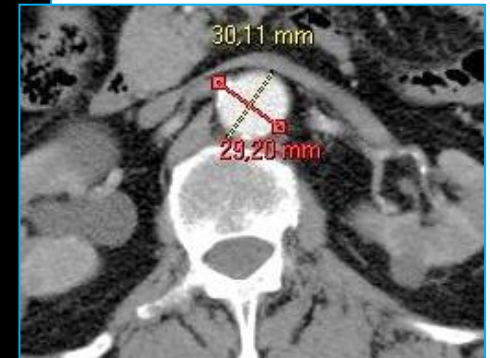
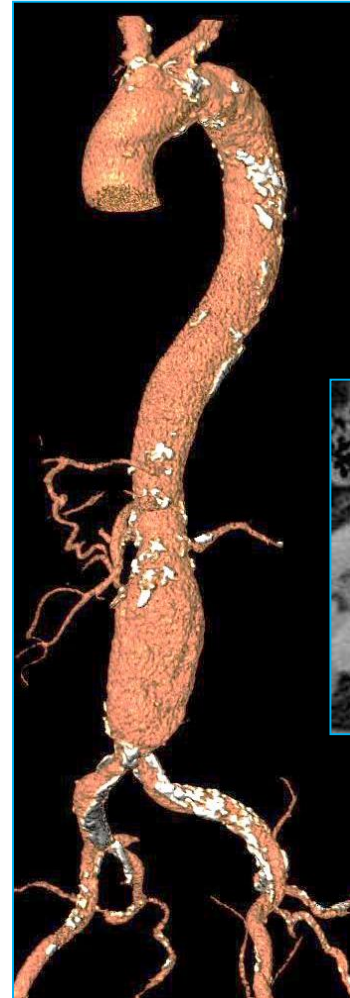


Is a large neck a contraindication to EVAR ?

A multicentric experience

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Is a large neck a controindication to EVAR ?

A multicentric experience



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Background

Identifying and grading factors that modify the outcome of endovascular aortic aneurysm repair

Chaikof EL et al. JVS 2002

Aortic neck	Absent = 0	Mild = 1	Moderate = 2	Severe = 3
Length	> 25 mm	25 - 15 mm	15 - 10 mm	< 10 mm
Diameter	< 24 mm	24 - 26 mm	26 - 28 mm	> 28 mm
Angle	> 150°	150° - 135°	135° - 120°	< 120°
Calcification/thrombus	< 25%	25 - 50%	> 50%	-



**Hostile
Neck**

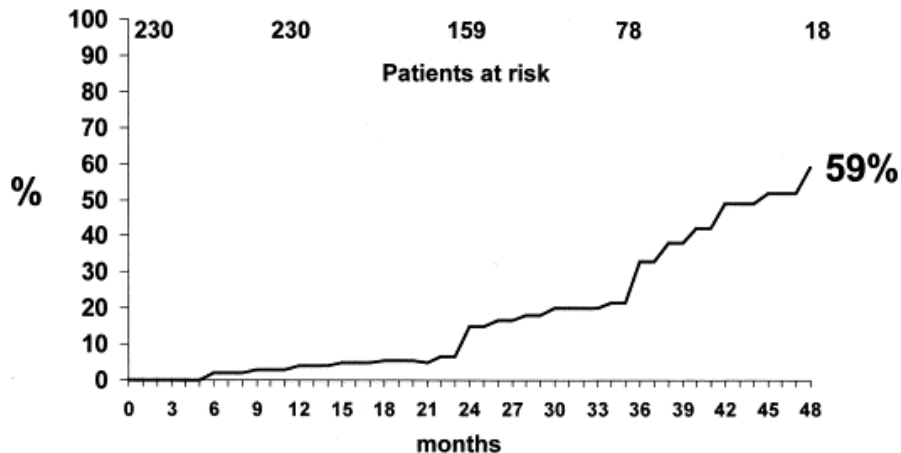
Background

Predictive factors and clinical consequences of proximal aortic neck dilatation in 230 patients undergoing abdominal aorta aneurysm repair with self-expandable stent-grafts

