THE IMPACT OF GENDER ON 30-DAY AND 5-YEAR OUTCOMES POST ELECTIVE ENDOVASCULAR REPAIR OF ABDOMINAL AORTIC ANEURYSM.

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COI Disclosure

Speaker name :

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I have the following potential conflicts of interest to report:

- ☐ Consulting
- ☐ Employment in industry
- ☐ Stockholder of a healthcare company
- ☐ Owner of a healthcare company
- ☐ Other(s)
- ■ I do not have any potential conflict of interest

Introduction

- Endovascular aneurysm repair (EVAR) is now the most common treatment for AAA
- Women have been shown to have worse outcome following open repair
- The aim of the study to determine our the effect of sex on mortality and morbidity after EVAR

Methodology

- A retrospective-cohort study
- All elective EVAR from January 2004 to December 2017 across 3 major tertiary hospitals in Western Australia (RPH, SCGH, HPH)

- Baseline data including :

  Comorbidities (hypertension, hyperlipidaemia, cardiac disease, diabetes, tobacco use, history of malignancy, renal, carotid, thyroid, and pulmonary disease); **Aneurysm characteristics** (aneurysm diameter, neck length, neck diameter, iliac artery diameters, and infrarenal neck angle). **ASA Score**, **treatment indications**, **anaesthetics type** (local/spinal vs. general) were obtained.

Device Type

Device	Patient number (n = 415)
Endurant	213
Excluder	81
Zenith	40
Talent	42
Nellix	19
AFX-2	9
Anaconda	5

- Information at follow-up visits (1, 3, 6, 12 months and yearly thereafter) were recorded on a standardized case record form

The primary outcome was:

- 30-day mortality defined as death within 30 days of the index EVAR

Secondary outcomes were:

- A 30-day composite end-point (consisting of mortality, systemic complications, and conversion)
- Length of stay (LoS) after EVAR between both groups
- 5-year survival rate expressed by KM between both groups
- Freedom from reintervention at 5-years follow-up
- MAE rate at 5-years follow-up

RESULTS

Characteristic		Women (57)	Men (352)	P value
Age, years		76.8 ± 9.5	73.5 ± 9.8	0.017
BMI > 30		9 (15.8%)	94 (26.7%)	0.066
Ethnicity				0.243
Caucasian		52 (92.8%)	347 (98.6%)	
Asian		-	4 (1.1%)	
Smoking				
Smoking				0.929
Current	24 (42.11%)	146 (41.5%)	0.929	0.005
Former	13 (22.8%)	143 (40.9%)	0.005	0.447
				0.743
CABG	2 (3.5%)	40 (11.2%)	0.042	0.639
				0.188
	Angina	10 (17.5%)	60 (17.0%)	0.926
History of Cancer	6 (10.5%)	85 (24.1%)	0.014	0.496
	CABG	2 (3.5%)	40 (11.2%)	0.042
	CAS	3 (5.3%)	24 (6.8%)	0.652
	CHF	2 (3.5%)	27 (7.7%)	0.215
	MI	7 (12.5%)	53 (15.2%)	0.592
Renal		5 (8.8%)	57 (16.2 %)	0.124
Carotid				
	CVA	7 (12.3%)	35 (10.0%)	0.598
	TIA	5 (8.8%)	28 (7.9%)	0.835
PVD		13 (22.8%)	94 (26.7%)	0.529
COPD		14 (24.6%)	98 (27.8%)	0.603
History of Cancer		6 (10.5%)	85 (24.1%)	0.014
ASA Classification				0.445
Class I		1	3	
Class II		12	75	
Class III		38	209	
Class IV		6	64	

