Influence of Differential Calcification in the Descending Thoracic Aorta on Aortic Pulse Pressure

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BACKGROUND
• Multiple studies have shown pulse pressure to be a strong predictor of aortic calcification.
• However, no studies are available that correlate pulse pressure with aortic calcification at the segmental level.

HYPOTHESIS
• To check the correlation of pulse pressure with aortic calcification at different segments of thoracic aorta.

METHODS
• We identified 37 patients with pulse pressure measured in the aorta during cardiac catheterization.
• The non-contrast chest computed tomography scans of these patients were evaluated for the presence of calcium in different segments of thoracic aorta (ascending aorta, arch of aorta, and descending aorta) and calcium score was quantified.
• Patients without calcification (Group A) were compared with patients with calcification (Group B) in terms of pulse pressure, calcification, and compliance.

RESULTS
• The mean of the total calcium score was higher in the descending aorta than the arch and ascending aorta (691 vs 571 vs 131 respectively, P<0.0001).
• Pulse pressure had the strongest correlation with calcification in the descending aorta (r=0.47, P=0.004).
• Group A had a much higher pulse pressure than Group B.
• The difference of pulse pressure when Group A was compared to Group B was greatest in the descending aorta (20 mmHg, P<0.0001) and least in the arch (5 mmHg, P=0.38), whereas the ascending aorta displayed intermediate difference (10 mmHg, P=0.12).
• The difference in compliance when Group A was compared to Group B was also greater in the descending aorta (0.71 ml/mmHg, P=0.02) compared to the arch (0.15 ml/mmHg, P=0.57) and ascending aorta (0.54 ml/mmHg, P=0.03).

Figure 1: Aortic calcium score rises with increasing distance from the aortic valve(top). Difference in pulse pressure (middle) and difference in compliance (bottom) between non-calcified and calcified aorta is the highest in the descending aorta.

Figure 2: Sagittal view of an aorta with out calcification (left), and aorta with calcification (right).

LIMITATIONS
• Retrospective study
• Small Sample Size
• Cross-sectional study

CONCLUSIONS
These are the first data to evaluate the relative impact of aortic segments on pulse pressure. The greatest amount of calcification and greatest change in pulse pressure and compliance being in the descending aorta makes the case that the descending aorta plays a major role in pulse pressure, compared with other segments of the thoracic aorta.