Gender Related Variation in the Aorta and Iliofemoral Arteries in Patient Undergoing Transcatheter Aortic Valve Replacement

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Abstract:
Gender Related Variation in the Aorta and iliofemoral Arteries in Patients Undergoing Transcatheter Aortic Valve Replacement
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Background: Determining aortic valve and vascular size is needed in order to determine feasibility of performing a transcatheter aortic valve replacement (TAVR). Variations in size of the aortic valve and iliofemoral arteries can impact TAVR size and deliverability, respectively. To determine if gender variations exists in the aorta and iliofemoral arteries this study was undertaken.

Methods: One-hundred fifty-one patients undergoing TAVR were studied. Aorta and iliofemoral artery areas were obtained from pre-procedural computed tomography imaging and compared between genders. Specifically, the following areas were determined: aortic annulus (mid systole), sinotubular junction, ascending aorta (4 cm above annulus), right and left common iliac arteries, right and left external iliac arteries, and right and left femoral arteries. Non-adjusted area and adjusted area for body surface area (BSA) were determined.

Results: Non-adjusted areas were significantly greater in men for aortic annulus, sinotubular junction, ascending aorta, left and right iliac arteries, and left and right femoral arteries (5.29±0.83 vs. 4.27±0.78 cm^2, p<0.0001; 6.86±1.57 vs. 5.70 ±1.43 cm^2, p<0.0001; 8.80±1.69 vs. 7.98±1.64 cm^2, p<0.005; 0.52±0.19 vs. 0.42 ±0.15 cm^2, p<0.005; 0.50±.016 vs. 0.38±0.13 cm^2, p<0.0001, 0.48±0.18 vs. 0.40±0.14 cm^2, p<0.005; 0.47±0.16 vs. 0.40±0.12 cm^2, p=<0.05, respectively). After adjusting for BSA, areas were significantly greater in men for aortic annulus, sinotubular junction, and left iliac and femoral arteries (2.63±0.42 vs. 2.36±0.36 cm^2, p<0.0001; 3.40±0.73 vs. 3.16±0.71 cm^2, p <0.0001; 0.26±0.09 vs. 0.23±0.08 cm^2, p= 0.04; 0.25±0.08 vs. 0.21±0.07, p= 0.01 cm^2, respectively).

Conclusions: Gender variations in the aorta and iliofemoral artery areas persisted even after adjusting for BSA. This information may be useful when planning TAVR procedures

Background

- Transcatheter aortic valve replacement (TAVR) has been an enormous advancement in the treatment of patients with severe aortic stenosis
- Over the last decade, several trials have shown safety and efficacy of TAVR in low, intermediate and high-risk surgical patients
- Pre-procedural evaluation and risk stratification plays an important part in assessing the feasibility of performing a TAVR
- Computed tomography imaging is used to determining appropriate aortic valve replacement size and assess vascular anatomy for valve deliverability
- This study was undertaken to determine if gender variations exist in the aorta and iliofemoral arteries of patients undergoing TAVR

Methods

- 151 patients with tricuspid aortic valve stenosis undergoing TAVR in a tertiary referring medical center from 6/2018-1/2019 were studied
- Aorta and iliofemoral artery areas were obtained from pre-procedural computed tomography imaging and compared between genders
- Specifically, the following areas were determined: aortic annulus mid systole (AAMS), sinotubular junction (STJ), ascending aorta (4 cm above annulus), right and left common iliac arteries (R/L CIA), right and left external iliac arteries (R/L EIA), and right and left femoral arteries (R/L FA)
- Non-adjusted area and adjusted area for body surface area (BSA) were determined for all patients (BSA was calculated using the Dubois & Dubois formula)

Results

Thoracic Aorta Non Adjusted for BSA

Measurement (cm^2)	Mean ± SD (Male)	Mean ± SD (Female)	% Difference	P Value
Aortic Annulus Mid systole Area	5.29 ± 0.83	4.27 ± 0.78	23.89	<0.0001
STJ Area	6.86 ± 1.57	5.70 ± 1.43	20.35	<0.0001
Max Ascending Aorta (4 cm above annulus) Area	8.80 ± 1.69	7.98 ± 1.64	10.28	<0.005