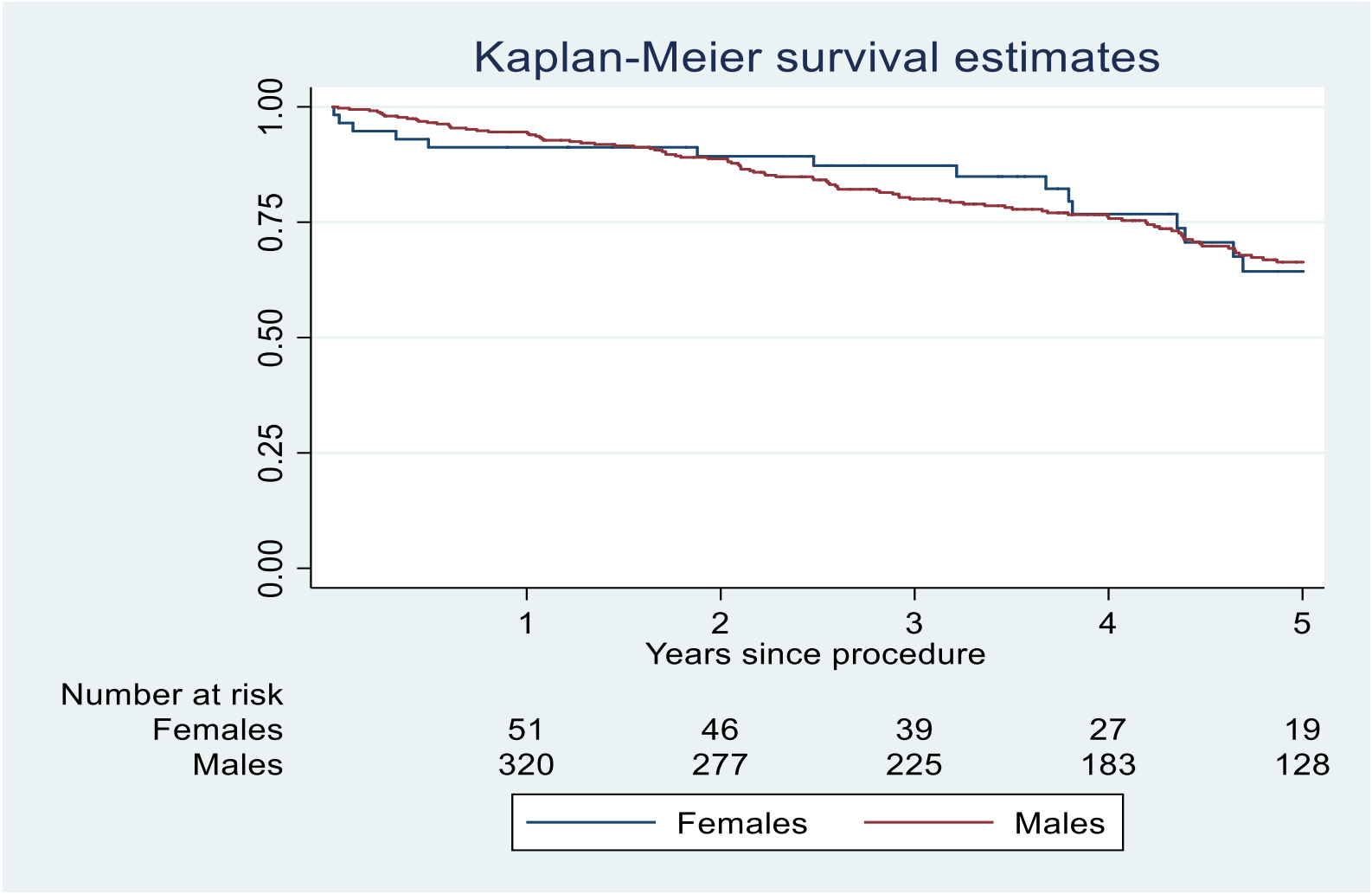
Characteristics	Women	Men	P Value
Size of Aneurysm (mm)	56.3 ± 9.9	59.7 ± 13.3	0.082
Length of Infrarenal neck (mm)	29.3 ± 8.8	32.3 ± 13.1	0.191
Proximal Neck Diameter (mm)	24.0 ± 3.2	24.1 ± 2.8	0.799
Distal Neck Diameter (mm)	27.3 ± 2.7	26.7 ± 2.9	0.112
Neck Angulation (º)	14.0 ± 15.7	20.2 ± 20.4	0.041
Neck Angulation > 60 º	2 (3.5%)	35 (9.9%)	0.081
Neck Flaring > 1mm	27 (47.4%)	140 (39.8%)	0.282
Neck Thrombosis			0.566
Neck Angulation (º)	14.0 ± 15.7	20.2 ± 20.4	0.041
Severe	1 (1.7%)	2 (0.6%)	
Length of Infrarenal Aorta (mm)	117.9 ± 10.8	121.6 ± 13.9	0.289
Right CIA Length (mm)	59.8 ± 11.3	61.9 ± 12.8	0.237
Distal Right CIA Diameter (mm)	14.5 ± 6.6	15.3 ± 7.5	0.259
Right EIA Diameter (mm)	9.3 ± 1.3	9.6 ± 1.4	0.113
