

Quantification of Aortic Cusp Parameters Using Computed Tomography in Valve-sparing Aortic Root Replacement Surgery: A Prospective Study

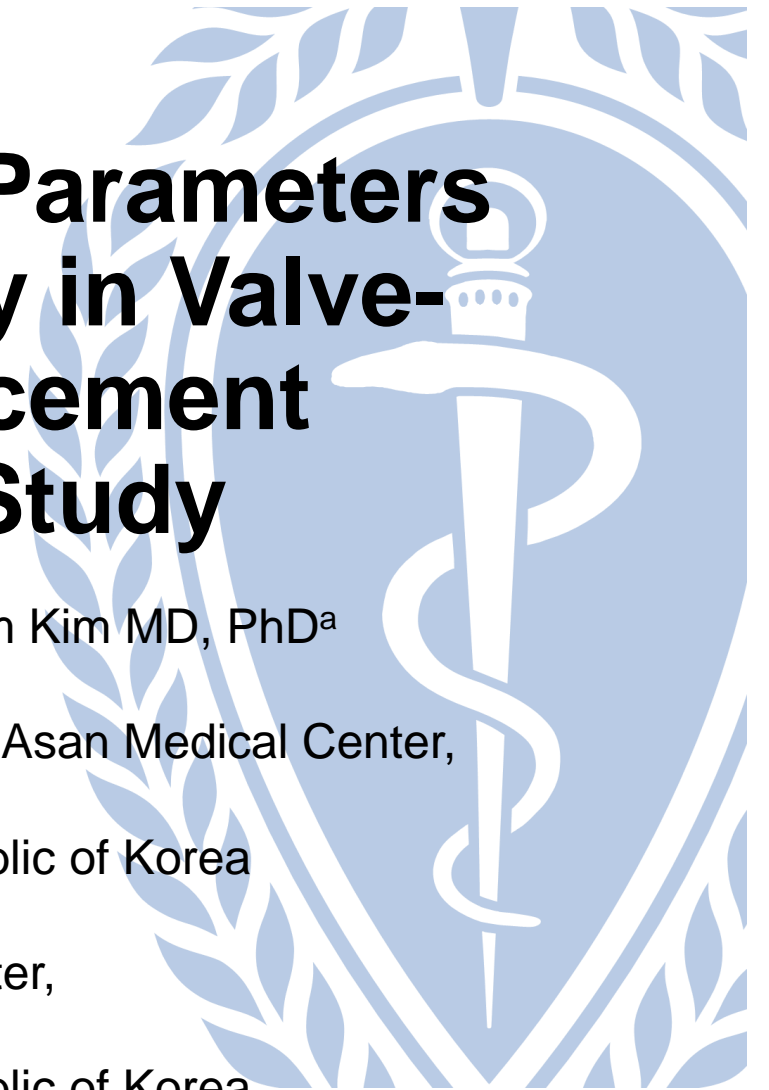
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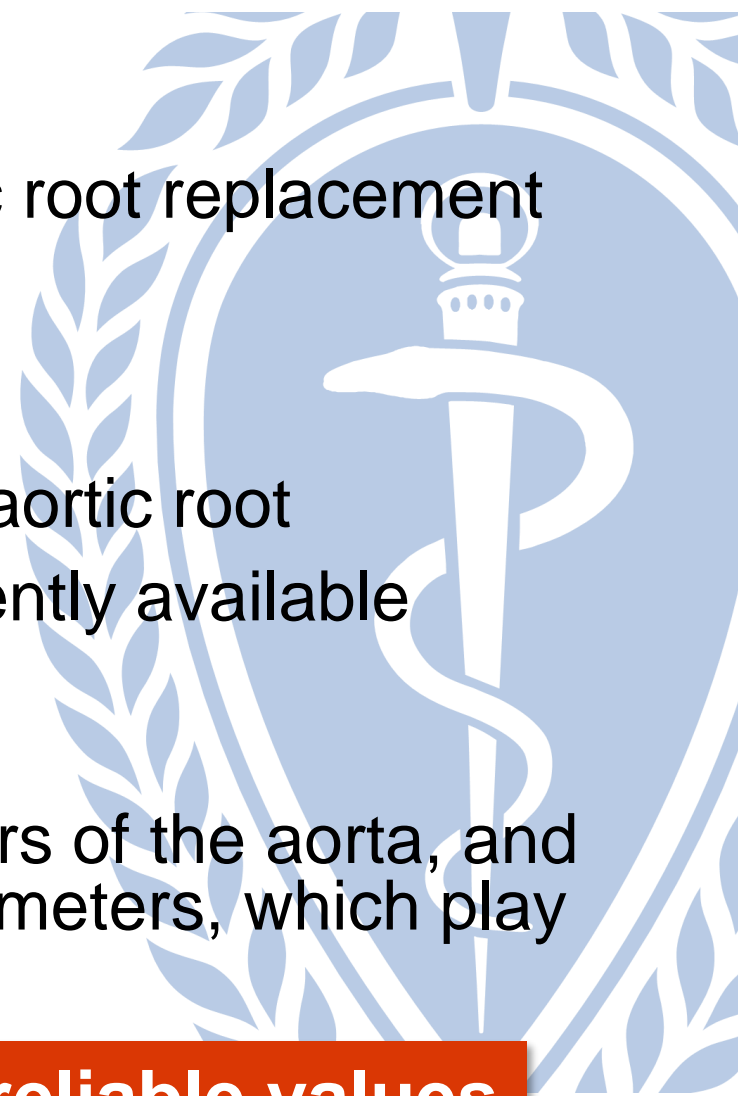
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Objectives

