The Feasibility of Cardiovascular Magnetic Resonance Imaging in Monitoring the Long-Term outcomes of Aortic Valve Bypass Surgery Patients

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Abstract

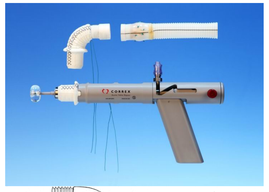
Background
Aortic valve bypass (AVB) (apico-aortic conduit) is an alternative surgical treatment for patients with aortic valve stenosis in whom surgical aortic valve replacement and transcatheter aortic valve implantation is not feasible. The role of ECG-triggered MRI in monitoring the long-term outcomes of this procedure is poorly understood. The aim of this study is two-fold. First to determine the long term follow-up of patients who have undergone aortic-valve bypass. Second to investigate the role of MRI in evaluating patient's postoperative anatomy and understand the cardiovascular physiology after almost 10 years post aortic valve bypass surgery.

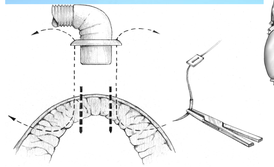
Methods
Between November 2010 and May 2015, a total of 8 patients (5 males, 3 females) had aortic-valve bypass surgery using the Correx automated coring and apical connector system (Correx, Waltham, MA). After 10 years, only two patients, who were operated on November 2010 and January 2013, were still alive. These patients had follow-up and were examined with a 1.5 Tesla Heart MRI. Qualitative assessment of flow patterns in the left ventricle, aorta and conduit was performed. Quantitative analysis included measurement of net flow, peak flow, retrograde flow in the aorta and conduit lumina.

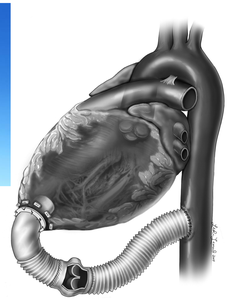
Results
One patient's apico-aortic conduit proved to be open with a maximum flow of 50 ml/beat whereas the other patient conduit was occluded with a maximal flow 15 ml/ beat and retrograde from the descending aorta. The anatomy was able to be evaluated in both patients and myocardial function was able to be assessed based on the deformation analysis. In the patient with the patent conduit (10 years post-op) more than 60% of the stroke volume was bypassed as measured by magnetic resonance. There was a small degree of retrograde blood flow in the descending aorta above the level of the conduit insertion.

Conclusion
The long-term outcome of patients with aortic valve bypass is very poor with only 25% alive and of two patients alive only one of the conduits was patent. ECG-triggered MRI is a reliable method for the evaluation of the long-term outcomes of aortic valve bypass with respect to anatomical and functional data.

The surgical Procedure







Patient demographic

Profile	N/ Mean ± SD
Age	75±11.3
Male	5
NYHA Class III	7
Comorbidities	
Diabetes	3
Peripheral Vascular Disease	1
COPD	3
Stroke	2
Previous CABG	4
Anatomy	
Calcified Aorta	7
Dilated Aortic Root	1

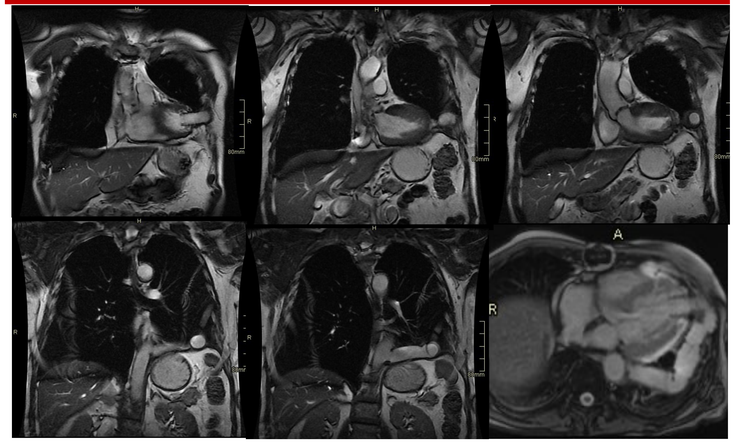
Patient Outcome

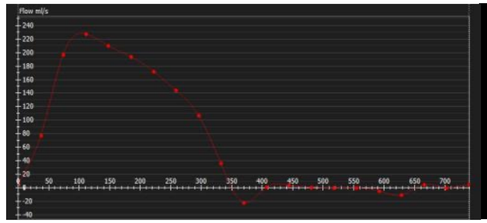
Patient	Status	Cause of death	Type of Death
1	Alive		
2	Alive		
3	Deceased	Massive Stroke	In-hospital Death/Re-admitted
4	Deceased	Congestive heart Failure	Out of Hospital Death
5	Deceased	Bowl Ischemia	In-hospital Death
6	Deceased	Bowl Ischemia	In-hospital Death
7	Deceased	Cardiac Arrest	In-hospital Death
8	Deceased	Cardiac Arrest	In of Hospital Death / Re-admitted

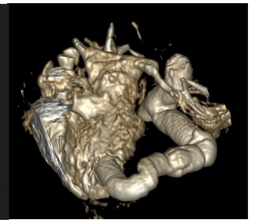
Pre and Post Echocardiography Findings

Profile	Preoperative Mean ± SD	Postoperative (3 mo) Mean ± SD	P value
Ejection fraction, %	58.1±5.3	58.3±5.8	0.83
Mean AV gradient, mm Hg	52.9±16.3	18.5±2.4	<0.001
Peak AV gradient, mm Hg	91.5±26.2	37.5±5.5	<0.001
LV mass (grams)	211.7±75.5	184.1±58.8	0.45

Patent Conduit









Occluded Conduit

