

## YIA-5

### Ascending aortic haemodynamic flow changes are stable in bicuspid aortic valve disease

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#### Introduction:

Aortic dilation in bicuspid aortic valve disease is thought to be at least in part caused by helical flow changes in the ascending aorta. We sought to examine whether these haemodynamic changes develop over time.

#### Methods:

All participants from our initial cohort were invited to undergo a 4D flow MRI assessment 3 years after the initial visit. The datasets were analysed using well described CMR parameters. Aortic valve function and ascending aortic diameters were assessed using 2D flow and anatomical MRI sequences.

#### Results:

64/100 participants returned for follow-up at a mean of 3.4 years (2.8 to 4.4). Of the remaining 36 participants 16 had undergone aortic valve ( $\pm$  ascending aortic) replacement (AVR $\pm$ AA), 3 had undergone valve repair, 1 patient had died of endocarditis, 2 had MRI contraindications at follow-up, 12 declined follow-up and 2 were lost to follow-up. Age range at initial study visit was 8-69 years. Mean ascending aortic growth was 0.3mm (range 0-1.7mm/year). There was no difference in growth rate between the flow groups normal flow, right-handed helical flow and complex flow ( $p=0.78$ ). There was also no statistically significant progression of flow angle, flow displacement, rotational flow and wall shear stress. Interestingly, 4/6 (67%) patients with a left-handed flow underwent AVR+-AA, compared to 19% in the right-handed flow group.

15/64 (23%) participants had an aortic growth rate  $> 0.5$ mm/year. Even in this group progression of haemodynamic flow abnormalities was minimal: Peak velocity 2.4 $\pm$ 0.6 m/s to 2.4 $\pm$ 0.6 m/s; flow angle 20 $\pm$ 8 degree to 20 $\pm$ 10 degree; normalised flow displacement 0.139 $\pm$ 0.063 to 0.144 $\pm$ 0.51; wall shear stress 0.88 $\pm$ 0.28 to 0.96 $\pm$ 0.40.

#### Conclusion:

This is the first large prospective longitudinal follow-up study examining haemodynamic flow changes using 4D flow MRI. We have shown that both ascending aortic growth and haemodynamic flow changes are largely stable over a 3 year follow-up period suggesting slow disease progression in the majority of patients. Previous work has shown left handed helical flow is not seen in health and a high proportion of these participants underwent aortic valve or ascending aortic surgery, suggesting that left handed helical flow may be a predictor of likelihood of intervention.