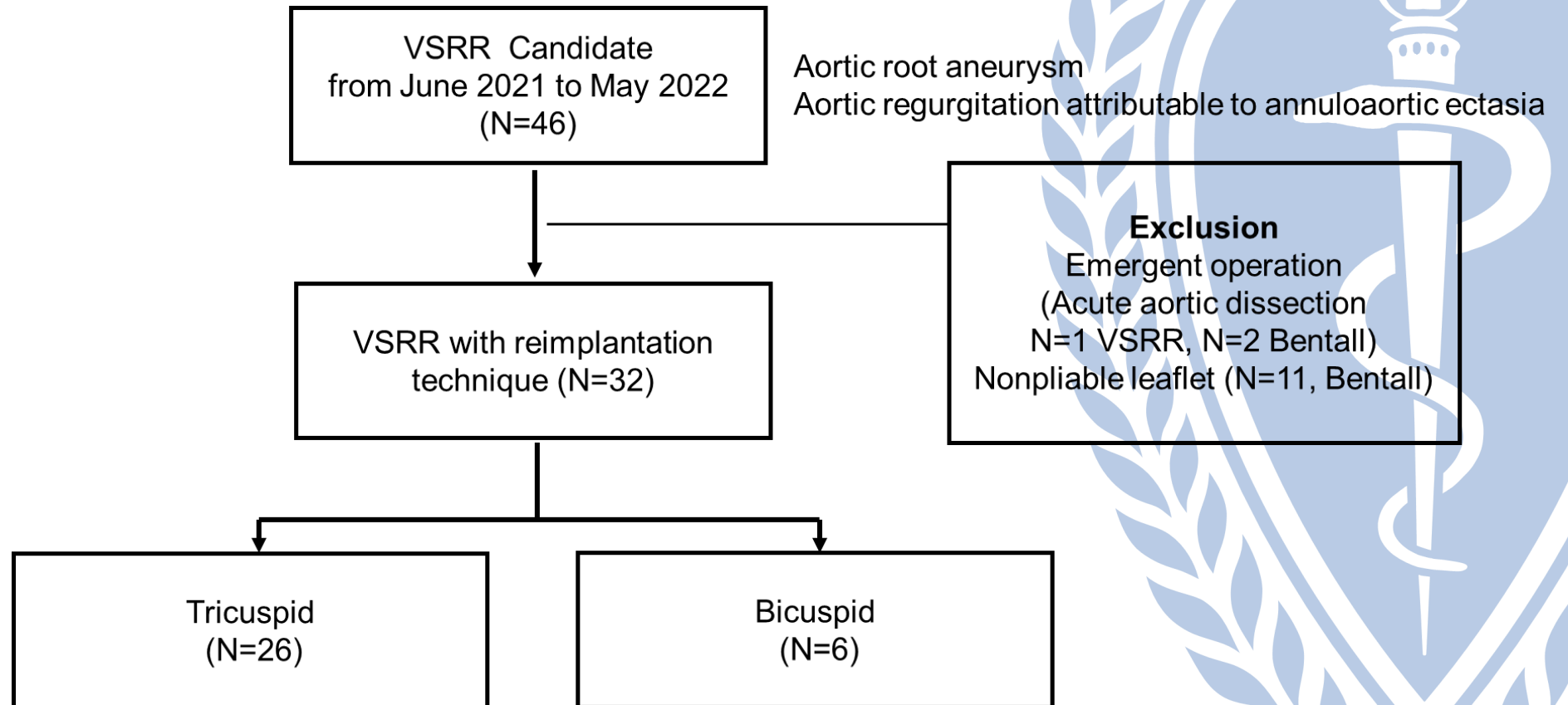
- Determining the feasibility of valve-sparing aortic root replacement (VSRR)
 - Achieving a successful aortic valve repair
 - Requires a comprehensive understanding of the aortic root
 - Accurate preoperative measurements using currently available imaging modalities
- Most relevant prior studies focused on parameters of the aorta, and only a few studies have evaluated the cusp parameters, which play a critical role in competent valve function.

