

POSTER PRESENTATION

Open Access

Haemodynamic flow abnormalities in bicuspid aortic valve disease improve with aortic valve replacement

Malenka M Bissell^{1*}, Margaret Loudon¹, Aaron T Hess¹, Victoria Stoll¹, Elizabeth Orchard², Stefan Neubauer¹, Saul G Myerson¹

From 18th Annual SCMR Scientific Sessions
Nice, France. 4-7 February 2015

Background

Bicuspid aortic valve disease (BAV) is associated with dilatation of the proximal aorta and abnormal flow patterns, particularly increased helical flow and changes in the aortic wall shear stress. These altered flow patterns may be partly responsible for the aortic dilation, though the aetiology is still unclear. Aortic valve replacement can modify the flow pattern in the proximal aorta (potentially to normal) and could thus have an effect on future aortic dilation. In this study, we aimed to assess the effect of different types of aortic valve replacement (AVR) on aortic flow patterns.

Methods

We prospectively enrolled 69 participants: 23 BAV patients with prior AVR (10 mechanical, 6 bioprosthetic, 7 Ross procedure), 23 BAV patients with a native aortic valve and 23 healthy volunteers. All underwent 4D flow cardiovascular magnetic resonance.

Results

The majority of patients with mechanical AVR or Ross showed a normalised flow pattern (70% and 57% respectively) with near normal rotational flow values (7.4 ± 3.9 and $11.0 \pm 12.0 \text{ mm}^2/\text{s}$ respectively; normal range -5 to $+11 \text{ mm}^2/\text{s}$); and reduced in-plane wall shear stress compared to native BAV ($0.13 \pm 0.18 \text{ N/m}^2$ for mechanical AVR vs. $0.37 \pm 0.26 \text{ N/m}^2$ for native BAV, $p < 0.05$). In contrast, all subjects with bioprosthetic AVR showed abnormal flow patterns (mainly marked right-handed helical flow), with similar rotational flow values to native

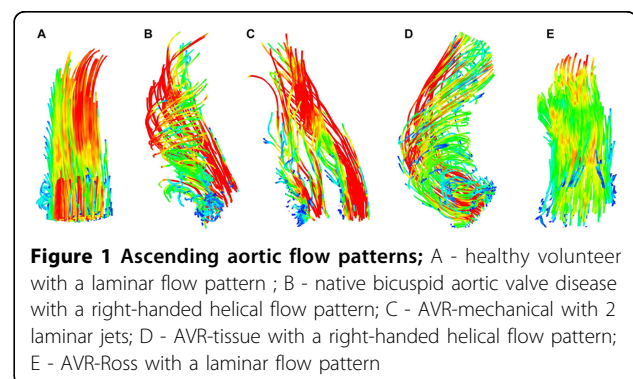
BAV ($25.3 \pm 15.0 \text{ mm}^2/\text{s}$ and $20.1 \pm 11.0 \text{ mm}^2/\text{s}$ respectively, $p > 0.05$) and similar wall shear stress pattern. Data before and after AVR ($n = 13$) supported these findings: mechanical AVR showed a significant reduction in rotational flow (29.3 ± 15.1 to $7.9 \pm 4.2 \text{ mm}^2/\text{s}$, $p < 0.05$) and in-plane wall shear stress (0.45 ± 0.19 to $0.20 \pm 0.12 \text{ N/m}^2$, $p < 0.05$), whereas these remained unchanged in the bioprosthetic AVR group.

Conclusions

Abnormal flow patterns in BAV are significantly reduced after mechanical AVR or Ross procedure, but remain similar after bioprosthetic AVR. This is the first insight indicating that type of valve replacement may influence post-operative flow patterns, and could have important implications for future aortic growth.

Funding

This study was funded by the British Heart Foundation.



¹University of Oxford, Oxford, UK

Full list of author information is available at the end of the article

Authors' details

¹University of Oxford, Oxford, UK. ²Cardiology, John Radcliffe Hospital, Oxford, UK.

Published: 3 February 2015

doi:10.1186/1532-429X-17-S1-P330

Cite this article as: Bissell *et al.*: Haemodynamic flow abnormalities in bicuspid aortic valve disease improve with aortic valve replacement. *Journal of Cardiovascular Magnetic Resonance* 2015 **17**(Suppl 1):P330.

**Submit your next manuscript to BioMed Central
and take full advantage of:**

- Convenient online submission
- Thorough peer review
- No space constraints or color figure charges
- Immediate publication on acceptance
- Inclusion in PubMed, CAS, Scopus and Google Scholar
- Research which is freely available for redistribution

Submit your manuscript at
www.biomedcentral.com/submit

