Surgical and Endovascular Treatment of Juxtarenal Aortic Aneurysms

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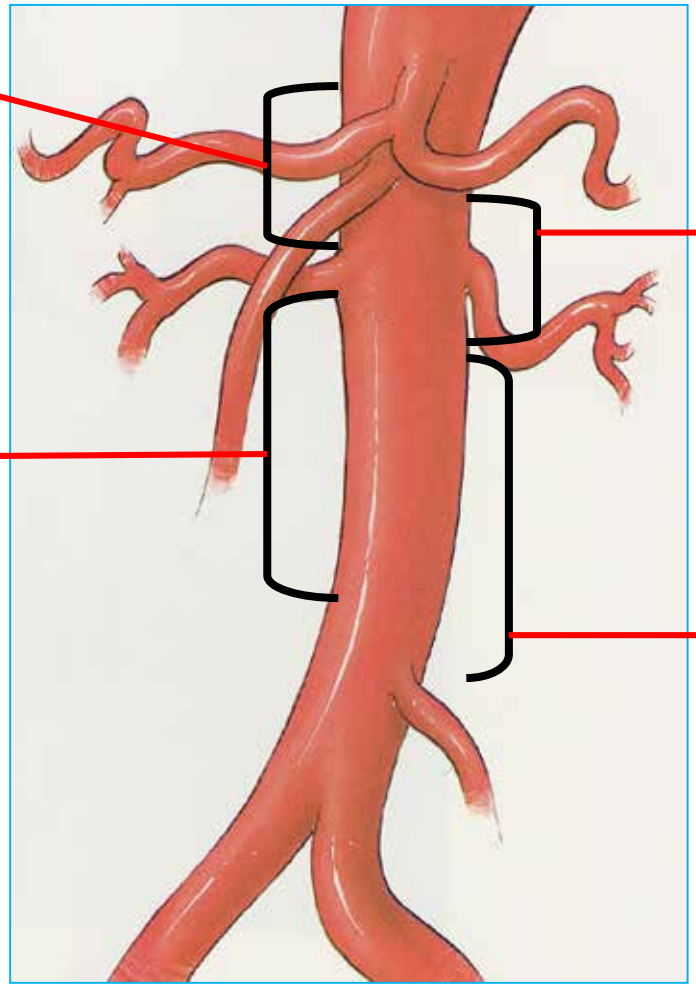
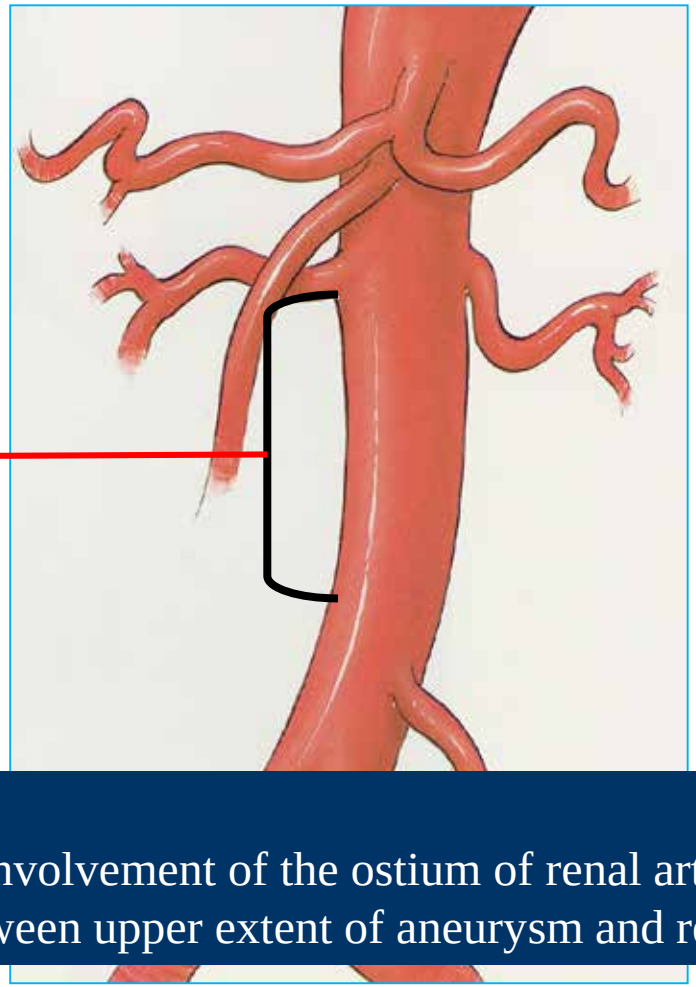
Abdominal aortic aneurysms – Anatomic Classification

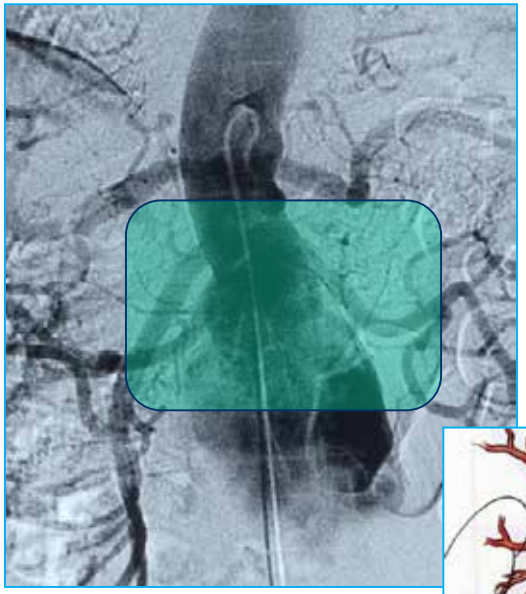


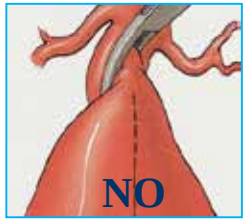
Johnston KW et al
JVS 1991; 13: 452-8

Abdominal aortic aneurysms – Anatomic Classification

Iuxtarenal







Definition:
Aneurysm without involvement of the ostium of renal arteries ;
no normal aorta between upper extent of aneurysm and renal arteries

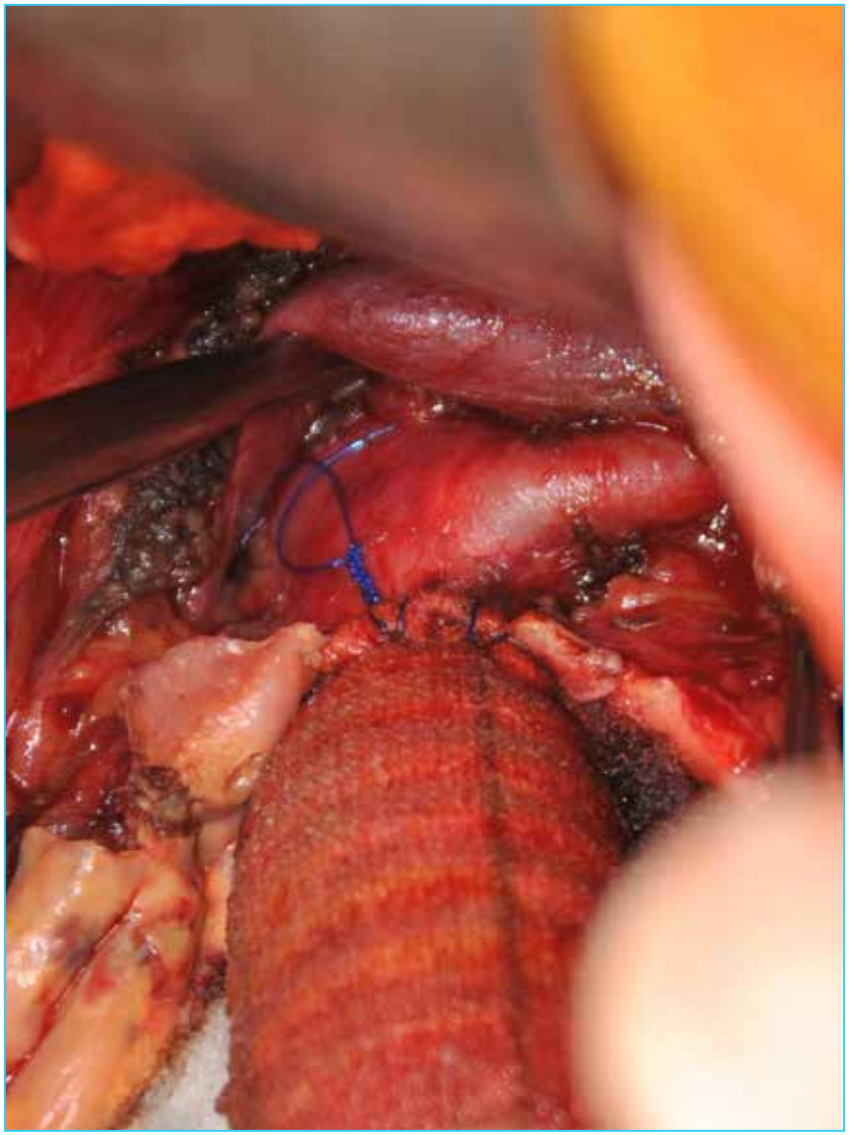
Identifying and grading factors that modify the outcome of endovascular aortic aneurysm repair