Can computed tomography (CT) offer reliable values for the planning of VSRR ?



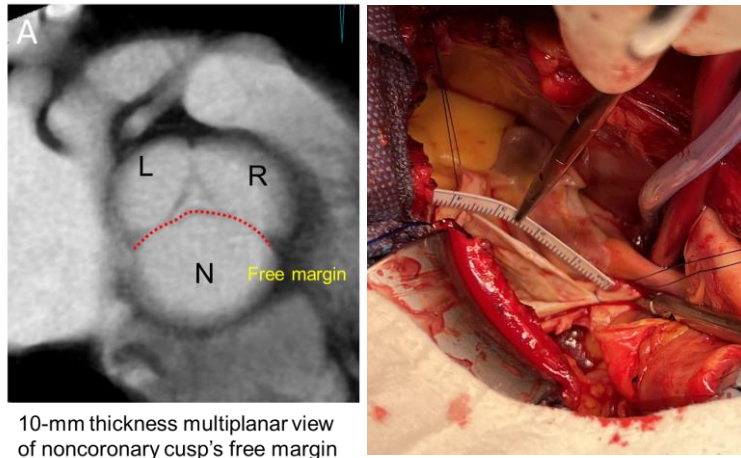
Methods

Prospective trial

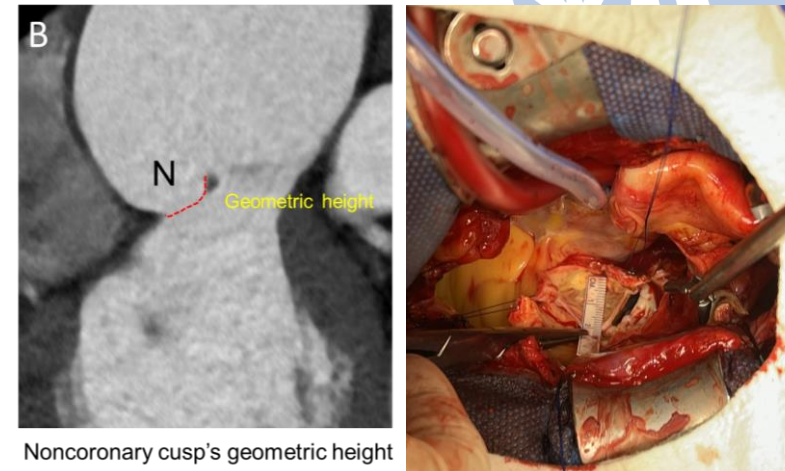


- The aortic cusp profiles, including **the free-margin length** and **geometric height**, were measured on preoperative cardiac CT.
- Comparisons between preoperative cardiac CT and intraoperative measurement of the aortic valve cusp
 - performed by Bland–Altman plots and the interclass-correlation method.