Cao P et al. JVS 2003

Grafts 230

- AneuRx 176
- Excluder 26
- Zenith 14
- Talent 13
- Endologix 1



Probability of neck dilatation

	AND				Odds ratio	P
	Yes (n = 65)		No (n = 165)			
	n	%	n	%		
Proximal neck length ≤ 10 mm	18	27	34	21	—	.3
Proximal neck diameter ≥ 25 mm	9	14	8	4.8	3.1	.02
Neck thrombus	10	15	12	7	—	.08
Neck angulation >60 degrees	3	4.6	10	6	—	1
AAA diameter ≥ 55 mm	17	26	41	25	—	.9
Graft oversizing $>15\%$	30	46	76	46	—	1
Suprarenal fixation	9	14	19	11.5	—	.6
Migration >10 mm	18	27	10	6	8.0	.0001
Type 1 endoleak	6	9	2	1	8.3	.009
AAA growth >3 mm	8	12	13	7	—	.3

Background

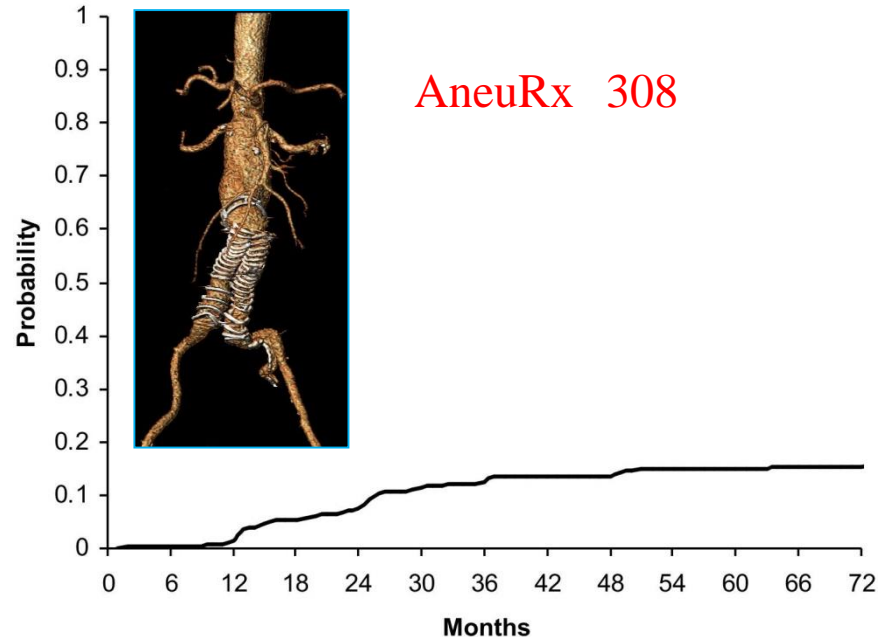
The role of aortic neck dilatation and elongation in the etiology of stent graft migration after endovascular abdominal aortic aneurysm repair with passive fixation device

Litwinski RA et al JVS 2006

Variables significantly correlated with migration

- Short neck

- **Infrarenal neck dilatation**



Probability of stent graft migration

Background

Risk factors for proximal neck complications after endovascular aneurysm repair using the Endurant Stentgraft

Bastos Goncalves F et al EJVES 2015

Post-operative neck related adverse events	<i>N</i> = 1263 <i>N</i> (%)
Endoleak type 1a	18 (1.4)
Corrected by remodeling the stent graft	2/18 (11)
Corrected with extension cuffs (prox or dist)	6/18 (33)
Corrected (others)	4/18 (22)
Proximal device migration (>10 mm)	0 (0)
Total (patients)	18 (1.4)

Background

Risk factors for proximal neck complications after endovascular aneurysm repair using the Endurant Stentgraft