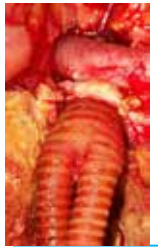
Chaikof EL et al. JVS 2002

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
Angle	> 150°	150° – 135°	135° – 120°	**< 120°**
Calcification/thrombus	< 25%	25 – 50%	> 50%	-

Hostile Neck

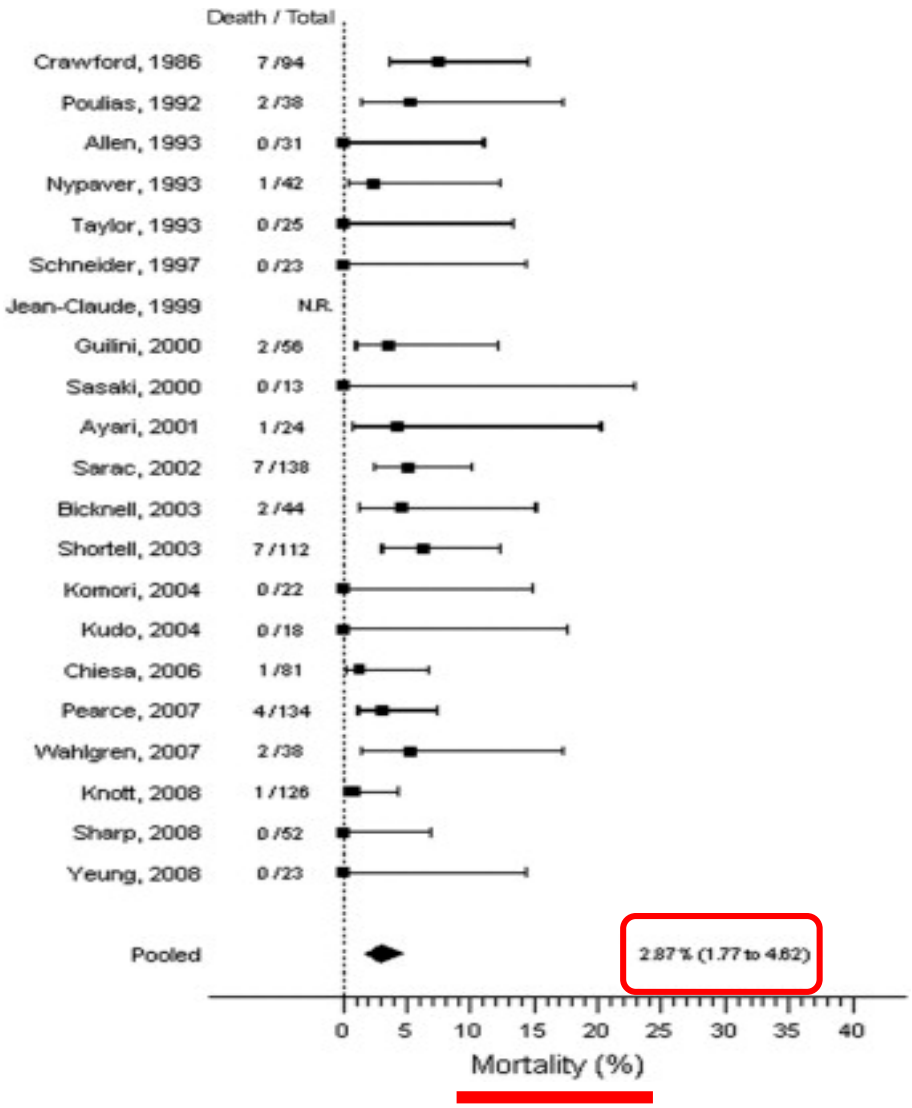
JAAA – Surgical Treatment

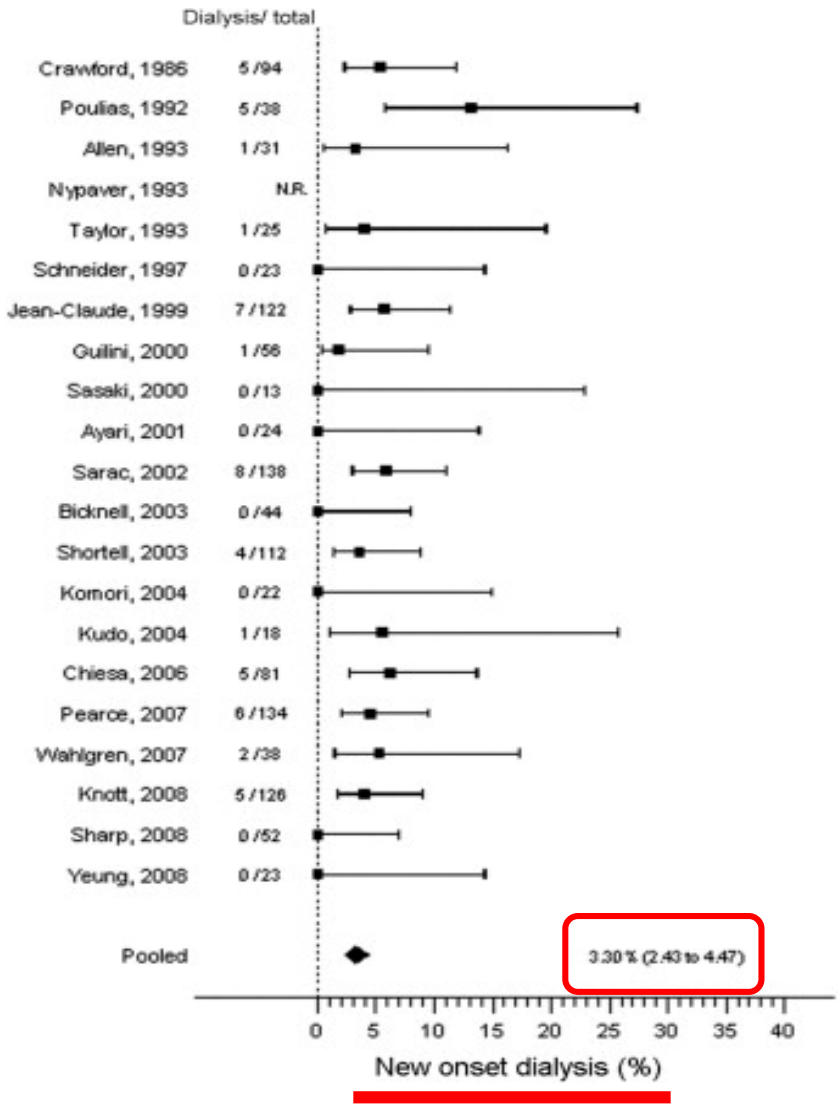




Juxtarenal aortic aneurysm repair

Jongkind V et al.
J Vasc Surg 2010; 52:760-7





Early and Long-term Results in the Surgical Treatment of Juxtarenal and Pararenal Aortic Aneurysms

