Associations of Lifelong Exercise Characteristics with Valvular Function and Aortic Diameters in Subjects with a Bicuspid Aortic Valve

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Background: Whether exercise-induced hemodynamic stress accelerates the development of valvular dysfunction and aortic dilatation in subjects with a bicuspid aortic valve (BAV) is unclear.

Purpose: To examine the association between lifelong exercise characteristics (i.e. exercise volume, exercise intensity and type of exercise), valvular dysfunction and aortic dilatation in subjects with BAV.

Methods: Adults with BAV were classified as inactive (<500 metabolic equivalent of task minutes per week [MET-min/wk]), active (500-1000 MET-min/wk) or highly active (≥1000 MET-min/wk) based on their reported lifetime exercise characteristics. Subjects’ lifelong predominant exercise intensity was classified as moderate (3-6 MET) or vigorous (≥6 MET) and predominant sport type as skill, power, mixed or endurance. Transthoracic echocardiography was used to assess the presence of aortic stenosis (AS) or regurgitation (AR) and to measure aortic diameters at the sinus of Valsalva (SV) and in the ascending aorta (AA). Aortic dilatation was defined as a Z-score ≥ 2.

Results: 407 subjects (42 ± 17 years old, 60% male) were included of which 133 were inactive, 94 active and 180 highly active. 61 subjects did not perform exercise, whereas 136 and 207 subjects predominantly participated in moderate or vigorous intensity exercise, respectively. Subjects performing sports were allocated to the skill (n=12), power (n=41), mixed (n=218), endurance (n=75) or non-dominant (n=24) exercise type group. Moderate-to-severe AS or AR was present in 96 (23.6%) and 81 (19.9%) subjects, respectively. SV and AA diameters were 34.8 ± 6.6 and 36.5 ± 8.1 mm, whereas 74 (18.2%) and 194 (47.7%) subjects had a Z-score ≥ 2. Exercise volume was not associated with valve dysfunction or aortic dilatation. Vigorous intensity exercise and mixed sports were associated with lower odds ratios for the risk of moderate-to-severe AS (ORadjusted: 0.43 (0.20-0.94) and ORadjusted: 0.47 (0.23-0.95), respectively). Exercise intensity and sport type were not associated with AR and aortic dilatation (Figure 1).

Conclusions: We found no deleterious associations between lifelong exercise characteristics, valvular dysfunction and aortic dilatation in subjects with BAV. In contrast, vigorous intensity and mixed sports were associated with a lower risk for moderate-to-severe AS. These observations suggest that lifelong exercise does not appear to induce deleterious cardiovascular effects in subjects with BAV.

Figure 1: Association between lifelong exercise characteristics, valvular dysfunction (Panel A en B) and aortic dilatation (Panel C en D).

Dominant exercise intensity or sport type are defined as >50% of their total exercise volume performed. Outcomes were dichotomized and defined as yes or no. Odds ratios from multivariable-adjusted logistic regression analyses are reported with 95% confidence intervals. MET = metabolic equivalent of a task.