Free margin length



Geometric height



Results

Baseline characteristics

Variables	Overall patients (n = 32)
Age, years	53.5 [39.5–61.0]
Female sex, n (%)	5 (15.6)
Hypertension, n (%)	17 (53.1)
Diabetes mellitus, n (%)	2 (6.2)
Atrial fibrillation, n (%)	1 (3.1)
Chronic renal failure, n (%)	2 (6.2)
Bicuspid aortic valve, n (%)	6 (18.8)
Aortic regurgitation, n (%)	
None to trivial	2 (6.3)
Mild	3 (9.4)
Moderate	5 (15.6)
Severe	22 (68.8)
LV ejection fraction, %	56.5 [52.0 - 63.0]
LVESD, mm	41.5 [33.5 - 48.5]

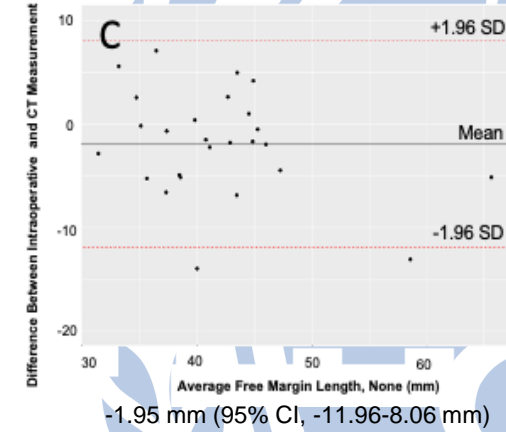
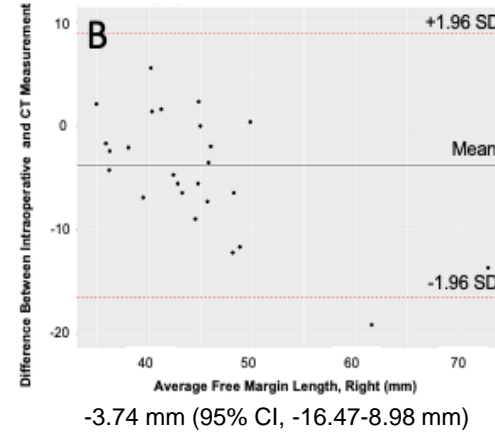
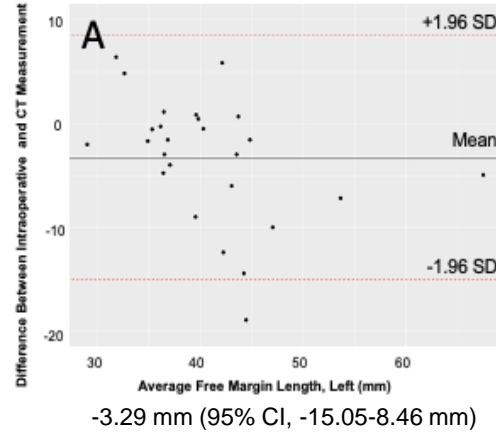
Operative profiles

Variables	Overall patients (n = 32)
Surgical approach, n (%)	
Full sternotomy	9 (28.1)
Upper mini sternotomy	23 (71.9)
Graft size, n (%)	
26 mm	2 (6.2)
28 mm	3 (9.4)
30 mm	8 (25.0)
32 mm	18 (56.2)
34 mm	1 (3.1)
Leaflet plication, n (%)	7 (21.9)

Measurement reliability-Tricuspid

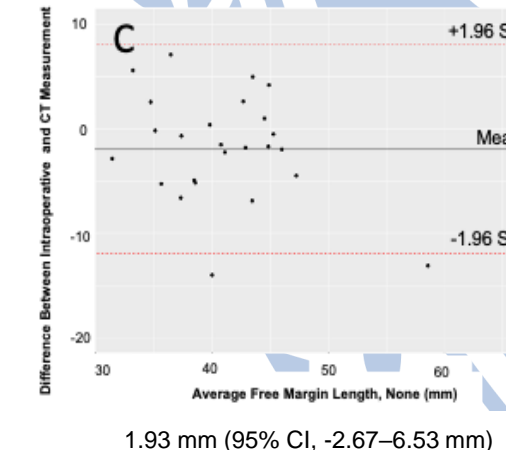
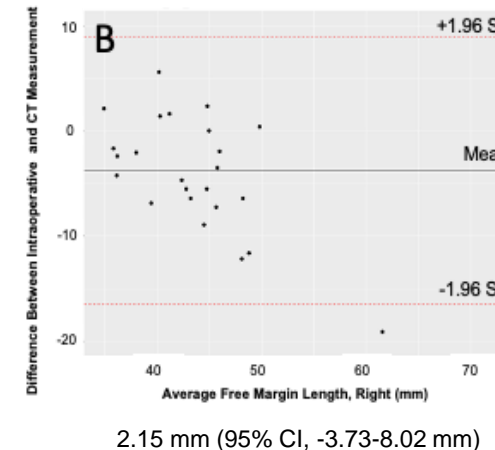
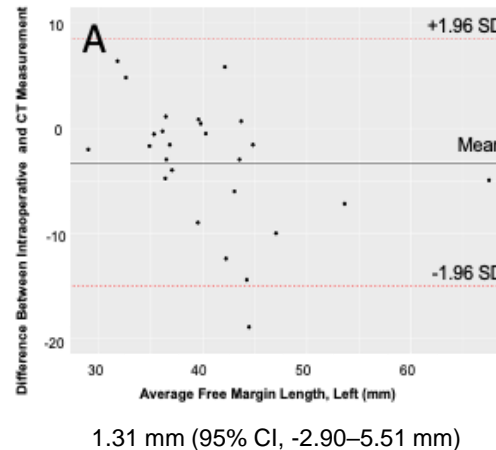
Free margin length

