The Bicuspid Aortic Valve in Turner Syndrome: a Fetal Morphology Study

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Background
Bicuspid aortic valve (BAV) is the most common congenital heart defect. Recent animal studies have suggested BAVs with different leaflet orientations to be of distinct etiologic origin. BAV leaflet orientation may have prognostic significance in terms of valve disease, aortic dilatation and necessity for intervention. BAV is particularly common in Turner syndrome (TS) and 95% of BAVs in adult patients with TS were shown to have anterior-posterior (AP) leaflet orientation, due to fusion of right- and left coronary leaflets. Data in fetal stages are scarce. Available data indicate that a larger proportion TS fetuses with BAV has a latero-lateral (LA) orientation of the leaflets (fusion of the right or left coronary leaflets with the non-coronary leaflet). This might indicate a worse prognosis with a higher risk of fetal demise in BAVs with LA orientation, possibly due to associated congenital heart disease. The aim of our study was to gain insight in the morphology of the aortic valve and its associated cardiovascular malformations in prenatal hearts of TS patients.

Methods and Results
We studied post-mortem heart specimens of 36 TS fetuses and 1 TS newborn. Abnormal aortic valve morphology was observed in 32 of 37 (86%) hearts: BAV was observed in 28 (76%) hearts, unicommissural aortic valve in 2 (5%) and aortic atresia in 2 (5%) hearts. In hearts with BAV that could be reinvestigated (n = 18), the leaflets showed AP orientation in 61% and latero-lateral (LA) orientation in 39%. There were no significant differences in the overall occurrence of additional cardiovascular malformations between hearts with AP- or LA orientation of the BAV leaflets. However, all hearts with LA orientation showed ascending aorta hypoplasia and tubular hypoplasia of the B-segment, as opposed to 55% and 64% of hearts with AP orientation respectively.

Conclusion
A large proportion of TS fetuses have abnormal aortic valve morphology. The proportion of BAV with LA orientation is higher in fetuses than in adults with TS. Fetal TS hearts with LA leaflet orientation were all associated with severe pathology of the aorta, which may contribute to a worse prognosis of LA oriented BAV in TS.