

# Sex differences in maximal aortic dimension at acute Type A dissection:

*Time for sex-specific guidelines?*

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Guidelines for **abdominal** aortic aneurysm intervention were recently updated to include **sex-specific size thresholds**, due to higher rates of acute complications in females at smaller aortic sizes

2022 ACC/AHA Clinical practice guidelines

COR	LOE	Recommendation
1	A	In patients with asymptomatic AAA, repair is recommended with a diameter >5.5 cm in men and >5.0 cm in women

2024 EACTS/STS Clinical practice guidelines

COR	LOE	Recommendation
1	A	In patients with asymptomatic AAA, those with a diameter >5.5 cm should be repaired
2a	C	In women with asymptomatic AAA, aneurysms may be repaired at a diameter >5.0 cm

# There are **no sex-specific size thresholds** for intervention for **ascending thoracic aneurysms**

## 2022 ACC/AHA Clinical practice guidelines

Recommendations for Surgery for Sporadic Aneurysms of the Aortic Root and Ascending Aorta		
Referenced studies that support the recommendations are summarized in the <a href="#">Online Data Supplement</a> .		
COR	LOE	Recommendations
1	C-LD	or ascending aorta of <5.5 cm, whose growth rate confirmed by tomographic imaging is $\geq 0.3$ cm/y in 2 consecutive years, or $\geq 0.5$ cm in 1 year, surgery is indicated. <sup>10-13</sup>
2a	B-NR	4. In asymptomatic patients with aneurysms of the aortic root or ascending aorta who have a maximum diameter of $\geq 5.0$ cm, surgery is reasonable when performed by experienced surgeons in a Multidisciplinary Aortic Team. <sup>14-17</sup>

### Take home message from the guidelines:

“In patients who are significantly smaller or taller than average, surgical thresholds may incorporate indexing of the aortic root or ascending aortic diameter to either patient body surface area or height, or aortic cross-sectional area to patient height.”

## 2024 EACTS/STS Clinical practice guidelines

COR	LOE	Recommendation
2a	C	<p>In patients with nonsyndromic TAV surgery may be considered at a <u>maximum diameter <math>\geq 50</math> mm</u> if any of the following is present:</p> <ul style="list-style-type: none"> <li>• age &lt;50 years</li> <li>• <u>short stature (&lt;1.69 m)</u></li> <li>• ascending aortic length &gt;11 cm</li> <li>• aortic diameter growth rate &gt;3 mm/year</li> <li>• refractory hypertension</li> <li>• shared decision with the patient</li> </ul>

## **Question:**

Do current absolute, sex-independent size thresholds for ascending aortic aneurysm intervention disadvantage females?

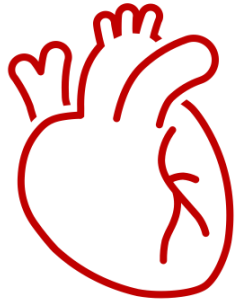
## **Objective:**

Compare estimated pre-dissection aortic diameter by sex

## **Hypothesis:**

Females experience type A dissection at a smaller diameter

# Cohort and Analysis



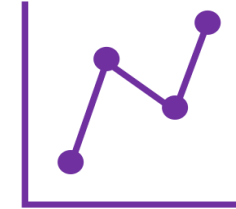
## Inclusion

Adults undergoing  
type A dissection repair  
7/2011-3/2023



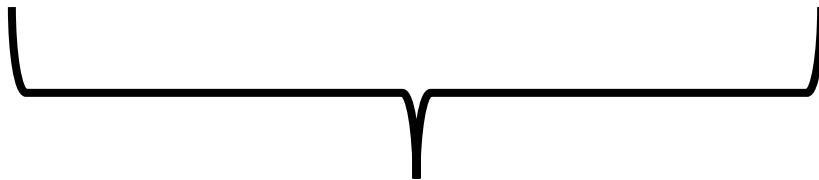
## Exclusion

Redo, no CT scan,  
poor quality CT scan,  
connective tissue disorder



## Analysis

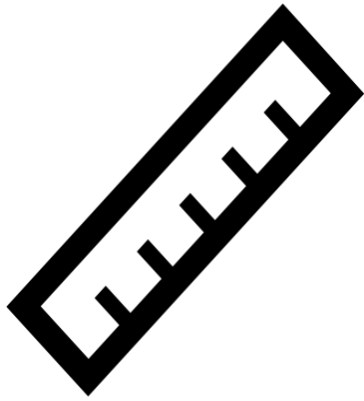
Cumulative distribution curve  
Linear regression



