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# Normal reference values for thoracic and abdominal aorta and main pulmonary artery dimensions by cardiovascular magnetic resonance: the Framingham heart study

Michael L Chuang<sup>1\*</sup>, Philimon Gona<sup>1</sup>, Carol J Salton<sup>2</sup>, Connie W Tsao<sup>1,2</sup>, Susan B Yeon<sup>2</sup>, Christopher J O'Donnell<sup>1</sup>, Warren J Manning<sup>2</sup>*From* 16th Annual SCMR Scientific Sessions  
San Francisco, CA, USA. 31 January - 3 February 2013**Background**

Enlargement of the aorta or main pulmonary artery (MPA) is associated with cardiopulmonary disease, and an increased MPA-to-ascending aorta ratio is associated with pulmonary hypertension. We sought to determine mean and upper 90th percentile (p90) diameters of the thoracic and abdominal aorta and MPA in a longitudinally-followed adult cohort without clinical cardiopulmonary disease.

**Methods**

1794 Framingham Heart Study Offspring cohort members (65±9 yrs, 844 men) underwent ECG-gated, free breathing T2-weighted black-blood TSE at 1.5T (Philips Gyroscan NT, TR=3RR, TE=45ms, trigger delay=75ms (thorax) or 125ms (abdomen), 1.03x0.64-mm<sup>2</sup> in-plane resolution, THK=5mm, Gap=5 (abdomen) or 10mm (thorax)). Ascending (ASC) and descending thoracic (DTA) aortic and MPA diameters were measured at MPA-bifurcation level, abdominal (ABD) aorta was measured 5 mm above renal artery origins. We determined sex-specific mean, SD and p90 values for vessel diameters and MPA/ASC ratio in a healthy referent group free of hypertension (SBP≥140 or DBP≥90 mmHg or on medication), obesity (body mass index≥30 kg/m<sup>2</sup>), emphysema, prevalent myocardial infarction or heart failure, and any smoking history. Men were compared to women using 2-sample t test. We also indexed vessel diameters to sex-and-vessel specific allometric powers of

height (HT<sup>β</sup>); β's were determined by linear regression of log(HT) to log(diameter). Indexation to HT<sup>β</sup> was selected since indexation to HT or body surface area (BSA) resulted in significant inverse correlations of vessel diameters to HT and/or BSA.

**Results**

370 Offspring (62±9 yrs) met referent-group criteria. Men had greater aortic (at all levels) and MPA diameters than women both before and after indexation to HT<sup>β</sup>. The β values corresponding to ASC, DTA, ABD and MPA were 0.22, 0.30, 0.11 and 0.29, respectively, in men, and 0.10, 0.39, 0.37 and 0.48 in women. Vessel diameters indexed to HT<sup>β</sup> were correlated with neither HT nor BSA. The MPA/ASC ratio did not differ between sexes. The mean±SD and upper limits (p90) for raw and indexed vessel diameters and MPA/ASC ratio are shown (Table).

**Conclusions**

We present CMR-derived sex-specific upper 90th percentile values for aortic and MPA diameters and MPA/ASC ratio derived from a cohort of longitudinally-followed, community dwelling adults free of clinical cardiac and pulmonary disease. These p90 thresholds may be useful for identification of cardiopulmonary pathology.

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<sup>1</sup>NHLBI's Framingham Heart Study, Framingham, MA, USA  
Full list of author information is available at the end of the article

**Table 1**

|                      | Men       | p90 (Men) | Women     | p90 (Women) |
|----------------------|-----------|-----------|-----------|-------------|
| ASC, mm              | 31.1±2.9  | 34.9      | 28.5±3.1  | 31.8        |
| DTA, mm              | 23.0±2.0  | 25.3      | 20.2±1.8  | 22.7        |
| ABD, mm              | 17.9±1.6  | 20.0      | 15.3±1.5  | 17.3        |
| MPA, mm              | 23.4±2.9  | 26.6      | 21.3±3.1  | 24.2        |
| ASC/HT <sup>β</sup>  | 27.5±2.6  | 30.9      | 27.1±2.9  | 30.4        |
| DTA/ HT <sup>β</sup> | 19.4±1.7  | 21.4      | 16.7±1.5  | 18.6        |
| ABD/ HT <sup>β</sup> | 16.8±1.5  | 18.9      | 12.8±1.3  | 14.4        |
| MPA/ HT <sup>β</sup> | 19.9±2.5  | 22.5      | 16.9±2.4  | 19.1        |
| MPA/ASC              | 0.76±0.10 | 0.88      | 0.75±0.15 | 0.87        |

**Author details**

<sup>1</sup>NHLBI's Framingham Heart Study, Framingham, MA, USA. <sup>2</sup>Cardiovascular Division, Beth Israel Deaconess Medical Center, Boston, MA, USA.

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