Right Iliac Tortuosity			0.423
None	35 (61.4%)	183 (52.0%)	
Mild	7 (12.3%)	61 (17.3%)	
Moderate	12 (21.0%)	74 (21.0%)	
Severe	3 (5.3%)	34 (9.7 %)	
Left CIA Length (mm)	56.7 ± 10.7	57.1 ± 8.8	0.139
Distal Left CIA Diameter (mm)	13.6 ± 2.6	13.8 ± 2.9	0.456
Left EIA Diameter (mm)	9.6 ± 1.5	9.8 ± 1.4	0.285
Left Iliac Tortuosity			0.650
None	29 (50.9%)	156 (44.3%)	
Mild	14 (24.6%)	104 (29.5%)	
Moderate	12 (21.0%)	70 (19.9%)	
Severe	2 (3.5%)	22 (6.2%)	
Neck Calcification			0.459
None	43 (75.4%)	278 (79.0%)	
Mild to Moderate	12 (21.05%)	70 (19.9%)	
Severe	2 (3.5%)	4 (1.1%)	
Patent Lumbar Vessels	51 (89.5%)	292 (82.9%)	0.193
Patent IMA	49 (86.0%)	286 (81.2%)	0.378
Patent Left Iliac	51 (89.5%)	333 (94.6%)	0.164
Patent Right Iliac	53 (93.0%)	326 (92.6%)	0.921

