

Heritability estimation of the aortic root based on computed tomography angiography

A classical twin study

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BACKGROUND

- Configuration of the aortic root can be related to healthy ageing and/or to variety of disorders
- Aortic root dilatation is a major pathophysiological mechanism for aortic regurgitation and predisposes the aortic root to dissection or rupture
- 2D echocardiography revealed that common environmental effects have a strong influence on the aortic root dimensions
- 3D imaging modalities can provide more accurate measurements of the aortic dimensions

AIMS

To determine the CTA based heritability of the aortic root geometry within a sample of Hungarian twins.

METHODS

Patient population, anthropometrics

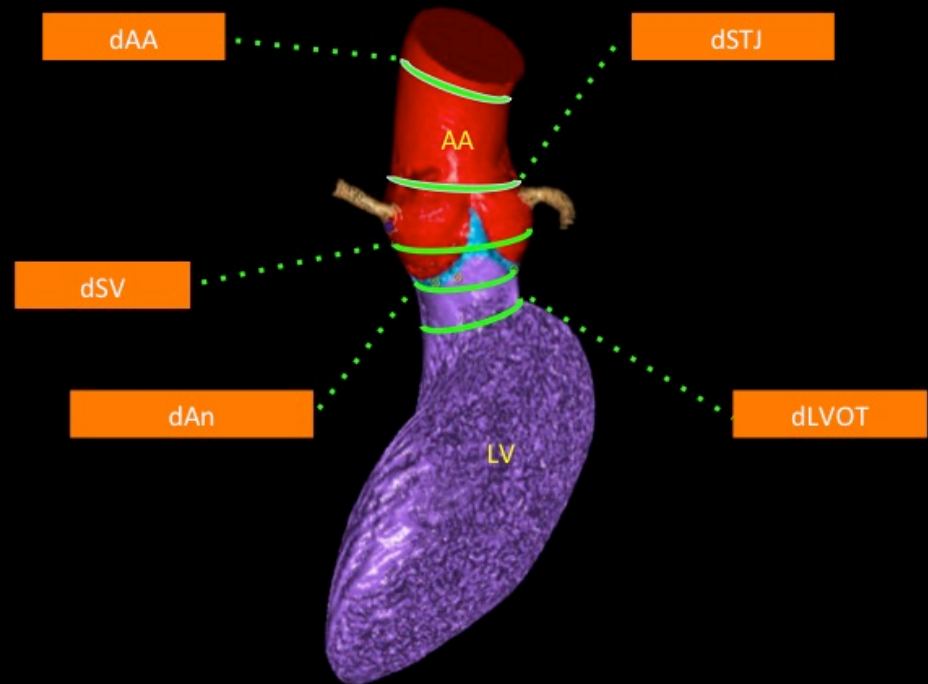
- 102 twin pairs

	MZ twins (n=61)	DZ twins (n=41)	p
	mean \pm SD	mean \pm SD	
age (years)	55 \pm 10	59 \pm 8	0.09
female/male	74/48	56/26	0.43
weight (kg)	76.2 \pm 15.7	76.3 \pm 14.7	0.97
height (cm)	166.1 \pm 9.5	166.8 \pm 9.5	0.69
BMI (kg/m ²)	27.7 \pm 4.6	27.0 \pm 4.3	0.38