**N=381**

# Main outcome: Pre-dissection diameter

1. Measure aorta when presenting with dissection



Maximum diameter ascending aorta w/ 3D analysis software

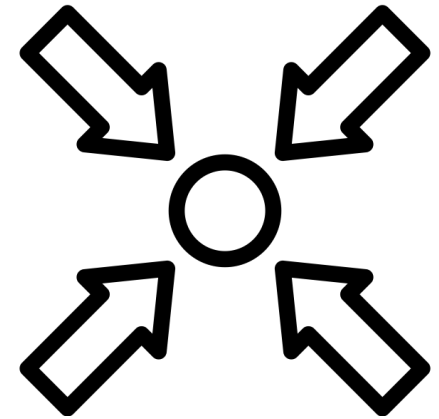
4 trained physicians  
(ICC 0.76 30 case test set)

2. Identify diameter increase with dissection

$$\frac{\text{Aorta Diameter}_{\text{pre-dissection}}}{\text{Aorta Diameter}_{\text{post-dissection}}}$$

Ratio: 0.81  
ICC: 0.86 (30 case test set)

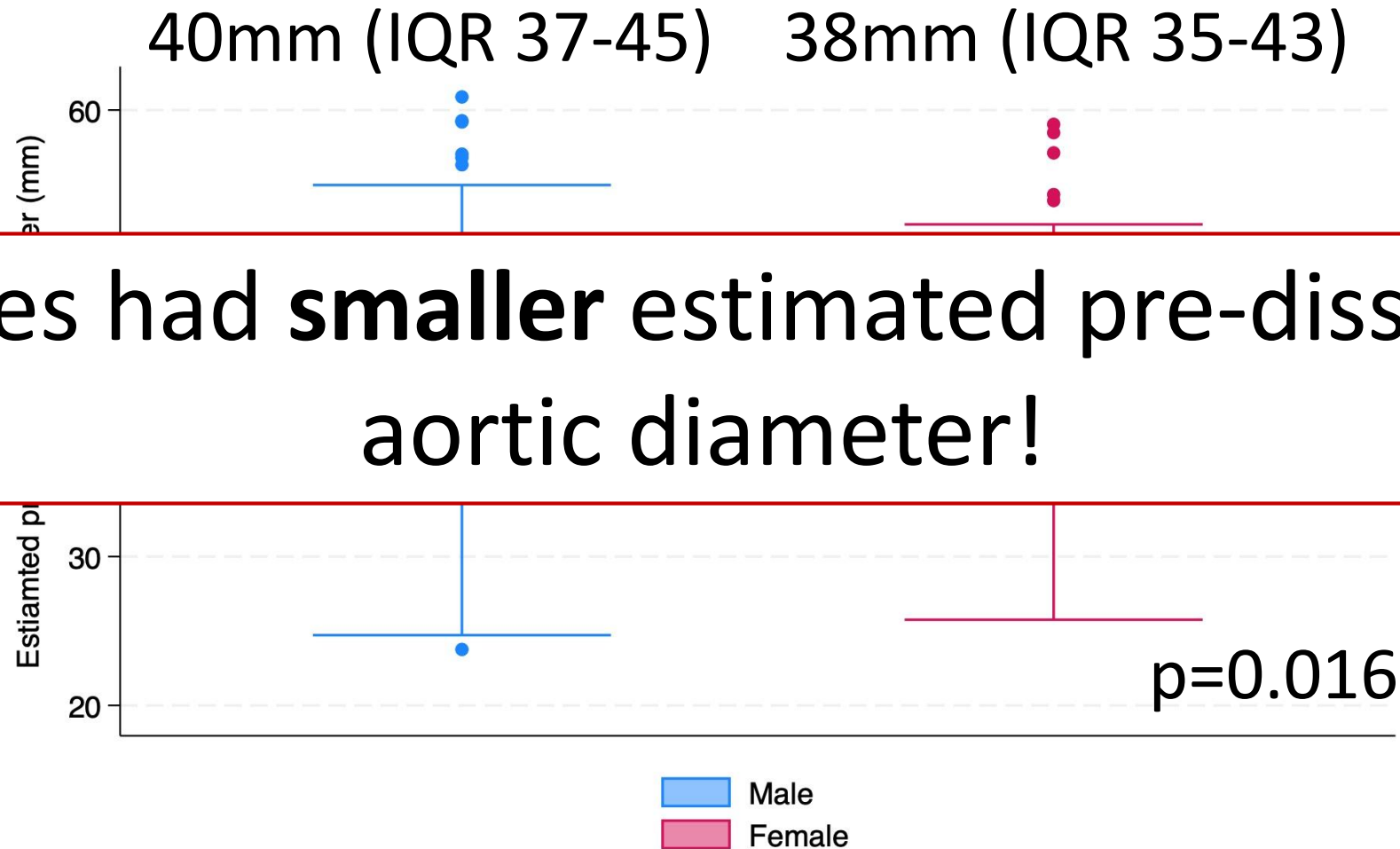
3. Scale diameter at time of dissection by 0.81 to estimate pre-dissection diameter