Faggioli GL et al.
***EJVES 1998**; 15: 205-211*

Retrospective study

AAA : January 1981 – April 1996

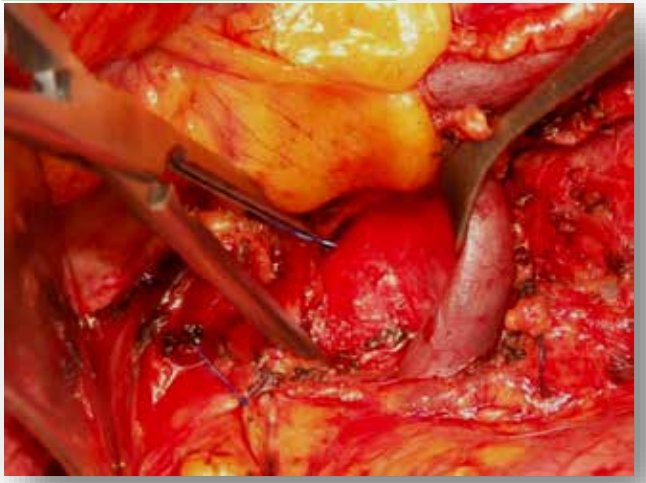
- AAA: 1450
  - Infrarenal 1400 (96.5%)
  - **Juxtarenal 42 (2.9%)**
  - Pararenal 8 (0.6%)

Early and Long-term Results in the Surgical Treatment of Juxtarenal and Pararenal Aortic Aneurysms

Faggioli GL et al.
***EJVES 1998**; 15: 205-211*

- **Surgical access**
  - Transperitoneal (anterior) 96%
  - Retroperitoneal 4%

- **Aortic control**
  - At the diaphram level 16%
  - Above the renal arteries 42%
  - Above 1 renal artery 42%



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Perioperative mortality

Procedures	Infrarenal AAA Pts 1400	JAAA Pts 50	P
Elective procedure	1.5%	7.1%	**< 0.02**
Emergency cases	37.5%	37.5%	n.s.

Early and Long-term Results in the Surgical Treatment of Juxtarenal and Pararenal Aortic Aneurysms

Faggioli GL et al.
***EJVES 1998**; 15: 205-211*

- Perioperative mortality 12%
  - elective procedure 7.1%
  - rupture aneurysms 37.5%

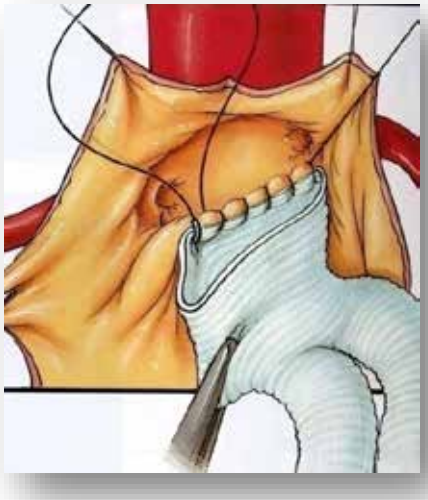
P = 0.036

Variable	Significance
Age > 70 years	**0.029**
Gender (male)	0.90
Hypertension	0.22
Smoking history	0.10
Coronary artery disease	**0.039**
Diabetes mellitus	0.87
Renal failure	0.17
Ruptured aneurysm	**0.024**
Tube graft	0.15
Supraceliac clamping	0.44
Renal revascularization	0.57
Technically difficult cases	0.90

Abdominal aortic aneurysms with short proximal neck: comparison between standard endograft and open repair

Freyrie A, Gargiulo M, Gallitto E et al.
***J Cardiovasc Surg 2012**; 53:617-23*

- Prospective, non randomized, one-center
- 2005 – 2009
- Inclusion criteria: AAA neck $\leq$ 1 cm
  - Surgery with suprarenal clamping



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Results

AAA (neck ≤ 1cm)	**82** (15.86%)
Sex (M)	76 (92.7%)
Age	72.4 ± 6.89
AAA Diameter	6.2 ± 1.18 cm
Surgery	**44** (53.7%)
EVAR	38 (46.3%)
Follow up:	**26.24** ± 17.4 months

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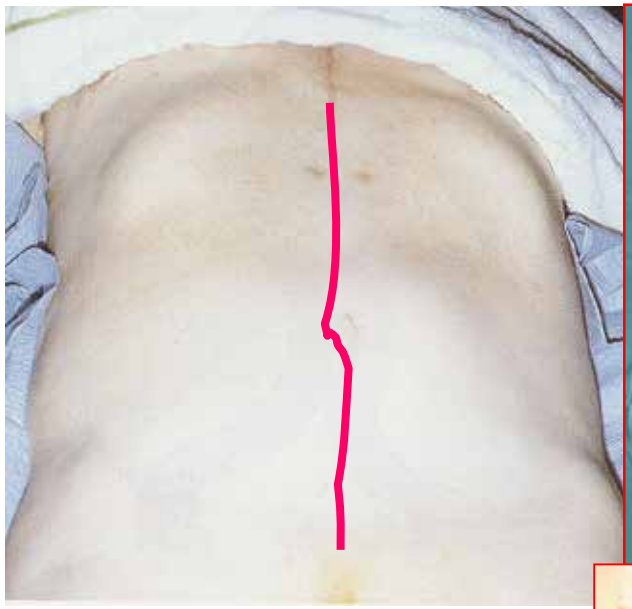
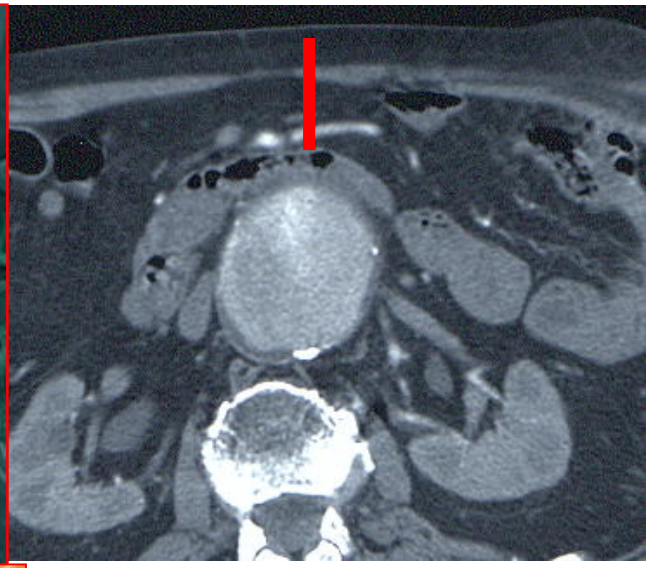
- **Surgical access**
  - Transperitoneal (anterior) 90.9%
  - Retroperitoneal 9.1%