Thoracic Aorta Adjusted for BSA

Measurement (cm^2)	Mean ± SD (Male)	Mean ± SD (Female)	% Difference	P Value
Aortic Annulus Mid systole Area	2.63 ± 0.42	2.36 ± 0.36	11.44	<0.0001
STJ Area	3.40 ± 0.73	3.16 ± 0.71	7.59	0.04
Max Ascending Aorta (4 cm above annulus) Area	4.38 ± 0.83	4.45 ± 0.97	1.57	0.61

Iliofemoral Arteries Non Adjusted for BSA

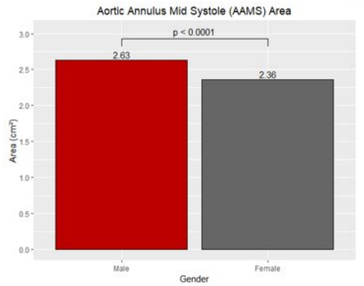
Measurement (cm^2)	Mean ± SD (Male)	Mean ± SD (Female)	% Difference	P Value
LCI Area	0.65 ± 0.27	0.58 ± 0.21	12.07	0.11
LEI Area	0.52 ± 0.19	0.42 ± 0.15	23.81	<0.005
LFA Area	0.50 ± 0.16	0.38 ± 0.13	31.58	<0.0001
RCI Area	0.63 ± 0.25	0.58 ± 0.83	8.62	0.25
REI Area	0.48 ± 0.18	0.40 ± 0.14	20.00	<0.005
RFA Area	0.47 ± 0.16	0.40 ± 0.12	17.50	<0.05

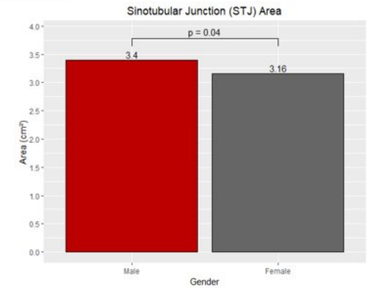
Iliofemoral Arteries Adjusted for BSA

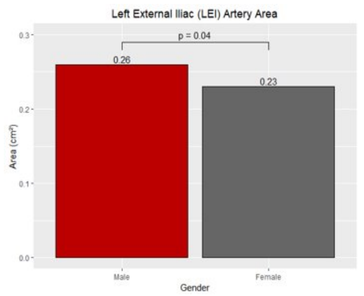
Measurement (cm^2)	Mean ± SD (Male)	Mean ± SD (Female)	% Difference	P Value
LCI Area	0.32 ± 0.13	0.32 ± 0.11	0.00	0.95
LEI Area	0.26 ± 0.09	0.23 ± 0.08	11.50	0.04
LFA Area	0.25 ± 0.08	0.21 ± 0.07	19.05	0.01
RCI Area	0.31 ± 0.12	0.32 ± 0.13	3.03	0.58
REI Area	0.24 ± 0.08	0.22 ± 0.07	9.09	0.17
RFA Area	0.23 ± 0.08	0.22 ± 0.06	4.55	0.39

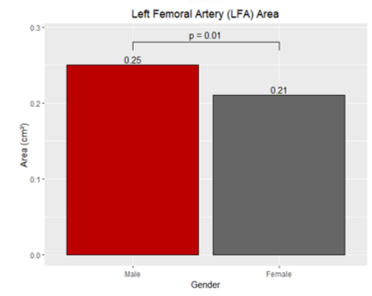
- Prior to adjustment for BSA, males had larger than female AAMS, STJ, MAA, R/L EI, R/L FA areas
  - No variation was observed in the R/L CI artery areas
- Following adjustment for BSA, males had larger than female AAMS, STJ, LEI, LFA areas
  - No variation was observed in the MAA, R/L CI, REI, RFA areas

Adjusted Measurements:









Conclusions

- Non adjustment for BSA showed that males had larger than female aortic annulus, sinotubular junction, maximum ascending aorta, right and left external iliac, right and left femoral artery areas.
  - No variation was observed in the right and left common iliac arteries
- Following adjustment for BSA, males had larger than female aortic annulus, sinotubular junction, left external iliac, and left femoral artery areas.
  - No variation was observed in the right external iliac and right femoral arteries following adjustment for BSA
- Gender variations in the aorta and iliofemoral artery areas persisted even after adjusting for BSA. This information may be useful when planning TAVR procedures