# Demographics

	<b>Female</b> <b>(n=140)</b>	<b>Male</b> <b>(n=241)</b>	<b>P-value</b>
<b>Age (median, IQR)</b>	65 (IQR 55-74)	58 (IQR 48-66)	<0.001
<b>Race</b>			
<i>White</i>	85 (62%)	164 (68%)	0.93
<i>Black</i>	39 (28%)	67 (28%)	0.19
<i>Other</i>	13 (10%)	8 (4%)	0.63
<b>Hypertension</b>	116 (84%)	201 (83%)	0.87
<b>Height (cm) (median, IQR)</b>	165 (160-170)	180 (175-183)	<0.001

# Estimated pre-dissection diameter by sex

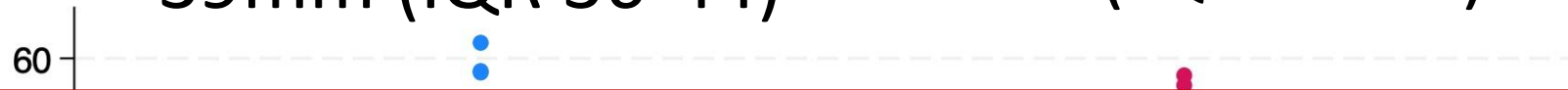


Females had **smaller** estimated pre-dissection aortic diameter!



Excluding patients  
“significantly smaller or taller than average”  
(2SD away from mean)

39mm (IQR 36-44)    37mm (IQR 34-42)