Juxtarenal aortic aneurysms – tips and tricks

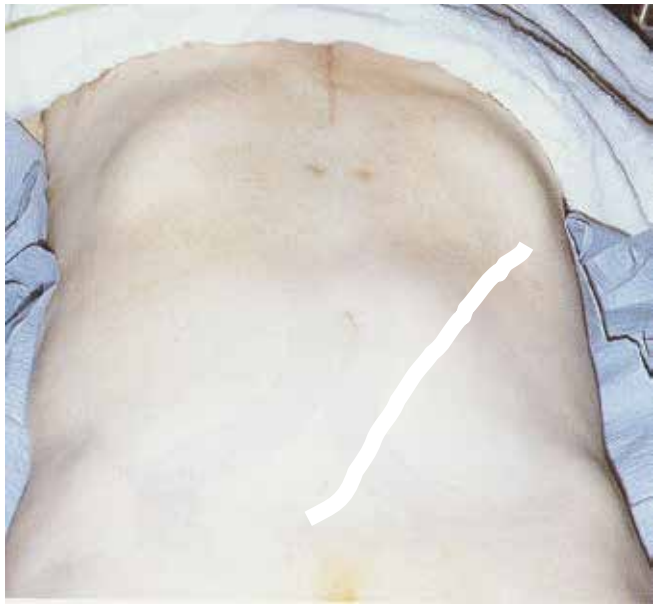
Abdominal incision – Transperitoneal (anterior) – 90.9%

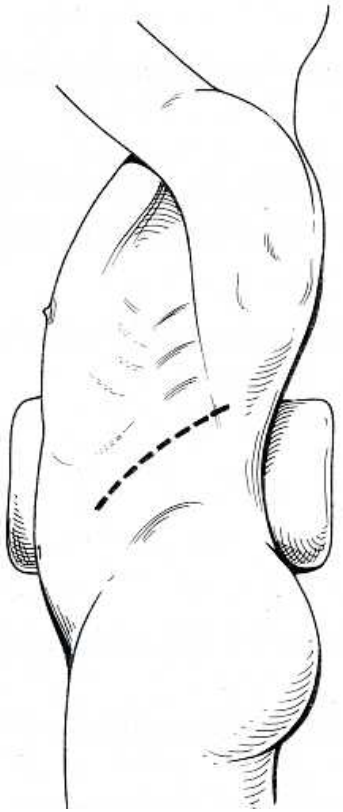


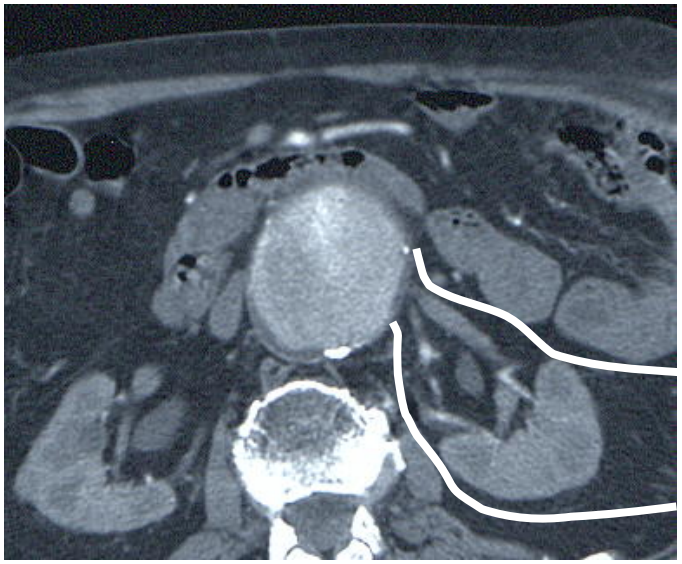


Juxtarenal aortic aneurysms – tips and tricks

Abdominal incision – Retroperitoneal – 9.1%

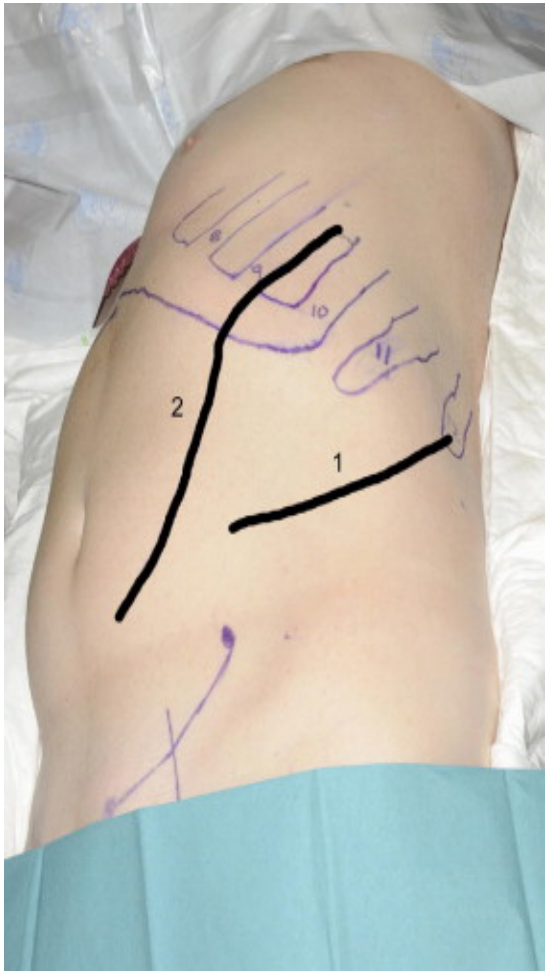






The retroperitoneal approach to the abdominal aorta in the endovascular era

Twine CP et al
J Vasc Surg 2012; 56:834-8



Advantages

1. Access to the juxtarenal and suprarenal aorta
2. Access to the aorta in hostile abdomen and obese patients
3. Faster recovery, quicker return to bowel function , fewer pulmonary complications, less pain, less cost

Disadvantages

1. Learning curve
2. Venous anomalies (LS IVC, retroaortic LRV)
3. Access to the right renal artery and right iliac artery

Systematic Review and Meta-analysis of the Retroperitoneal versus the Transperitoneal Approach to the Abdominal Aorta

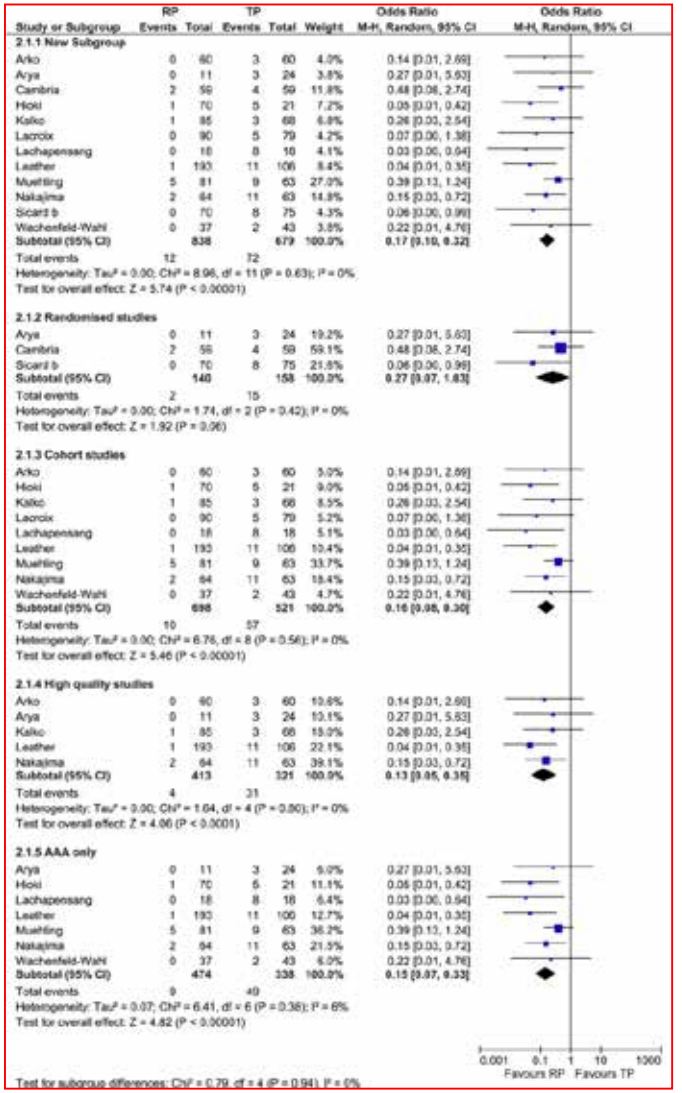
Twine CP et al
EJVES 2013; 46(1): 36-47

Post-operative complications

1. No difference on meta-analysis for rates of
- myocardial infarction
- renal failure
- wound hernia

2. Pneumonia was significantly less common in the RP group (p< 0.00001)

3. Ileus was significantly less common in the RP group (p< 0.00001)



Postoperative ileus

Systematic Review and Meta-analysis of the Retroperitoneal versus the Transperitoneal Approach to the Abdominal Aorta