Mean difference



Geometric height

Mean difference

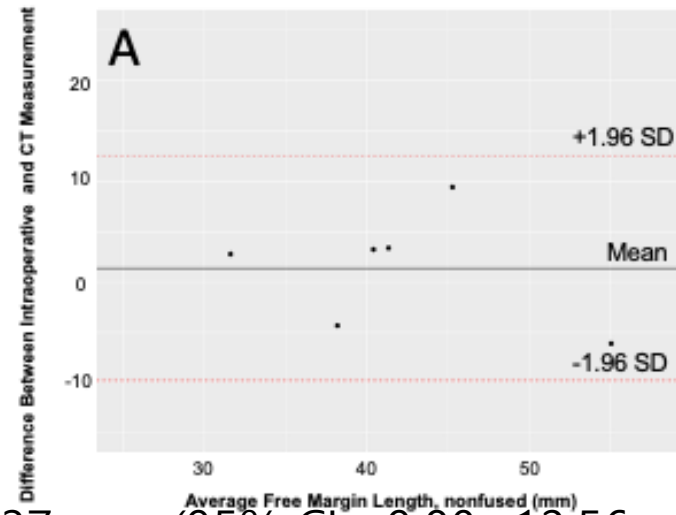


Measurement reliability-Tricuspid

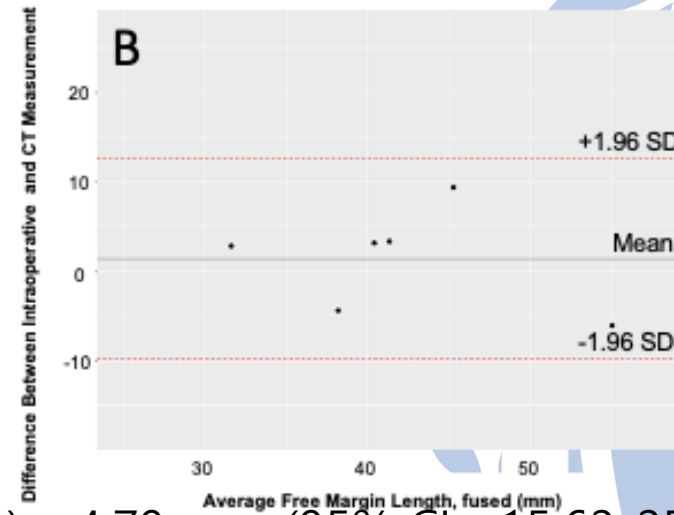
Variable	Intraoperative	CT	ICC	95% CI	p-value	Pearson	p-value
Free margin length, left	36.5 [35.0-42.0]	39.4 [36.3-46.0]	0.81	0.51-0.92	<0.001	0.76	<0.001
Free margin length, right	42.0 [40.0-45.0]	45.2 [39.0-49.2]	0.80	0.47-0.92	<0.001	0.80	<0.001
Free margin length, non	40.0 [36.0-45.0]	41.4 [38.3-45.7]	0.87	0.70-0.94	<0.001	0.80	<0.001
Geometric height, left	20.0 [19.8-20.0]	18.8 [15.8-20.5]	0.69	0.21-0.87	0.006	0.67	<0.001
Geometric height, right	20.0 [20.0-20.0]	18.1 [15.7-19.4]	0.44	-0.23-0.75	0.08	0.39	0.04
Geometric height, none	21.0 [20.0-23.0]	19.4 [18.1-21.8]	0.60	-0.13-0.84	0.04	0.57	0.002

