The relationship of bicuspid aortic valve phenotype and pattern of aortopathy: a meta-analysis

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Background - Aortopathy in patients with bicuspid aortic valve (BAV) is increasingly recognized to be a heterogeneous disease entity. Likewise, many studies suggest that the bicuspid valve morphology influences aortic dilatation, but the association of the two is controversial. We therefore, compared, in a meta-analysis, the effect of right-left coronary cusp fusion (RL) and right-non coronary cusp fusion (RN) on the pattern of aortic dilatation.

Methods – Up to November 2017, a systematic search was conducted to identify all studies that compared aortic dimensions in patients with BAV. Raw mean differences in millimeters was analyzed using Comprehensive Meta Analysis software (version 3), and data was combined using random-effect model.

Results - Twenty studies reported aortic dimensions for 3854 patients with RL and 1735 patients with RN BAV (with or without raphe). Indexed and non-indexed values were compared at the level of aortic annulus, sinuses of Valsalva, sinotubular junction and ascending aorta. Using indexed values showed only the sinuses of the Valsalva wider in RL BAV patients (mean difference 1.84 (95% CI: 0.46–3.23), $p < 0.009$, I2 = 90.4%) (Fig 1). Using non-indexed values showed the annulus (mean difference 1.38 (95% CI: 0.62–2.13), $p < 0.000$, I2 = 84%), sinuses of Valsalva (mean difference 2.94 (95% CI: 1.75–4.12), $p < 0.000$, I2 = 88.2%), and sinotubular junction (mean difference 1.28 (95% CI: 0.27–2.29), $p < 0.013$, I2 = 76.8%) wider in RL BAV patients but similar ascending aorta diameter (mean difference 0.14 (95% CI: -1.16–1.44), $p < 0.83$, I2 = 87.4%).

Conclusions – The meta-analysis found an association between BAV morphology and the pattern of aortic dilatation, suggesting a contributing effect of the transvalvular flow direction and its relationship with the wall. This does not necessarily exclude differences of development style and tissue composition. Thus, categorizing BAV subtypes may serve as a clinical tool for optimum follow-up strategies in order to provide optimum evidence based management.

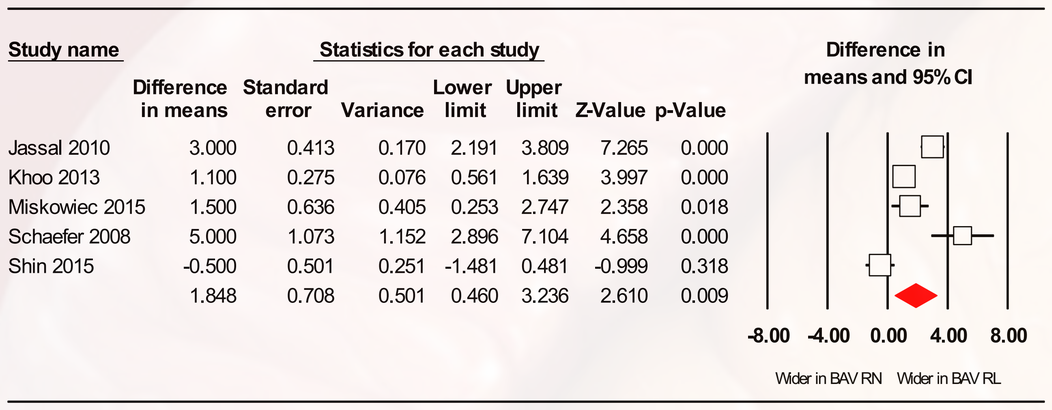

Figure 1. Difference in means of indexed values of BAV RN versus BAV RL at the level of sinuses of valsalva. Pooled effects showed significant difference between the two groups.