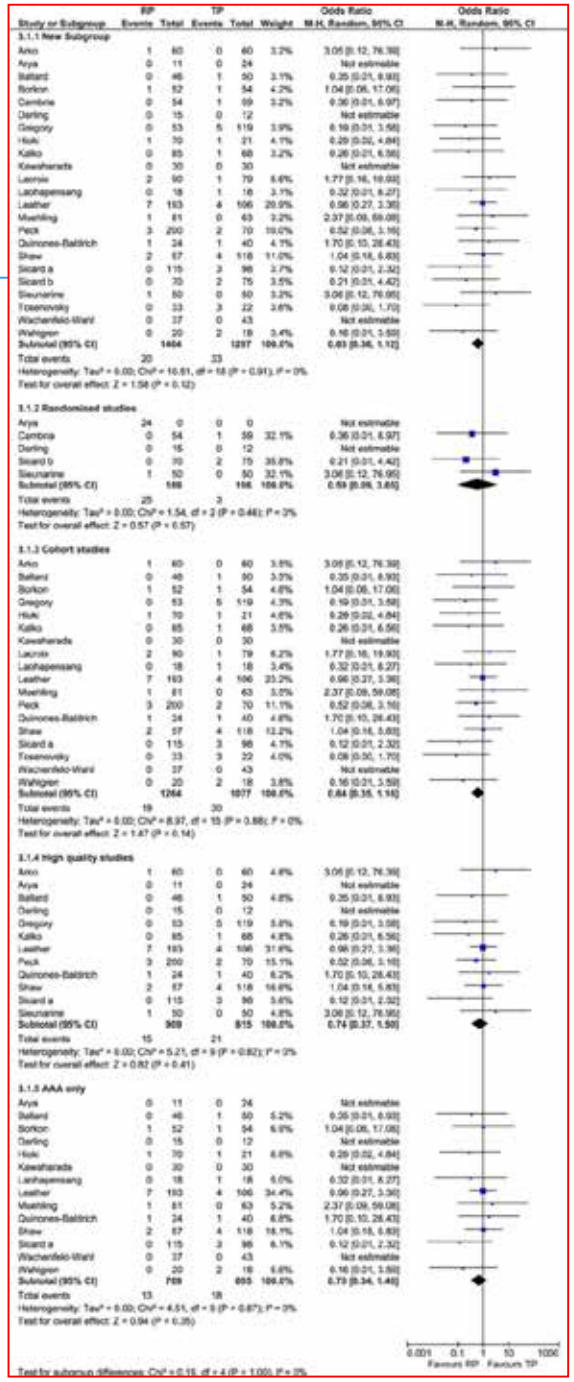
Twine CP et al
EJVES 2013; 46(1): 36-47

1. No difference on meta-analysis for rates of respiratory function

2. IC stay and hospital stay were significantly lower in the RP group ($p < 0.00001$)

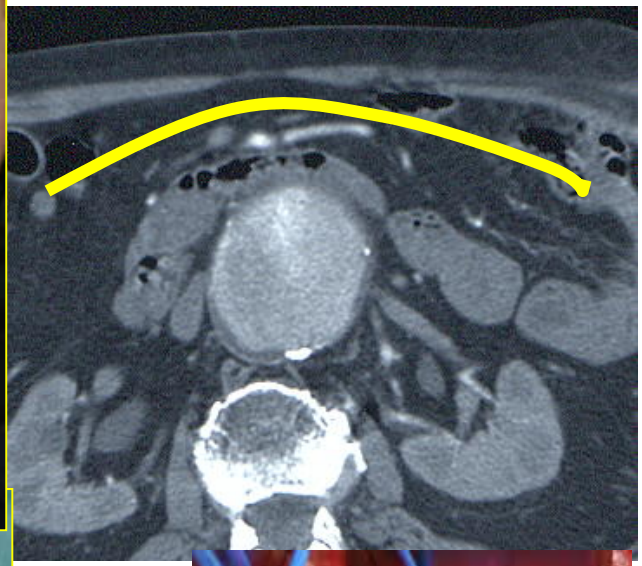
3. RP approach significantly cheaper ($p=0.02$)