- Estimated all-cause mortality rates at 30 days were 3.5% in women and 0.3% in men (p = 0.052).

30-day Mortality			
All Cause	2 (3.5%)	1 (0.3%)	0.052
30-day Composite Outcome			
Complications & Mortality	18 (31.6%)	98 (27.8%)	0.562

Long Term outcomes

Long Term Outcomes at 5 years			
All-Cause Mortality	15 (26.8%)	95 (27.5%)	0.907
Freedom from Reintervention	35 (87.5%)	222 (88.8%)	0.812
MAE Rate	20 (35.7%)	123 (35.5%)	0.981
Residual Aneurysm Size	51.2 ± 17.2	53.2 ±16.4	1.000


Kaplan-Meier survival estimates
1.00
0.75
0.50
0.25
0.00
1
2
3
4
5
Years since procedure
Number at risk
Females 51 46 39 27 19
Males 320 277 225 183 128
Females
Males

	Univariant			Multivariant		
	OR	95% CI	p-value	OR	95% CI	p-value
Sex	1.03	0.54 - 1.96	0.97	1.12	0.44 - 2.94	0.81
Age				1.09	1.05 - 1.11	0.00
ASA physical status ≥ 3				0.63	0.28 - 1.39	0.26
Comorbidities						
Smoking				1.15	0.62 - 2.37	0.67
Hypertension				1.27	0.63 - 2.54	0.50
Angina				0.85	0.27 - 2.20	0.75
Arrhythmia				1.44	0.50 - 3.15	0.39
Coronary Artery Disease				1.12	0.54 - 2.35	0.75
Coronary Artery Bypass Graft				1.48	0.37 - 4.33	0.50
Myocardial Infarction				0.99	0.31 - 2.34	0.98
Chronic Heart Failure				3.23	0.87 - 10.97	0.09
Transient Ischaemic Attack				1.35	0.32 - 4.54	0.65
Cerebrovascular Accident				0.85	0.24 - 2.41	0.79
Carotid Artery Stenting				1.52	0.33 - 5.23	0.52
Diabetes Mellitus				1.68	0.75 - 3.40	0.16
Hyperlipidaemia				0.81	0.47 - 1.60	0.49
Peripheral Vascular Disease				1.09	0.56 - 2.49	0.82
Chronic Kidney Disease				0.76	0.25 - 1.87	0.56
COPD				1.36	0.67 - 2.59	0.38
Obesity				0.34	0.16 - 1.1	0.38
AAA Characteristics						
Maximum AAA diameter (mm)				1.01	0.98 - 1.03	0.49
Distal Neck Diameter (mm)				0.94	0.81 - 1.09	0.42
Proximal Neck Diameter (mm)				1.08	0.93 - 1.28	0.36
Length of Infrarenal neck (mm)				1.01	0.98 - 1.03	0.49

Discussion

- The proportion of women who underwent elective EVAR between 2004 and 2017 in our study (13.9%) is comparable with the proportions previously quoted in the literature (range 7.8% - 21.6%).