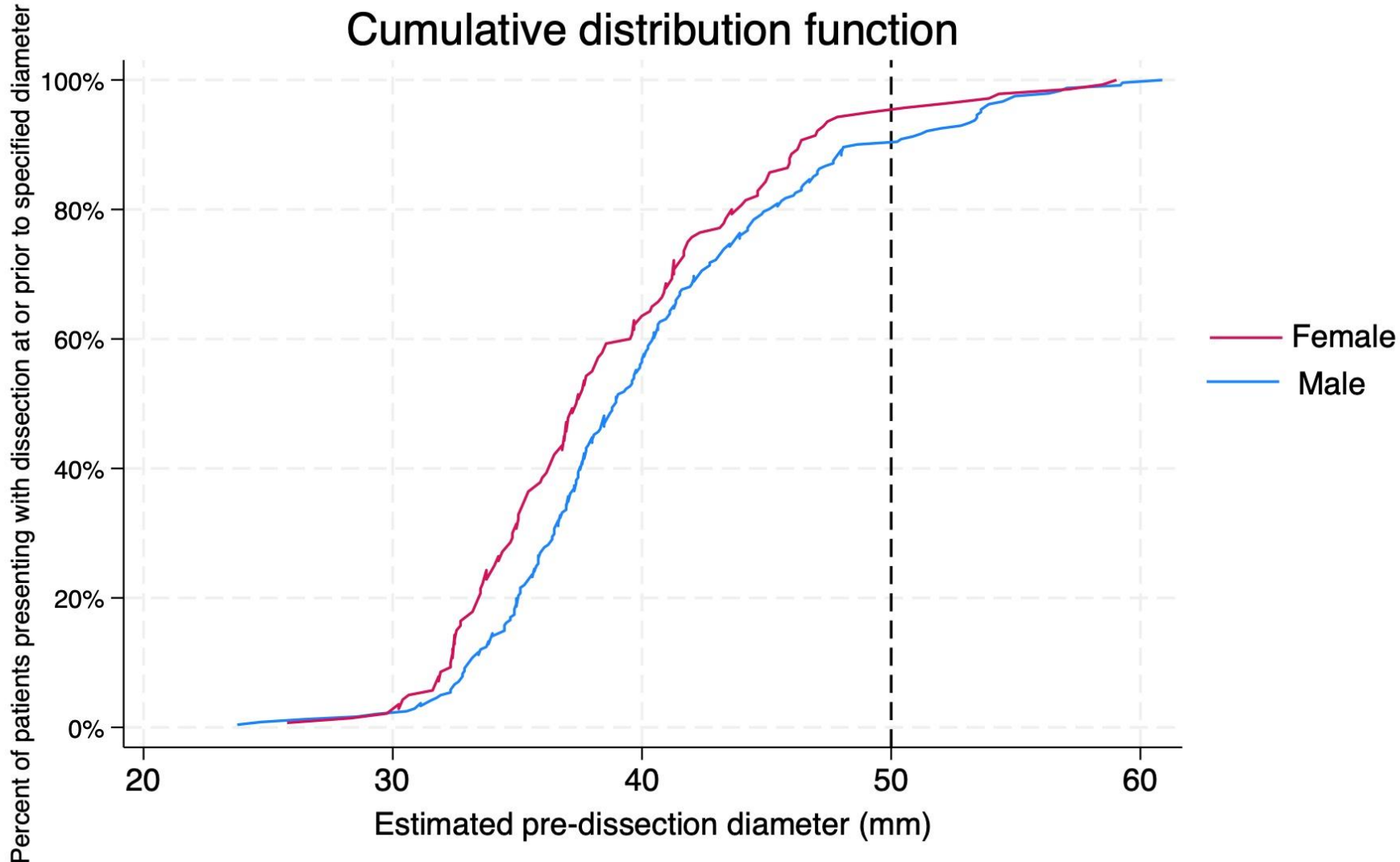
Females STILL had **smaller** estimated pre-dissection aortic diameter!



Accounting for height at the extremes does  
not sufficiently account for sex differences in  
height!

Male  
Female

# Cumulative distribution function of maximum aortic diameter prior to dissection compared by sex



96% of females and 80% of males had an estimated pre-dissection maximum aortic diameter below threshold size prior to onset of TAAD  
P=0.08

# Adding height to multivariable linear regression...

Variable	B (95% CI)	P-value
Female	-1.03 (-2.88 to 0.83)	0.28
Age	0.05 (-0.01 to 0.10)	0.56
Hypertension	-1.16 (-2.89 to 0.56)	0.18
Height	0.05 (-0.35 to 0.14)	0.28

***Female sex was not associated with smaller aortic diameter at dissection!***

# Conclusions

Females dissect at a smaller aortic diameter than males, even when:

- Controlling for factors associated with aneurysm size

- Excluding extremes of body size

Sex association went away if height was controlled for

**Sex-based, or height-indexed aneurysm thresholds may lead to more equitable intervention for aneurysm by sex**