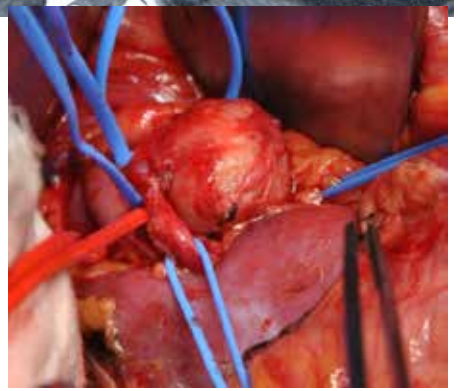
30 days mortality



Juxtarenal aortic aneurysms – tips and tricks

Abdominal incision - Subcostal





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- **Aortic control**
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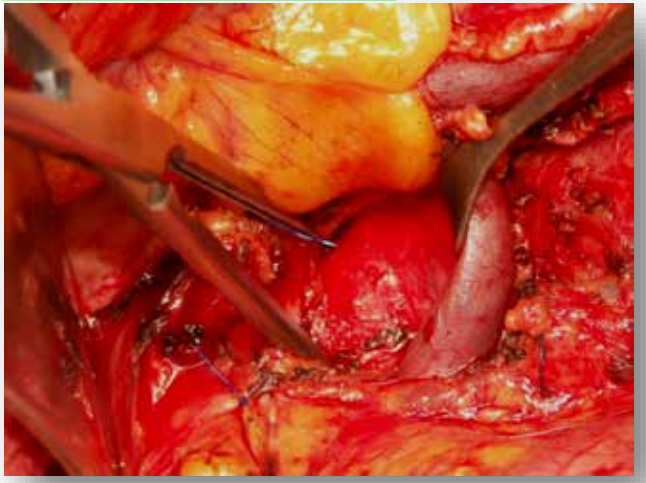
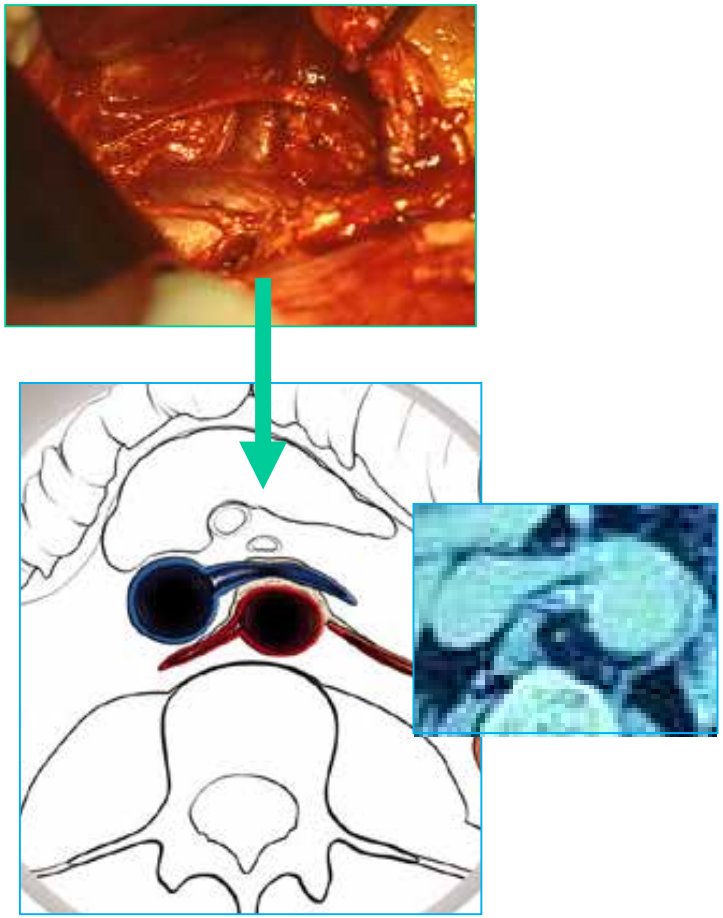
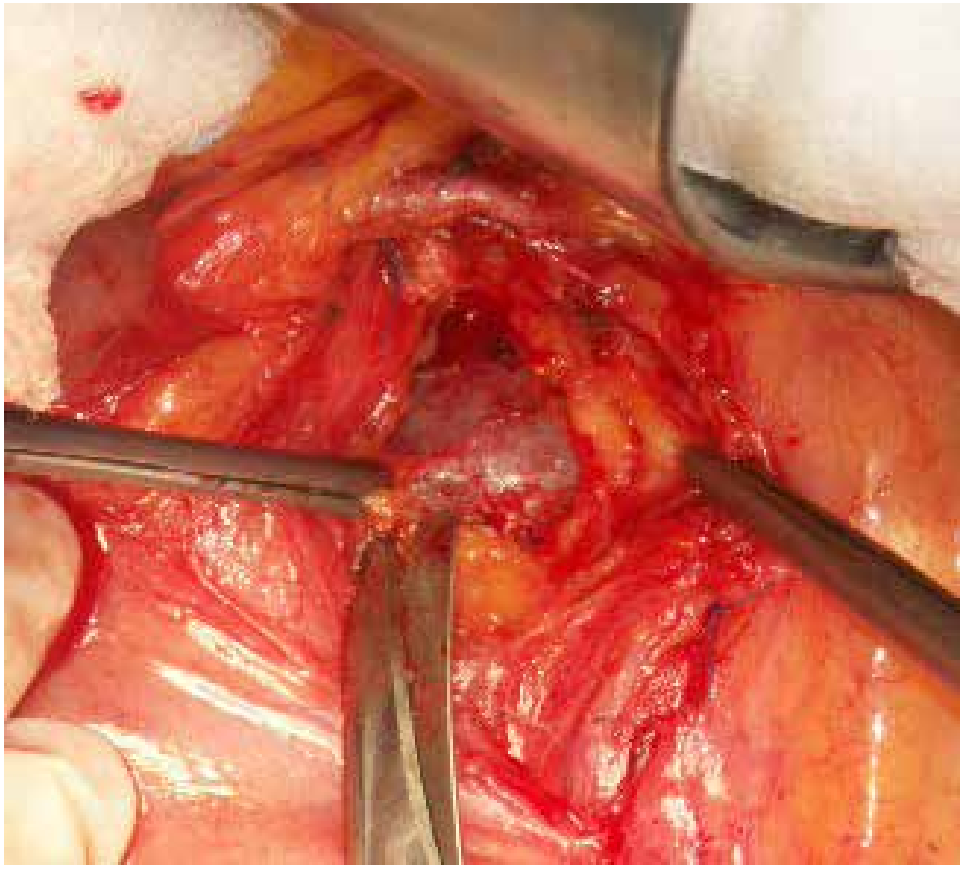
  - Above the renal arteries 54.5%
  - Above 1 renal artery 31.9%



Juxtarenal aortic aneurysms – tips and tricks

Dissection of aortic neck





Juxtarenal aortic aneurysms – tips and tricks

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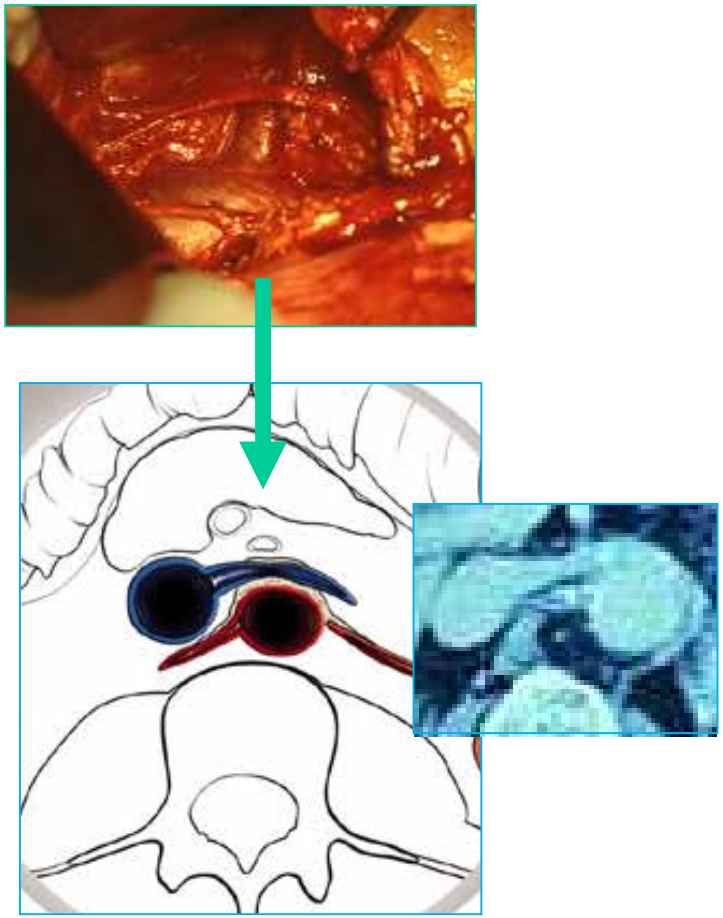