- The finding that women who undergo elective EVAR are older than men is also a consistent finding. The mean age of the women in the present study (76 years) was consistent with the cohorts previously published (range 73 - 78 years) as well in the GREAT REGISTRY

Great Registry

	Males	Females	All	p-value
Number of Subjects	3220	538	3758	
Race				0.0001*
White or Caucasian	2881(89.5%)	467(86.8%)	3348(89.1%)	
Black or African American	94(2.9%)	39(7.2%)	133(3.5%)	
Asian/Oriental	22(0.7%)	3(0.6%)	25(0.7%)	
American Indian or Alaska Native	6(0.2%)	2(0.4%)	8(0.2%)	
Native Hawaiian or Other Pacific Islander	10(0.3%)	1(0.2%)	11(0.3%)	
Middle Eastern	10(0.3%)	0(0.0%)	10(0.3%)	
Other	45(1.4%)	11(2.0%)	56(1.5%)	
Unknown	152(4.7%)	15(2.8%)	167(4.4%)	
Age (yrs)				<.0001**
n	3220	538	3758	
Mean (Std Dev)	73.0(8.3)	74.7(9.0)	73.3(8.4)	
Median	73.0	75.0	73.0	
Range	(40.0,95.0)	(45.0,98.0)	(40.0,98.0)	
BMI				0.75**
n	3207	531	3738	
Mean (Std Dev)	27.6(4.7)	27.5(7.1)	27.6(5.1)	
Median	27.0	26.3	26.9	
Range	(15.5,55.4)	(13.8,64.6)	(13.8,64.6)	

Subject Demographics by Gender

*Chi square test for white vs. non-white **t-test (unequal variance) for continuous variables. p-values are to be interpreted with caution due to the number of comparisons in the analysis.

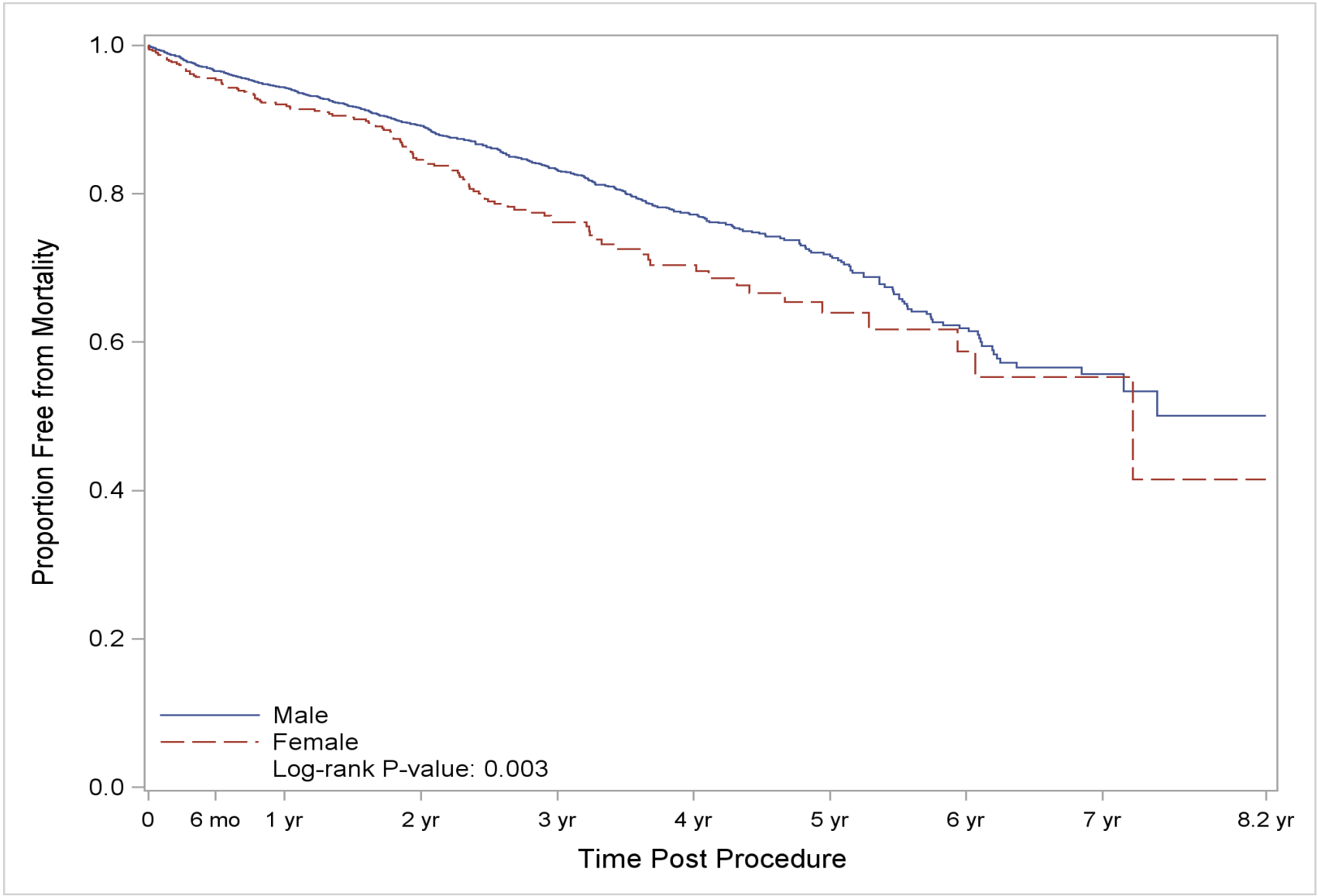
Summary of Aortic Repair History by Gender