ICC, interclass correlation coefficient

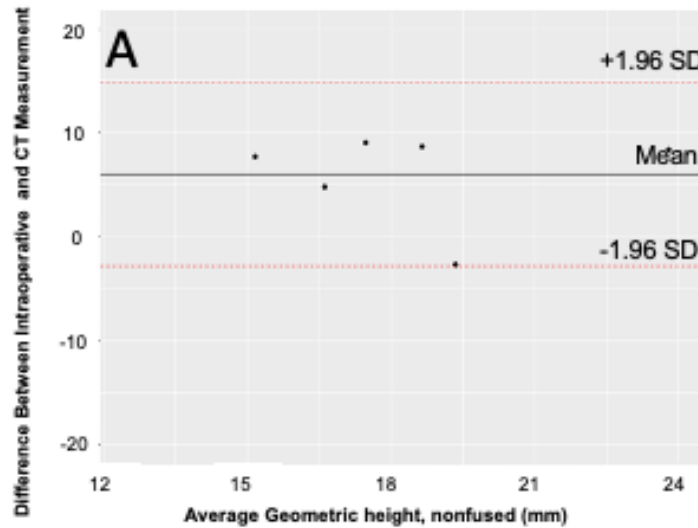
Measurement reliability-Bicuspid



Mean difference
1.37 mm (95% CI, -9.80 -12.56 mm)

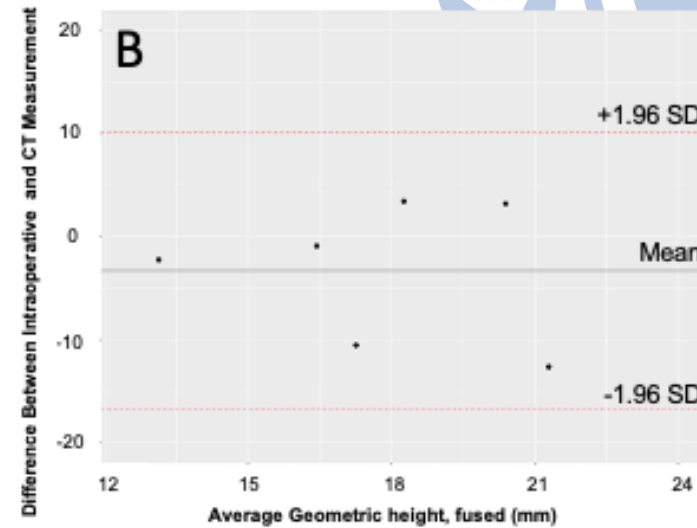


4.79 mm (95% CI, -15.62-25.19mm)

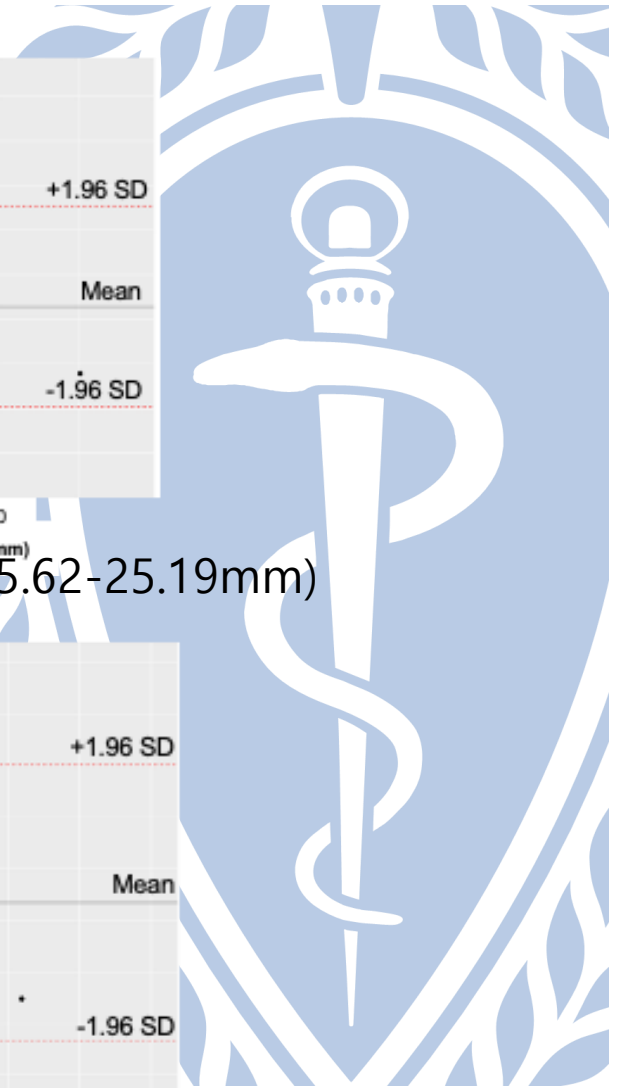


Mean difference

5.99 mm (95% CI, -2.86-14.85mm)