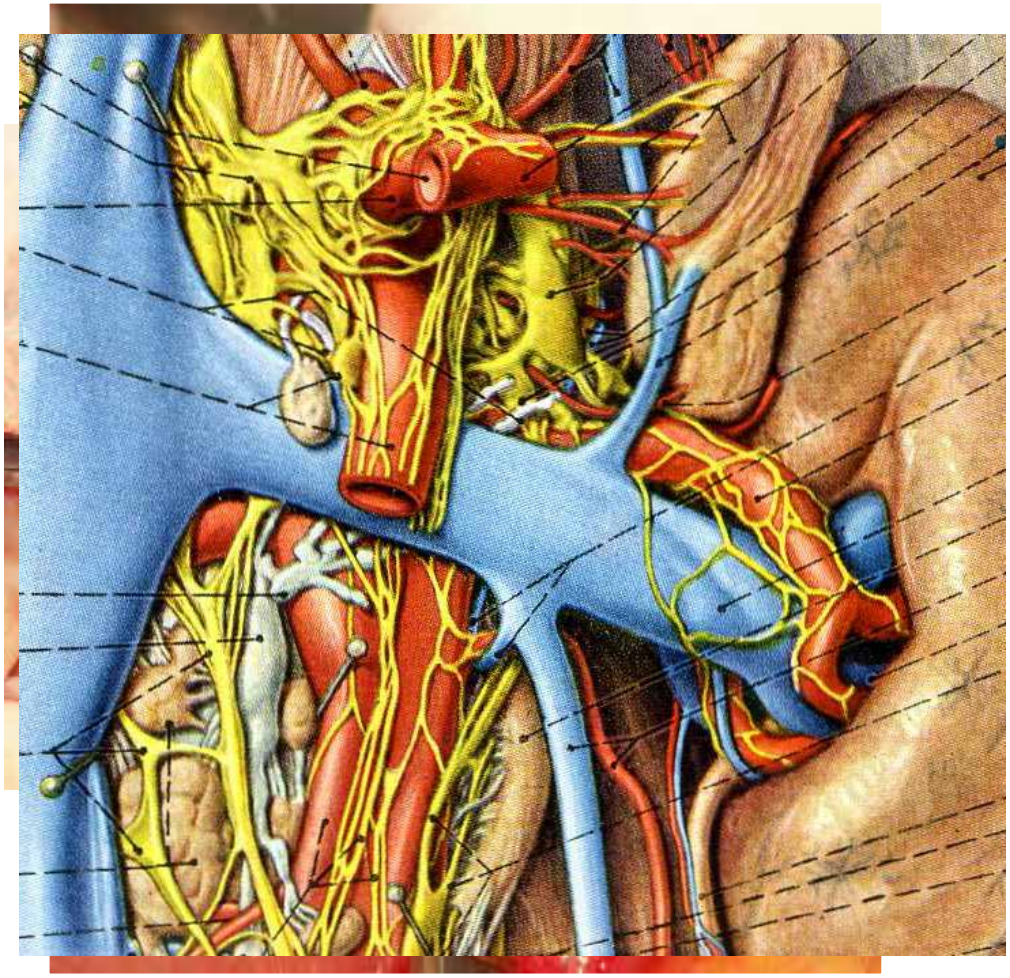

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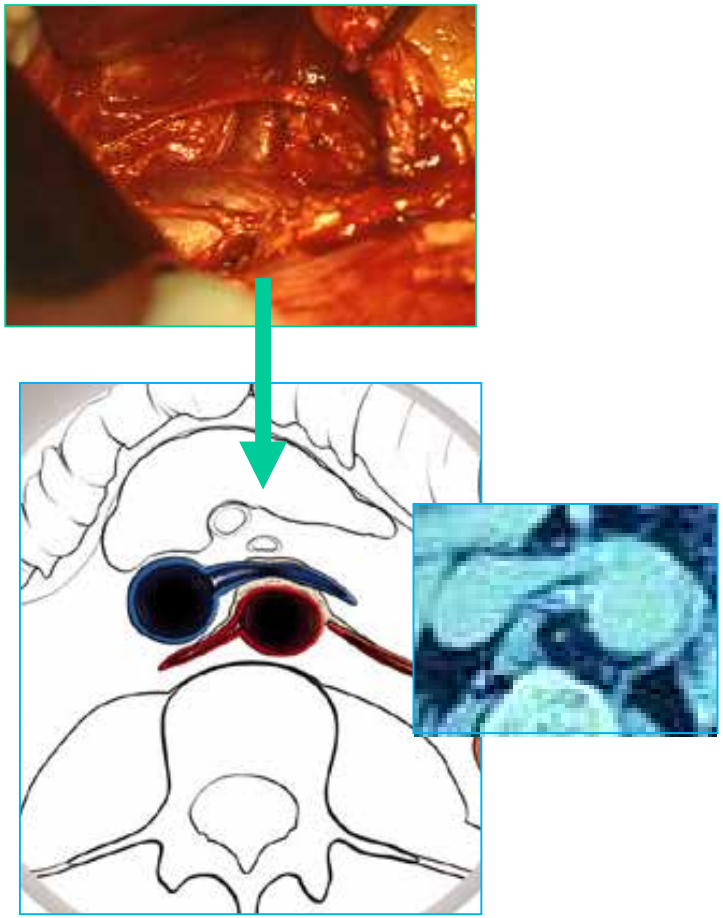
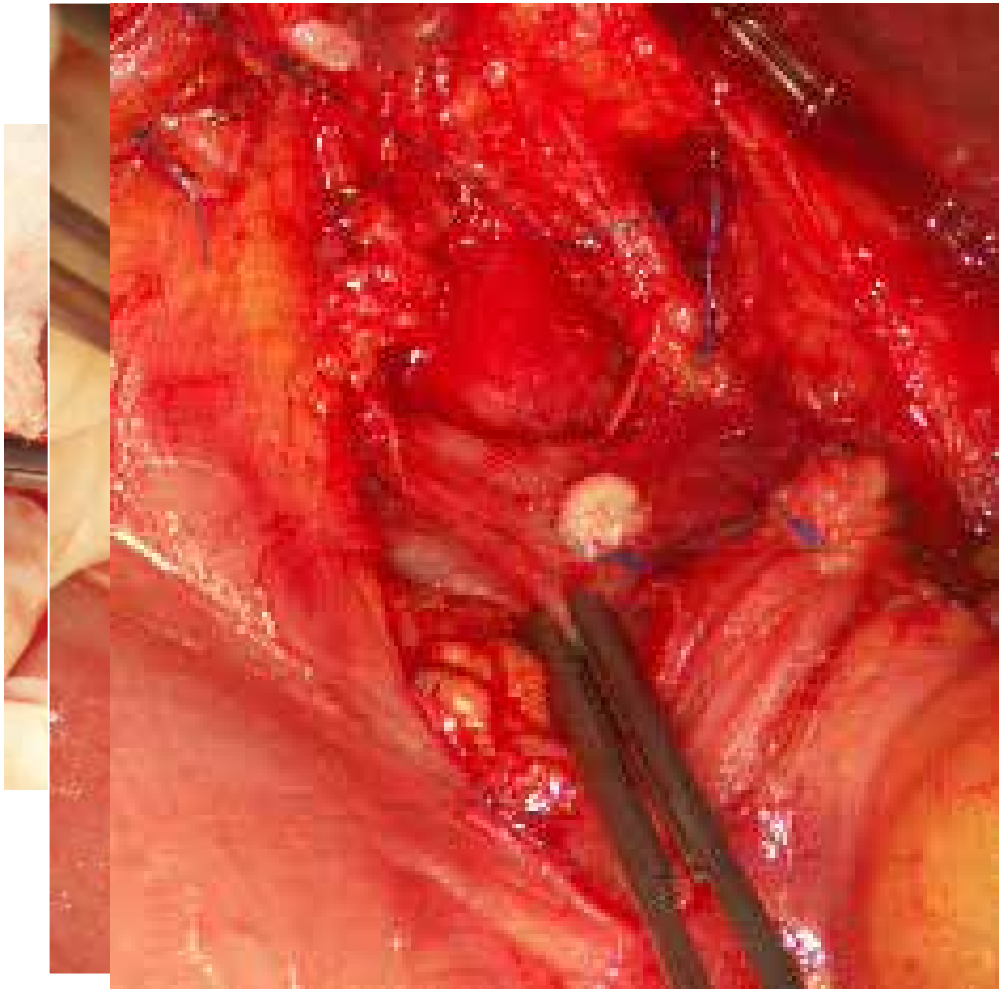
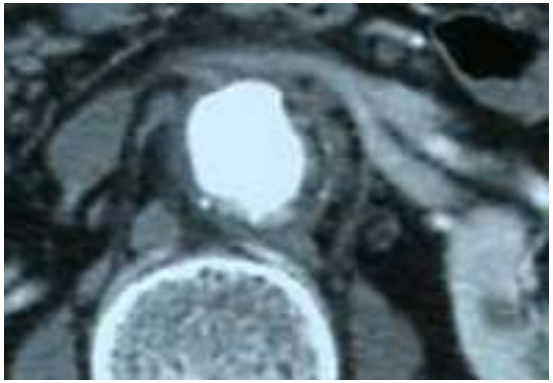
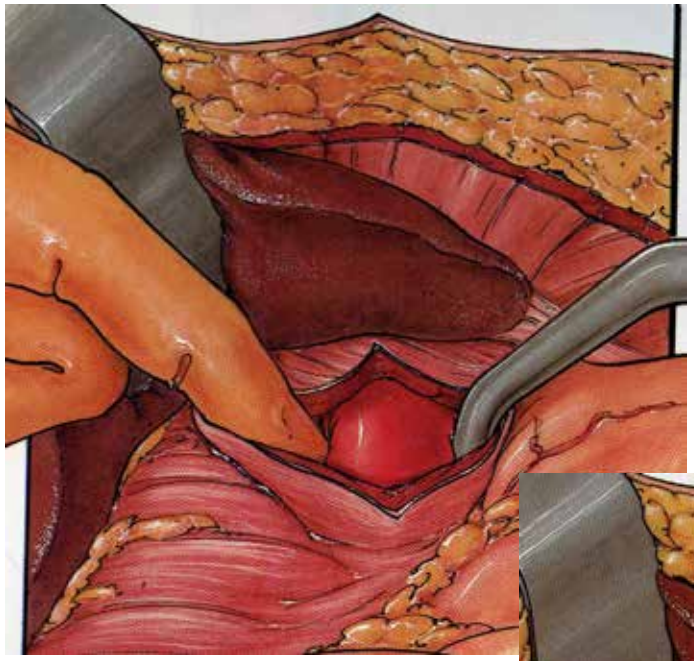


