Project for Outcome Assessment in Coronary Heart Disease (APPROACH) database, which is used to prospectively collect data on patients undergoing diagnostic cardiac catheterization, percutaneous coronary intervention, and/or cardiovascular surgery at the Health Sciences Centre (HSC) in St. John's, NL. Five patients with completed TAVI procedures in 2016 will be randomly selected as the study population. The pre-TAVI cardiac gated CT for these patients will be de-identified and printed in 3D. The 3D printing will be actual sizing, printing the aortic root (Ascending aorta, sinotubular junction, sinus of valsalva, aortic valve, and left ventricular outflow tract). In addition, the peripheral vasculature consisting distal aorta, common iliac, common femoral and bifurcation into the superficial and profunda will be printed. These 3D models will then be used to predict peri-operative and post-procedural complications of TAVI in each patient, and the predicted results will be compared with actual results from these patients.

Results: Our predicted results are that 3D printed models will be able to accurately predict peri-operative and post-operative complications of TAVI such as paravalvular leak, sizing predictions of valve, structural barriers to implantation of prosthetic valve, correct annulus shape of prosthetic valve as well as post-operative vascular events.

Conclusion: 3D printed models have been used for procedural planning in congenital heart disease and open valve surgeries through the ability to replicate unique anatomical anomalies in patients, allowing for visualization and improved surgical planning. In addition to improved visualization of vascular and valvular anatomy, 3D printed models allow improved ability to predict procedural complications.