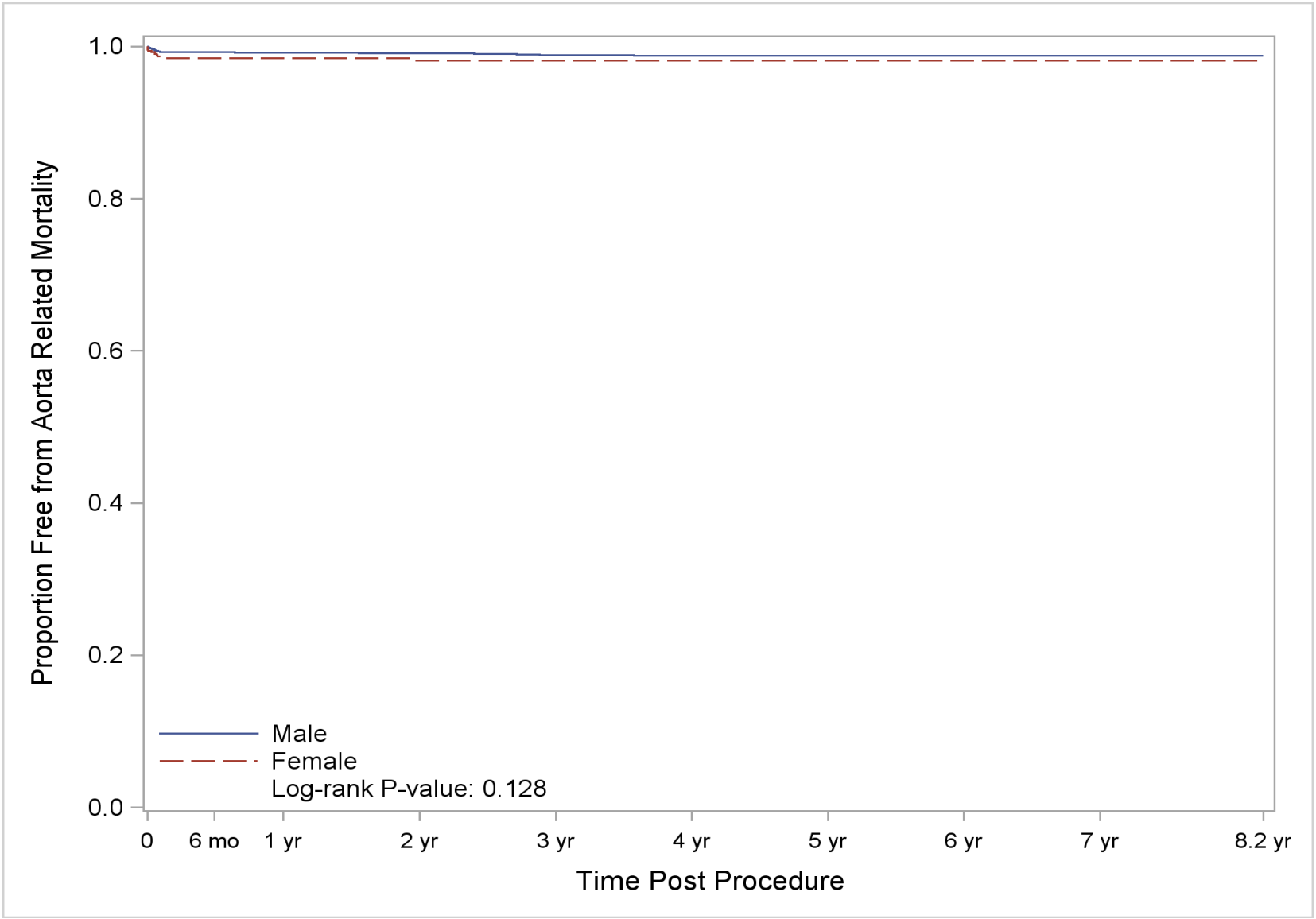
	Males	Females	All	p-value
Number of Subjects	3220	538	3758	
Prior aortic repair	130/3213(4.0%)	17/535(3.2%)	147/3748(3.9%)	0.338
AAA repair	64/3213(2.0%)	7/535(1.3%)	71/3748(1.9%)	
Descending TAA repair	20/3213(0.6%)	7/535(1.3%)	27/3748(0.7%)	
Other Aortic repair	20/3213(0.6%)	2/535(0.4%)	22/3748(0.6%)	
Ascending TAA repair	16/3213(0.5%)	1/535(0.2%)	17/3748(0.5%)	
Ascending Aortic Arch repair	11/3213(0.3%)	0/535(0.0%)	11/3748(0.3%)	
Descending Aortic Arch repair	6/3213(0.2%)	0/535(0.0%)	6/3748(0.2%)	
Type A Dissection repair	8/3213(0.2%)	0/535(0.0%)	8/3748(0.2%)	
Type B Dissection repair	5/3213(0.2%)	3/535(0.6%)	8/3748(0.2%)	
Penetrating Aortic Ulcer repair	2/3213(0.1%)	0/535(0.0%)	2/3748(0.1%)	
Traumatic Transection repair	3/3213(0.1%)	0/535(0.0%)	3/3748(0.1%)	
Coarctation repair	1/3213(0.0%)	0/535(0.0%)	1/3748(0.0%)	
Prior Stent Placement	593/3214(18.5%)	88/535(16.4%)	681/3749(18.2%)	0.266
Coronary	486/3214(15.1%)	64/535(12.0%)	550/3749(14.7%)	
Iliac	61/3214(1.9%)	15/535(2.8%)	76/3749(2.0%)	
Other	54/3214(1.7%)	12/535(2.2%)	66/3749(1.8%)	
Renal	39/3214(1.2%)	5/535(0.9%)	44/3749(1.2%)	