Bastos Goncalves F et al EJVES 2015

Characteristic	Event total = 18 N (%)	Univariate p value	Multivariate HR (95% CI)
Age ≥ 80	6/290 (2.1)	0.26	–
Female gender	6/133 (4.5)	0.003	5.6 (2.0–15.3)
ASA III/IV	12/658 (1.8)	0.20	–
Proximal graft diameter 32 or 36	4/398 (1.0)	0.40	–
Neck length <10 mm	3/27 (11.1)	0.040	8.9 (2.5–31.2)
Neck thrombus/calcification >50%	0/74 (0)	–	–
Neck Taper $\geq 15\%$	4/218 (1.8)	0.99	–
Maximum AAA diameter ≥ 65	11/317 (3.5)	0.61	6.4 (2.3–17.7)
Suprarenal angle >60°	3/44 (6.8)	0.003	–
Infrarenal angle >75°	3/62 (4.8)	0.010	–

Aim

- To report mid-term outcomes following EVAR in pts with Wide-Neck (WN)
- To evaluate the progression of infra / supra-renal aortic diameters



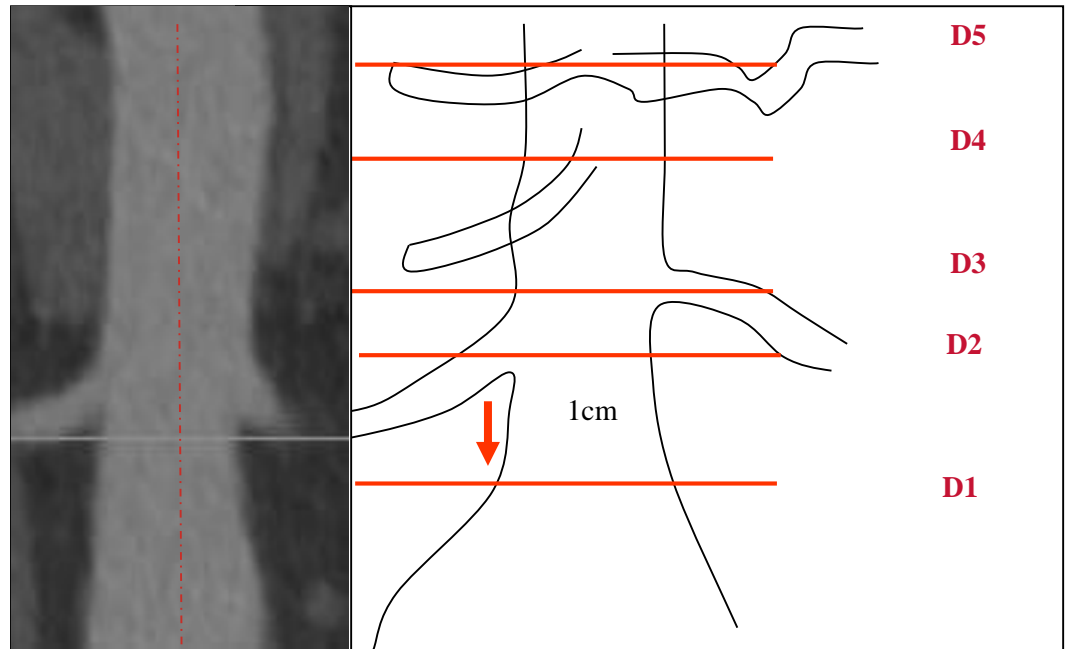
Methods – Patient's selection

- 3 European University Vascular Surgery Units
(Bologna, Lille, Perugia)
- January 2009 – December 2012
- Elective AAA with Wide-Neck and CT at 24 months
- Data base: pre-operative, procedural and follow up data



Methods – Measurements

- Preop CTA (T0)
- 24-month CTA (T24)
- CLL:
 - . aortic diameter (outerwall distance)
 - . D1
 - . D2
 - . D3
 - . D4
 - . D5



- Neck diameter $T24 - T0 \geq 3$ mm = significant dilatation



Methods – End points

- Early end points:

- . Technical success (TS)
(correct deployment of endograft without ELI-III, stenosis/kinking, conversion to OR and mortality)
- . 30 day Endoleak type Ia (ELIa)

- Mid-term endpoints:

- . Survival and AAA-related mortality
- . ELIa
- . Freedom from proximal neck-related reinterventions (FFR)
- . AAA- shrinkage
- . Aortic diameter evolution at the level D1-D5



Results

- 2009-2012: 1331 EVAR
- AAA with WN: 118 (8.86%)
- Mean age: 73.9±7.8 years
- Male / Female: 90.7% / 9.3%

Demographics,
co-morbidities

	n	%
Smoking	44	37.3
Hypertension	101	85.5
Hypercholesterolemia	66	55.9
COPD	43	36.4
Diabetes	22	18.6
CRF	30	25.4
BMI > 31	24	20.0
CAD	47	39.8
PAOD	16	13.6
Previous laparotomy	35	29.7
ASA II	4	3.4
ASA III	97	82.2
ASA IV	17	14.4

96.6%



Results

Anatomical neck characteristics

	Mean	Standard deviation	Range
Length (mm)	23.5	12.7	10 - 37
Diameter (mm)	29.7	1.7	28 - 36
	n	%	
Thrombus			
0	61	51.2	
1	33	28.0	
2	24	20.8	
Calcification			
0	81	68.6	
1	29	24.6	
2	8	6.8	

Endografts

	n	%	IFU (n)	No IFU (n)
Cook-Zenith	74	62.7	59	15
Flex	70	59.3	55	15
Low profile	4	3.4	4	0
Gore - Excluder	6	5.1	5	1
Medtronic - Endurant	28	23.7	20	8
Trivascular - Ovation	1	0.8	1	0
Vascutek Anaconda	9	7.6	9	0

Suprarenal fixation 86%, infrarenal fixation 14%



Results - Endografts

- Endograft main body diameter (mean): 33.3 ± 2.12 mm (range 30-36)
- Oversizing (mean): $17 \pm 9\%$ (range 1-29%)
 - . 39 pts (33%) received a main body oversize < 10%
- Aortic cuff : 6 pts (5.1%)
- Iliac limb PTA/stenting: 9 (7.7%)



Results – Early end-points

- TS: 98%

- ELIa : 2%

N	Neck length	Neck diameter	Neck calcification	Neck thrombosis	Type of Endograft	Diameter Endograft (mm)	Oversize (%)
1	12	28	0	0	Endurat	32	14
2	28	29	2	2	Zenith-Flex	32	10
3	14	33	0	0	Zenith-Flex	36	9

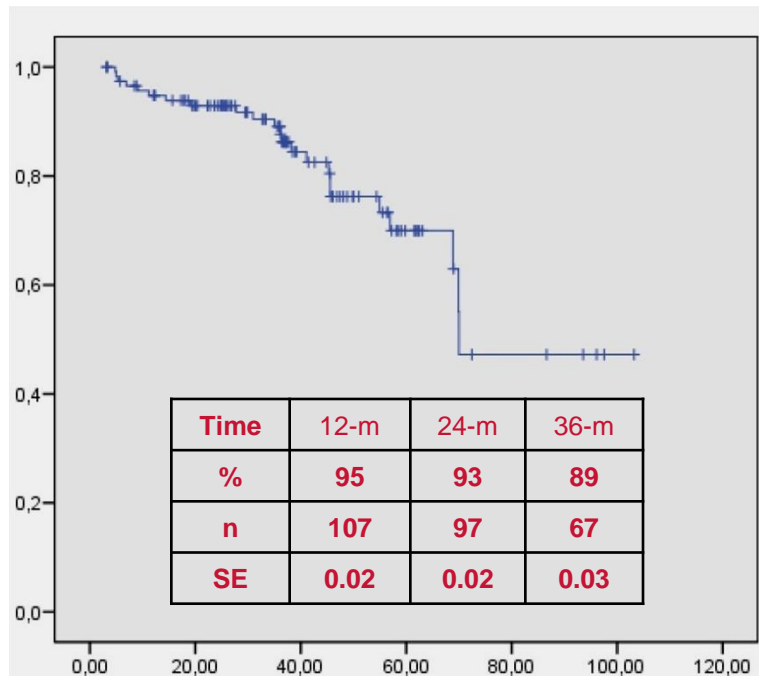
- Perioperative EL type II: 22 (25%)

