Athero-occlusive disease and AAA growth

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Athero-occlusive disease and AAA growth: An exploratory analysis of the TEDY trial

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Atherosclerosis and AAA pathogenesis

Patients with CHD or PAD have high AAA prevalence (ORs in SRs 2-3)

Not all AAA patients have marked athero-occlusive disease





Methods

Hypothesis: AOD associated with faster AAA growth

Design: Include patients in TEDY with CT imaging follow-up

Outcomes: Centrally read CT Volume and orthogonal diameter

AOD definition: Prior diagnosis of PAD, CHD, stroke or ABI <0.9

Data analysis: Multivariable linear mixed effects analyses adjusted for risk factors and medication unequally distributed (p<.10 in bivariate comparisons)



Participants in relation to AOD diagnosis

	AOD (n=70)	No AOD (n=61)	P-value
Diameter (mm)	43.0 (39.0-47.0)	42.0 (39.0-46.0)	0.603
Volume (cm³)	78.5 (58.0-99.0)	75.0 (66.0-90.0)	0.798
Age	75.0 (69.3-81.8)	74.0 (68.0-77.0)	0.056
Male gender	60 (85.7%)	55 (90.2%)	0.611
Current smoking	15 (21.4%)	15 (24.6%)	0.911
Diabetes	11 (15.7%)	5 (8.1%)	0.297
Statins	56 (80%)	26 (42.6%)	<0.001
Any antiplatelet	58 (82.9%)	21 (34.4%)	<0.001
Metformin	8 (11.4%)	2 (3.3%)	0.104

Main outcome AAA growth AOD vs No AOD

AOD (n=70) No AOD (n=61) MD (95% CI) P value

 Volume (cm³)
 12.5 (9.2, 15.8)
 18.9 (15.4, 22.5)
 -3.26 (-5.70, -0.82), 0.009*

 -3.34 (-5.96, -0.71), 0.013**

 Diameter (mm)
 3.1 (2.5, 3.8)
 4.6 (3.8, 5.3)
 -0.71 (-1.22, -0.19), 0.007*

 -0.82 (-1.35, -0.29), 0.007**

*Adjusted for hypertension, statins and antiplatelet medications; # excluding participants with diabetes

Summary analysis suggests PAD associated with slower AAA growth

Reference	Standard mean difference*	Weight (%)	Standard mean difference†	Standard mean difference†
Behr-Rasmussen et al. ²⁰	-0.279(0.010)	11.3	-0.28 (-0.47, -0.08)	
Bhak et al. ²¹	-0.048(0.123)	10.0	-0.05 (-0.29, 0.19)	
De Haro et al.22	-0.123(0.151)	8.5	-0.12 (-0.42, 0.17)	
Ferguson et al.23	-0.023(0.122)	10.0	-0.02 (-0.26, 0.22)	
Fujimura et al. ²⁴	-0.116(0.504)	1.6	-0.12 (-1.10, 0.87)	
Lindholt et al.25	-0.198(0.177)	7.3	-0.20 (-0.54, 0.15)	
Miyata et al.8	0.781(0.384)	2.5	0.78 (0.03, 1.53)	· · · · · · · · · · · · · · · · · · ·
Parr et al. ²⁶	-0.664(0.381)	2.6	-0.66 (-1.41, 0.08)	
Periard et al.27	-0.526(0.211)	6.0	-0.53 (-0.94, -0.11)	
Ruegg et al.28	0.381(0.215)	5.9	0.38 (-0.04, 0.80)	
Schlösser et al.29	-0.019(0.181)	7.2	-0.02 (-0.37, 0.34)	
Schouten et al.30	-0.374(0.217)	5.8	-0.37 (-0.80, 0.05)	
Sterpettii et al.31	-0.755(0.276)	4.2	-0.76 (-1.30, -0.21)	
Vega de Ceniga et al. ¹⁰ Overall cohort	-0.126(0.107)	10.9	-0.13 (-0.34, 0.08)	
Vega de Ceniga et al.32	-0.102(0.208)	6.1	0.10 (-0.31, 0.51)	· · · · · ·
Total		100.0	-0.13 (-0.27, -0.00)	•
Heterogeneity: $\tau^2 = 0.03$; $\chi^2 = 28.39$, 14				
Test for overall effect: $Z = 2.01$, $P = 0.04$	-1 -0.5 0 0.5 1			
1999년 1997년 199 1997년 1997년 1997				Favours PAD Favours no PAD

QRCPVD Queensland Research Centre for Peripheral Vascular Disease

Matthews E, et al. Br J Surg 2017;104(13):1765-74.

Sensitivity analyses 1: Could AOD be confounded by more intensive medical management?

- Statin prescription, LDL-C and antiplatelet medication not significantly associated with AAA growth
- AOD associated with slower AAA growth after adjusting for these factors and no significant interaction in LME models





Sensitivity analyses 2: Could diabetes explain the AOD association?

- Diabetes was associated with significantly slower AAA growth but AOD associated with significantly slower AAA growth after adjusting for diabetes (no significant interaction)
- AOD associated with significantly slower AAA growth after excluding participants with diabetes



Sensitivity analyses 3: Could biomechanical factors explain the AOD association?

	AOD (n=70)	No AOD (n=61)	P-value
PWS (kPa)	157.2 (143.0-184.1)	166.9 (146.6-185.8)	0.253
PWRI	0.37 (0.31-0.41)	0.39 (0.36-0.77)	0.447



High wall stress



Conclusions

- Why AOD associated with slower AAA growth?
 - Surrogate for better medical management beyond adjustment?
 - Different aneurysm phenotype with different etiologies?
- Limitations: Small sample size and exploratory analysis