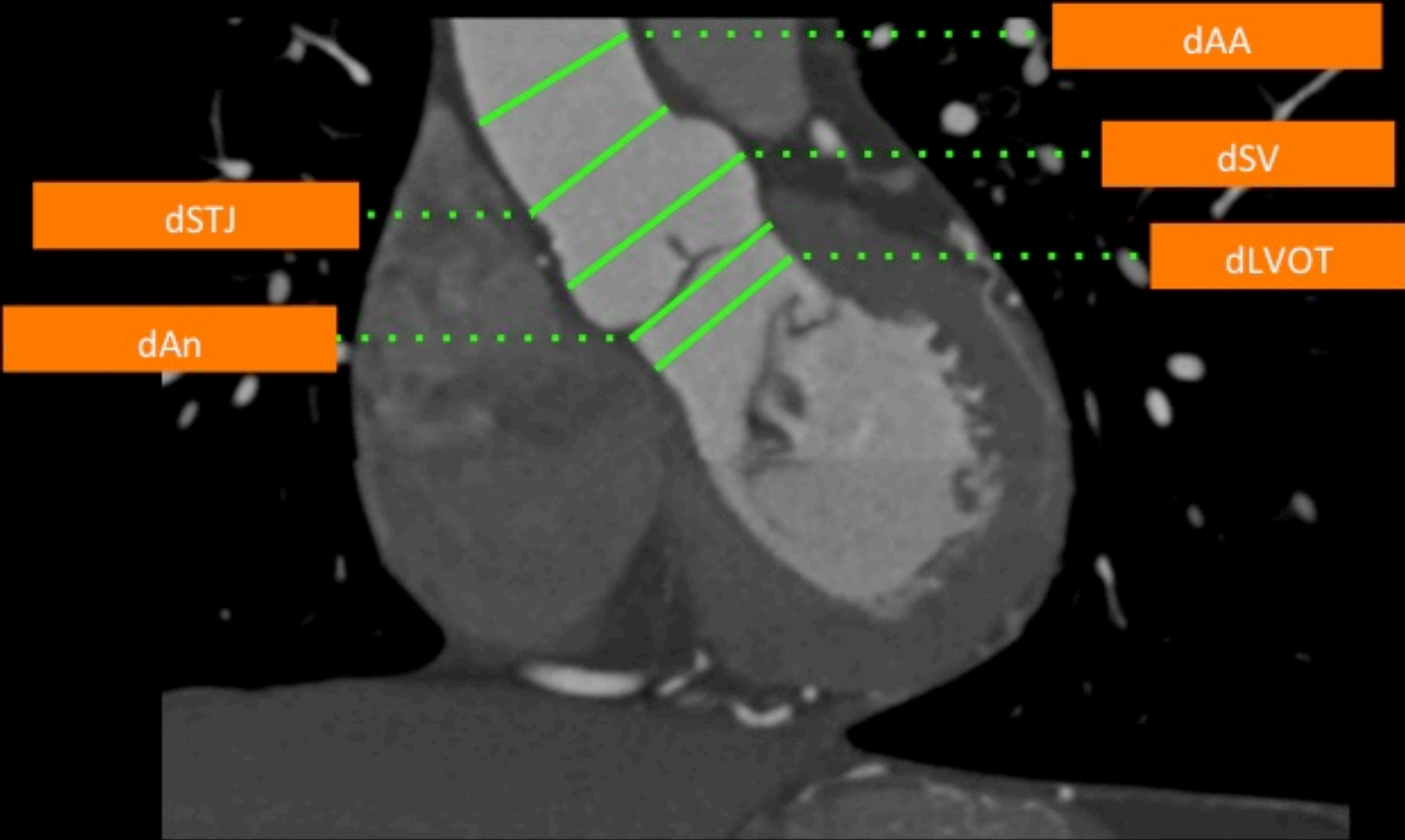
METHODS

- 256-slice CT-scanner
- semi-automated software tool developed for transcatheter aortic valve implantation CTA planning

- diameter of left ventricular outflow tract (dLVOT)
- annulus (dAn)
- sinus Valsalva (dSV)
- sinotubular junction (dSTJ)
- ascending aorta (dAA)



Measured aortic root parameters on CTA



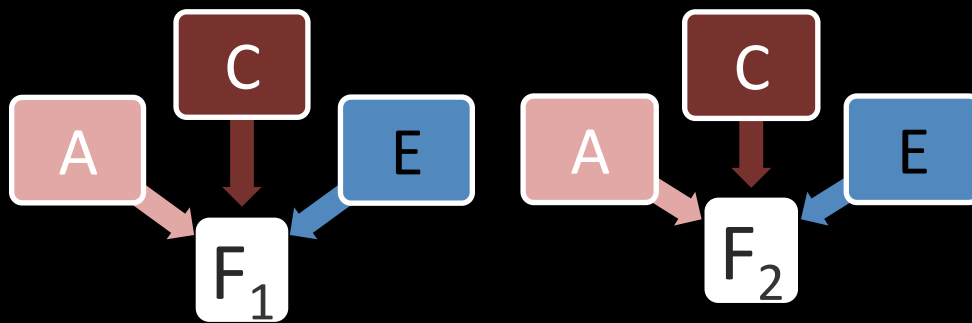
ACE-model

- in classical twin studies the extent of genetic and environmental effects is determined with ACE-model
- partial models (AE, CE and E) were also defined

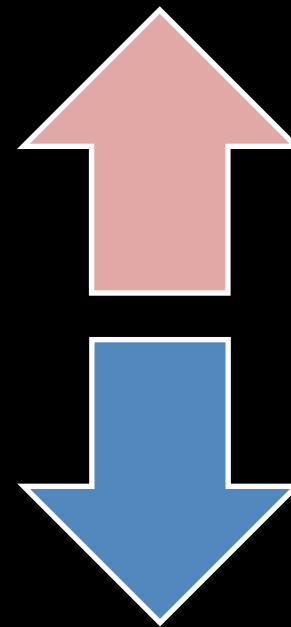
„A”: additive genetic effects

„C”: common environment

„E”: unique environment



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Additive genetic effects– A

Common environment– C

Unique environment – E

RESULTS

Aortic root diameters in MZ and DZ twins

	MZ twins (n=61)	DZ twins (n=41)	p
	mean \pm SD	mean \pm SD	
dLVOT	23.2 \pm 2.4	23.3 \pm 2.2	0.73
dAn	23.3 \pm 2.0	23.6 \pm 2.0	0.45
dSV	32.8 \pm 3.4	32.7 \pm 3.5	0.89
dSTJ	27.9 \pm 2.7	28.3 \pm 2.9	0.44
dAA	30.0 \pm 3.1	30.7 \pm 3.7	0.25

Genetics versus environment



CONCLUSION

- CTA-based measurements suggest that the metrics of the aortic root are strongly inherited.
- This contradicts previous findings derived by 2D echocardiography, which indicated a dominant role of the common environmental effects.