- Intraoperative and 30-day Mortality: 0%



Results – Follow up end-points

- Follow up (mean): 37.9 ± 11.9 months (range 24-103)



Survival

- Overall mortality: 19.5%
- Mortality AAA-related: 4 (17.4%)



Results – Follow up end-points

- Follow up (mean): 37.9±11.9 months (range 24-103)
- **Endoleak Type Ia: 14 (12%)**

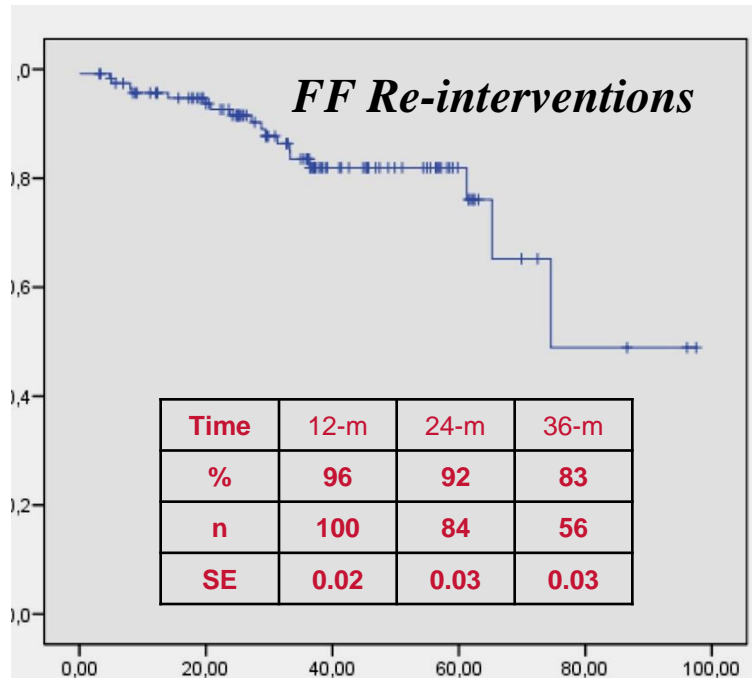
N	Neck length	Neck diameter	Neck calcification	Neck thrombosis	Type of Endograft	Diameter Endograft (mm)	Oversize (%)
1	10	28	0	2	Endurant	32	14
2	12	28	0	0	Endurant	32	14
3	10	30	2	2	Zenith Flex	32	7
4	15	28	2	2	Anaconda	30	7
5	25	30	1	0	Anaconda	34	13
6	28	30	1	1	Zenith Flex	32	7
7	15	29	0	0	Zenith Flex	32	10
8	32	36	0	0	Zenith Flex	36	1
9	16	28	0	2	Zenith Flex	32	14
10	14	34	0	0	Zenith Flex	36	6
11	28	30	0	0	Zenith Flex	32	7
12	16	30	0	0	Endurant	36	20
13	31	30	0	0	Endurant	36	20
14	18	34	1	0	Endurant	36	6

IFU vs outside IFU: p=0.15
 Neck length < 15 mm p=0.17
 Neck diam. > 32 mm p=0.09



Results – Follow up end-points

- Follow up (mean): 37.9±11.9 months (range 24-103)
- **Reinterventions: 19 (16,1%)**
 - . Open repair 36.8%
 - . Endo 63.2%



Reinterventions proximal neck related: 8 (6.8%)

N	Cause	Treatment	Results
1	Rupture	Conversion to open repair	Death
2	ELI	Proximal Aortic cuff	Sealed
	ELI	Conversion to open repair	Death
3	Rupture	Conversion to open repair	Death
5		Chimney (Proximal Aortic cuff + stent-graft for renal artery)	Sealed
	ELI		
8	ELI	Conversion to open repair	Survived
11	ELI	Proximal Aortic cuff	Sealed
	ELI	Conversion to open repair	Survived
12	Rupture	Chimney (Proximal Aortic cuff + stent-graft for renal and superior mesenteric arteries)	Death
14	ELI	Conversion to open repair	Survived