Subject Medical History by Gender

	Males	Females	All	p-value[1]
Number of Subjects	3220	538	3758	
Hypertension	2584/3200(80.8%)	443/532(83.3%)	3027/3732(81.1%)	0.169
Hypercholesterolemia	2015/3109(64.8%)	341/518(65.8%)	2356/3627(65.0%)	0.653
Tobacco Use	1725/3119(55.3%)	290/519(55.9%)	2015/3638(55.4%)	0.809
Coronary Artery Disease	1327/3161(42.0%)	165/516(32.0%)	1492/3677(40.6%)	<.0001
Chronic Obstructive Pulmonary Disease	747/3155(23.7%)	176/526(33.5%)	923/3681(25.1%)	<.0001
Cancer	725/3163(22.9%)	117/529(22.1%)	842/3692(22.8%)	0.683
Cardiac Arrhythmia	705/3161(22.3%)	92/526(17.5%)	797/3687(21.6%)	0.013
Peripheral Vascular Disease	571/3136(18.2%)	137/523(26.2%)	708/3659(19.3%)	0.0001
Diabetes Mellitus	610/3192(19.1%)	96/531(18.1%)	706/3723(19.0%)	0.575
Renal Insufficiency	483/3184(15.2%)	100/530(18.9%)	583/3714(15.7%)	0.030
Coronary Artery Bypass Graft	537/3193(16.8%)	44/530(8.3%)	581/3723(15.6%)	<.0001
Carotid Disease	373/3055(12.2%)	69/495(13.9%)	442/3550(12.5%)	0.280
Erectile Dysfunction (male only)	210/1759(11.9%)	-	210/1759(11.9%)	-
Stroke	310/3170(9.8%)	51/530(9.6%)	361/3700(9.8%)	0.911
Congestive Heart Failure	281/3158(8.9%)	49/523(9.4%)	330/3681(9.0%)	0.727
Valvular Heart Disease	241/3151(7.6%)	42/522(8.0%)	283/3673(7.7%)	0.752
Thromboembolic Event	197/3141(6.3%)	28/520(5.4%)	225/3661(6.1%)	0.435
Transient Ischemic Attack	172/3142(5.5%)	39/521(7.5%)	211/3663(5.8%)	0.068
Degenerative Connective Tissue Disease	43/3088(1.4%)	18/514(3.5%)	61/3602(1.7%)	0.001
Renal Dialysis	41/3196(1.3%)	12/530(2.3%)	53/3726(1.4%)	0.077
Paraparesis	33/3196(1.0%)	5/534(0.9%)	38/3730(1.0%)	0.840
Paraplegia	16/3204(0.5%)	2/534(0.4%)	18/3738(0.5%)	0.700

GREAT Gender Analysis AAA cohort




Proportion Free from Aorta Related Mortality
1.0
0.8
0.6
0.4
0.2
0.0
Male
Female
Log-rank P-value: 0.128
0
6 mo
1 yr
2 yr
3 yr
4 yr
5 yr
6 yr
7 yr
8.2 yr
Time Post Procedure

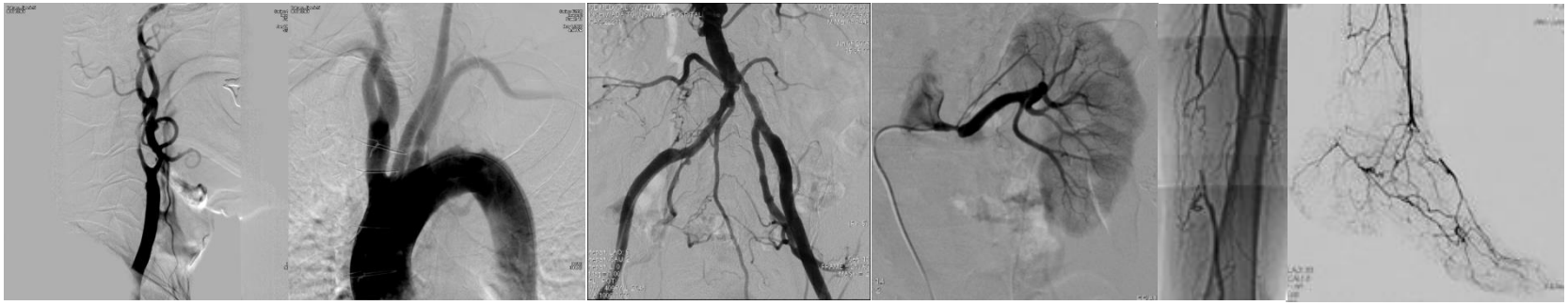
- No difference in 30-day mortality was demonstrated for women compared with men, nor did women have a higher incidence of the composite end-point (mortality, systemic complication, or conversion
- the **EUROSTAR** cohort in 2013:
  - 9227 EVAR patients
  - over a 5-year period
  - no difference in 30-day mortality (OR: 0.89; 95% CI, 0.48-1.67)

****The great registry

- A more complex anatomy is frequently indicated as an explanation for the higher rate of complications, longer LoS, and higher rates of long term reinterventions for women compared with men. This was not confirmed in the present study in which anatomical differences between men and women were not statistically different apart from neck angulation which is a variable known to negatively influence outcome

Study Limitation

- Study design: retrospective cohort study, and carries all the potential biases inherent to such study designs.
- The small number of patients in the female cohort may also have introduced type II errors.
- No comprehensive information regarding medication was documented in the database, making it impossible to adjust for its effect.
- Many patients had been lost to follow up or had them privately therefore much information pertaining to post-operative imaging were missing.



Thank you for your attention

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