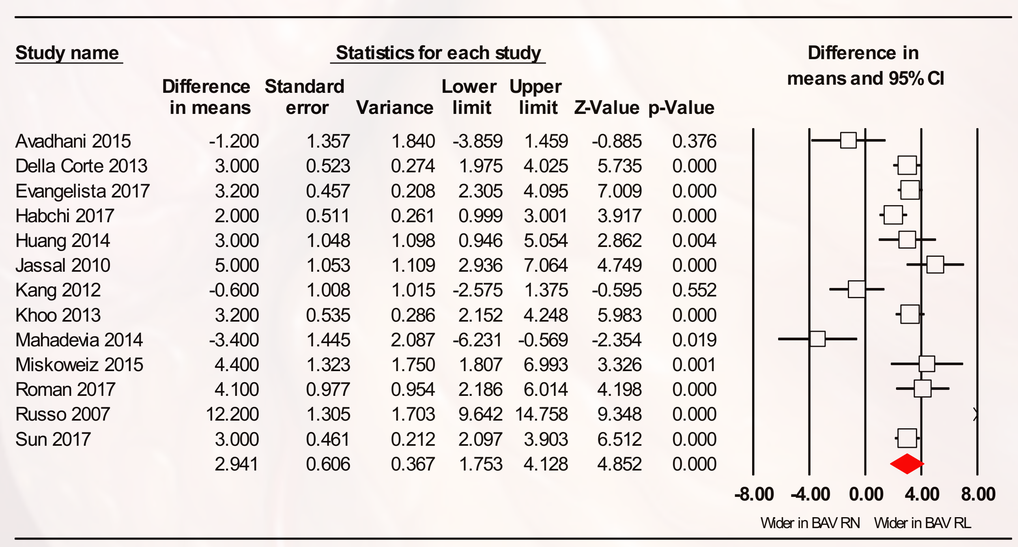

Figure 3. Difference in means of non-indexed values of BAV RN versus BAV RL at the level of sinuses of valsalva. Pooled effects showed significant difference between the two groups.

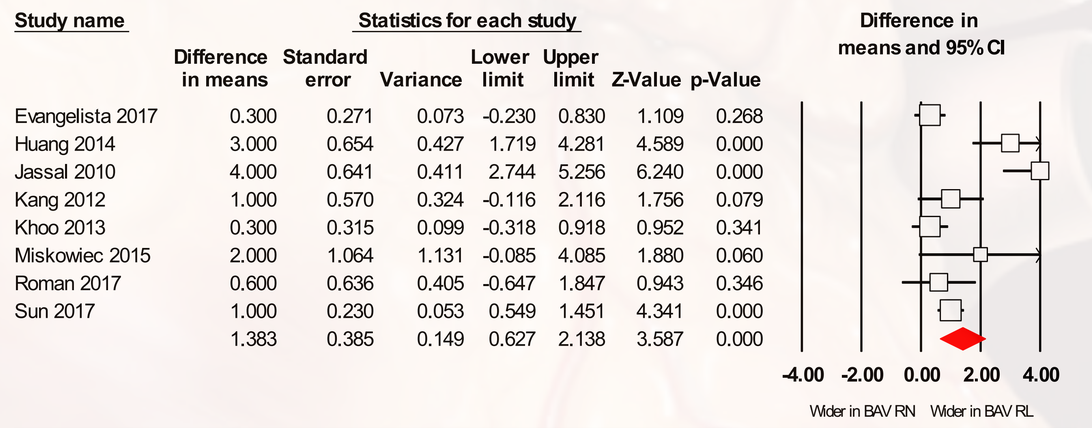

Figure 2. Difference in means of non-indexed values of BAV RN versus BAV RL at the level of aortic anulus. Pooled effects showed significant difference between the two groups.

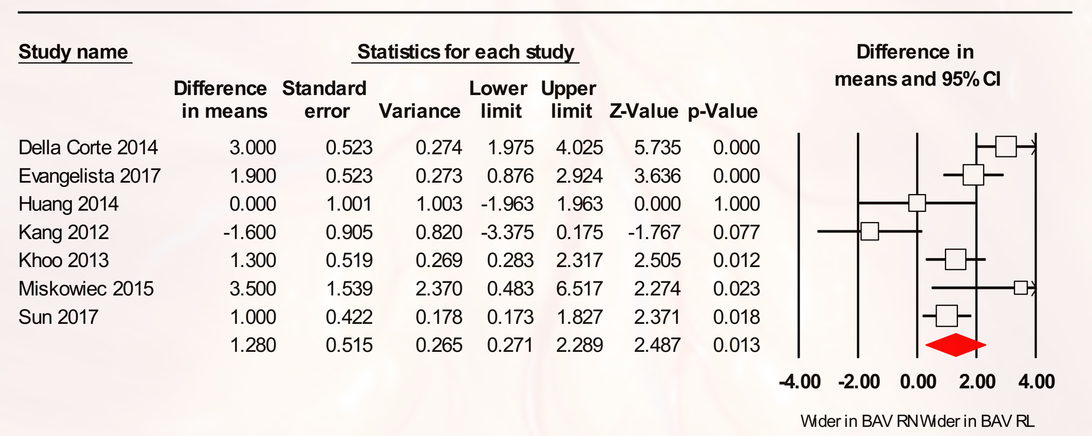

Figure 4. Difference in means of non-indexed values of BAV RN versus BAV RL at the level of sinutubular junction. Pooled effects showed significant difference between the two groups.

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