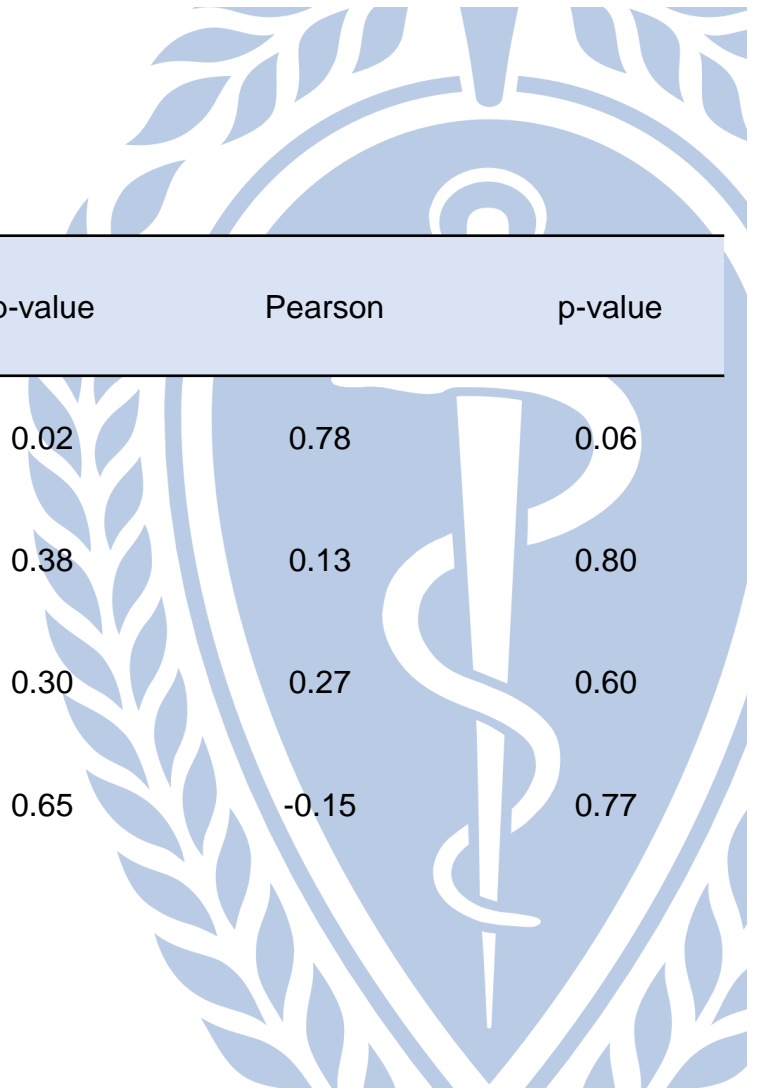


-3.26 mm (95% CI, -16.66-10.14 mm)



Measurement reliability-Bicuspid

Variable	Intraoperative	CT	ICC	95% CI	p-value	Pearson	p-value
Free margin length, non-fused	42.5 [36.0-50.0]	40.0 [38.8-40.6]	0.88	0.16-0.98	0.02	0.78	0.06
Free margin length, fused	39.5 [37.2-40.3]	39.5 [36.4-40.5]	0.23	-3.14-0.89	0.38	0.13	0.80
Geometric height, non-fused	20.5 [19.0-22.8]	14.3 [12.9-19.6]	0.22	-0.45-0.82	0.30	0.27	0.60
Geometric height, fused	15.5 [12.8-19.0]	17.8 [16.5-22.5]	-0.33	-9.23-0.82	0.65	-0.15	0.77



Conclusions

- The preoperative CT measurements of the aortic valve cusp showed reasonable predictive power for the free-margin length, albeit only limited accuracy for the geometric height measurement.