Results – Follow up end-points

- Follow up (mean): 37.9±11.9 months (range 24-103)
- **AAA shrinkage (> 5 mm): 63 pts (53.4%)**
- AAA-diameter stable : 41 (34.7%)
- **AAA-diameter increase: 14 (11.9%)**
 - ELIa 8pts
 - ELIb 1 pt
 - ELIII 1 pt
 - EL II 2 pts
 - Unknown 2 pts



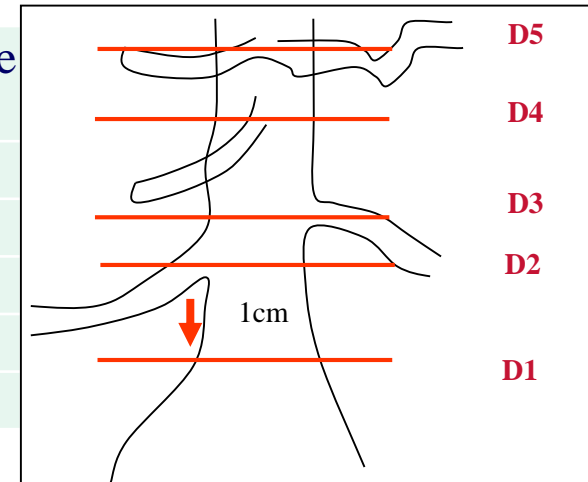
Results – Follow up end-points

- Follow up (mean): 37.9±11.9 months (range 24-103)

Infra and supra renal aortic diameter progression

All diameters increased at 24 month

	T0 (mm) Mean ± SD	T24 (mm) Mean ± SD	Paired T-Test p	Mean increase %
D1	29.1±1.1	32.3±4.5	< 0.001	10.9
D2	28.3±2.8	29.6±3.8	0.001	4.5
D3	27.7±2.9	28.9±3.6	< 0.001	4.3
D4	28.1±2.9	28.8±2.9	< 0.001	2.5
D5	29.1±3.0	29.4±3.9	< 0.001	1.0



Infrarenal Neck Enlargement associated with:- Neck length < 15 mm p=0.032
 - Stainless steel endograft p=0.003
 - ELIa p= 0.001



Results – Follow up end-points

- Follow up (mean): 37.9±11.9 months (range 24-103)

Significant infra-renal neck dilatation						
Variables	Univariate Logistic regression			Multivariate Logistic regression		
	Sig	Exp (B)	95% CI for Exp(B)	Sig	Exp (B)	95% CI for Exp(B)
EL 1a T24	0.009	0.170	0.045-0.649	0.001	0.059	0.010-0.331
Supra-renal fixation endograft	0.032	0.102	0.013-0.817	0.231	1.719	0.988-5.208
Stainless Steel endograft	0.001	0.265	0.118-0.593	0.003	0.219	0.081-0.593
Obesity	0.036	0.372	0.148-0.939	0.121	0.408	0.131-1.269
Previous Laparotomy	0.015	2.959	1.238-7.075	0.213	1.912	0.689-5.308
Neck Length	0.004	1.052	1.016-1.088	0.032	1.051	1.004-1.100
Neck Diameter	0.002	1.454	1.149-1.840	0.202	1.209	0.903-1.619
Age	0.047	0.952	0.907-0.999	0.072	0.943	0.886-1.005



Is a large neck a contraindication to EVAR ?

A multicentric experience

Conclusion

- Answer: NO

Is a large neck a contraindication to EVAR ?

A multicentric experience

Conclusion

- Answer: NO
- EVAR performed in AAA with large necks is associated with a significant infra-renal aortic neck enlargement at 24-month (neck length < 15 mm, stainless steel endograft, ELIa), as well as an increased risk of proximal type 1 endoleak and proximal neck re-interventions.
- In this subgroup of patients, main body over-sizing $> 15\%$ or supra-renal sealing (FEVAR) following aortic morphology assessment should be discussed.