

Variation in Ascending Thoracic Aorta position: an analysis by computed tomography

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Background: There is limited evidence in current literature that demonstrates the prevalence of ascending thoracic aortic variation in relation to the sternum in the general, or diseased population. This measurement has become an important factor in decision-making in aortic valve procedures such as Trans-Catheter Aortic Valve Implantation (TAVI) and Minimally Invasive Cardiac Surgery (MICS).

Methods: We conducted a cross sectional study in the Western Cape Province of South Africa. We evaluated the Thoracic CT scans of patients who underwent minimally invasive Aortic Valve Surgery (TAVI) from 2014-2017 (n=25) and compared these to Thoracic CT scans from a randomly selected sample population from the same general population (n=100). Three parameters of ascending thoracic aorta variation were measured.

Results: Mean aorta distance from sternum of 28,01 mm [95%CI: 24.56 - 31.48] in cases and 27,34 mm [95% CI: 25.49 - 29.20] in controls

was noted ($p < 0.001$). In the total population, the mean position of the aorta relative to the sternum, favoured the aorta being more than 50% of its diameter to the right, with 72% [95% CI: 51.11–86.34] in cases and 92% [95% CI: 84.67 - 96.00] in controls. Aorto-ventricular angle showed a mean angle (degrees) of 47.92 [95%CI: 44.36-51.23] in cases compared to 37.06 [95%CI: 35.03-39.09] in controls ($p < 0.001$). A linear relationship of aorto-ventricular angle compared to age was demonstrated.

Conclusion: The results obtained in this statistical analysis of ascending thoracic aorta position, indicates that patients presenting for aortic valve surgery, especially older patients (>70yrs) have favourable anatomy for MICS through a right thoracotomy. The aortic distance from the sternum was larger in the exposed group > 60 years. The aorto-ventricular angle in aortic stenosis patients was 10° more than the general population, regardless of age. This angle increases linearly with age in both groups.