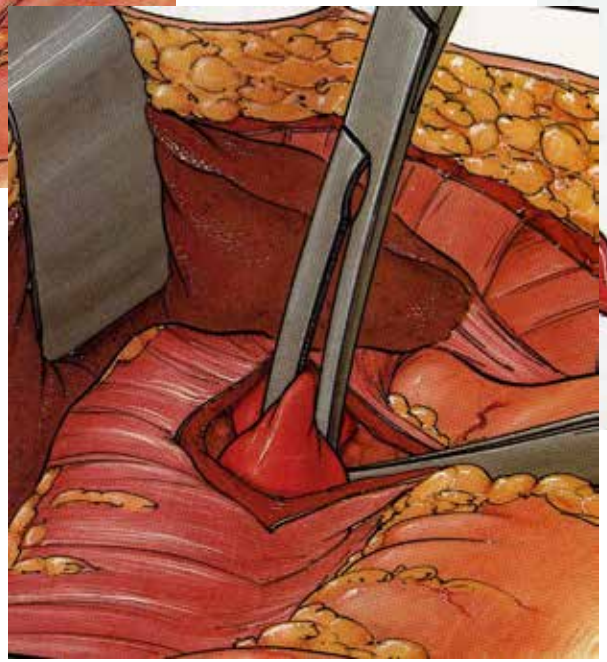


Juxtarenal aortic aneurysms – tips and tricks



Juxtarenal aortic aneurysms – tips and tricks





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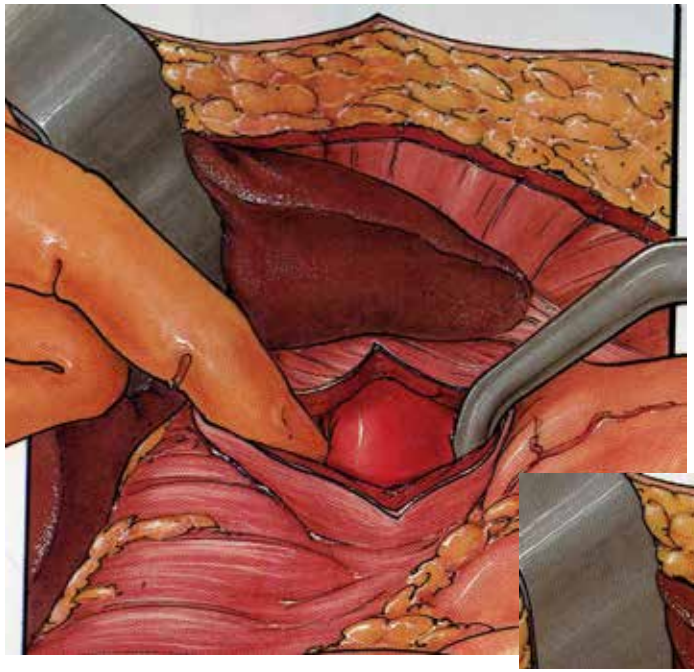
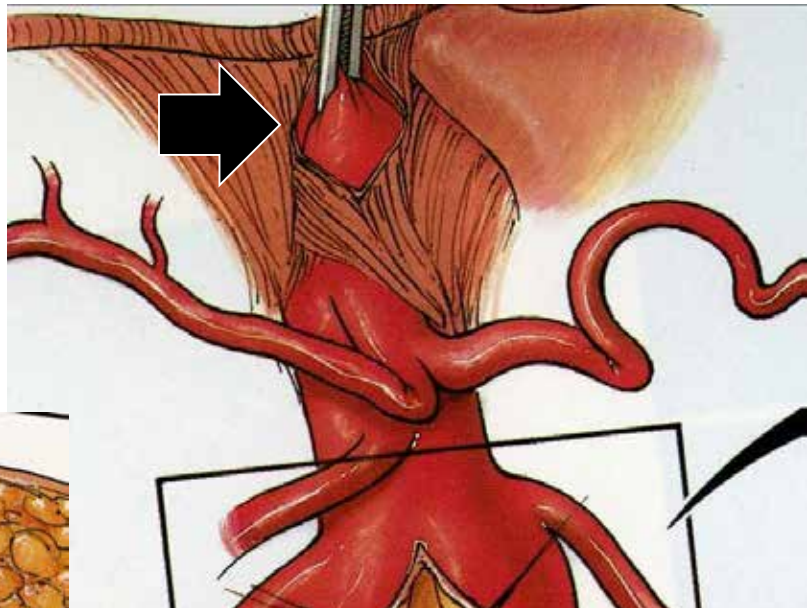
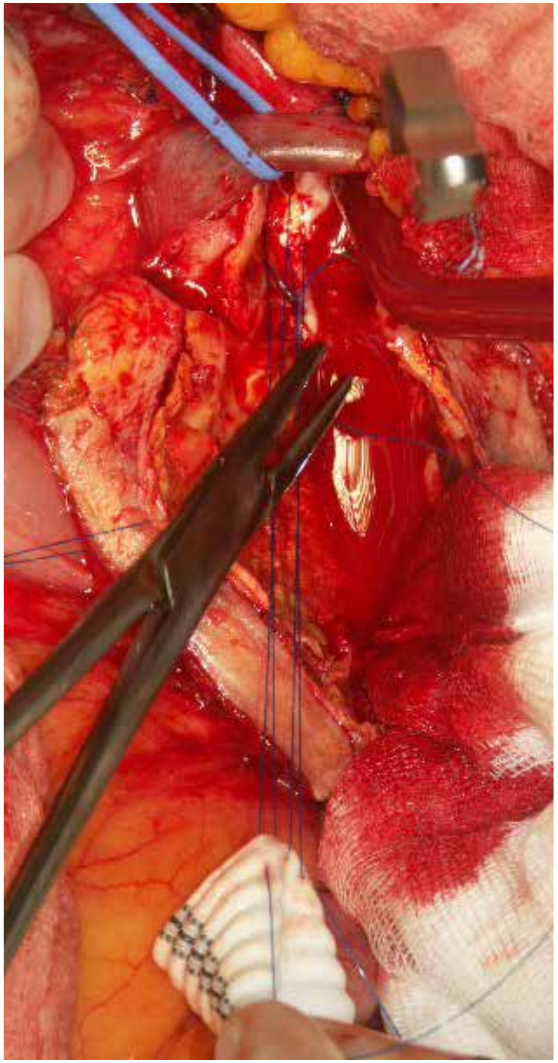


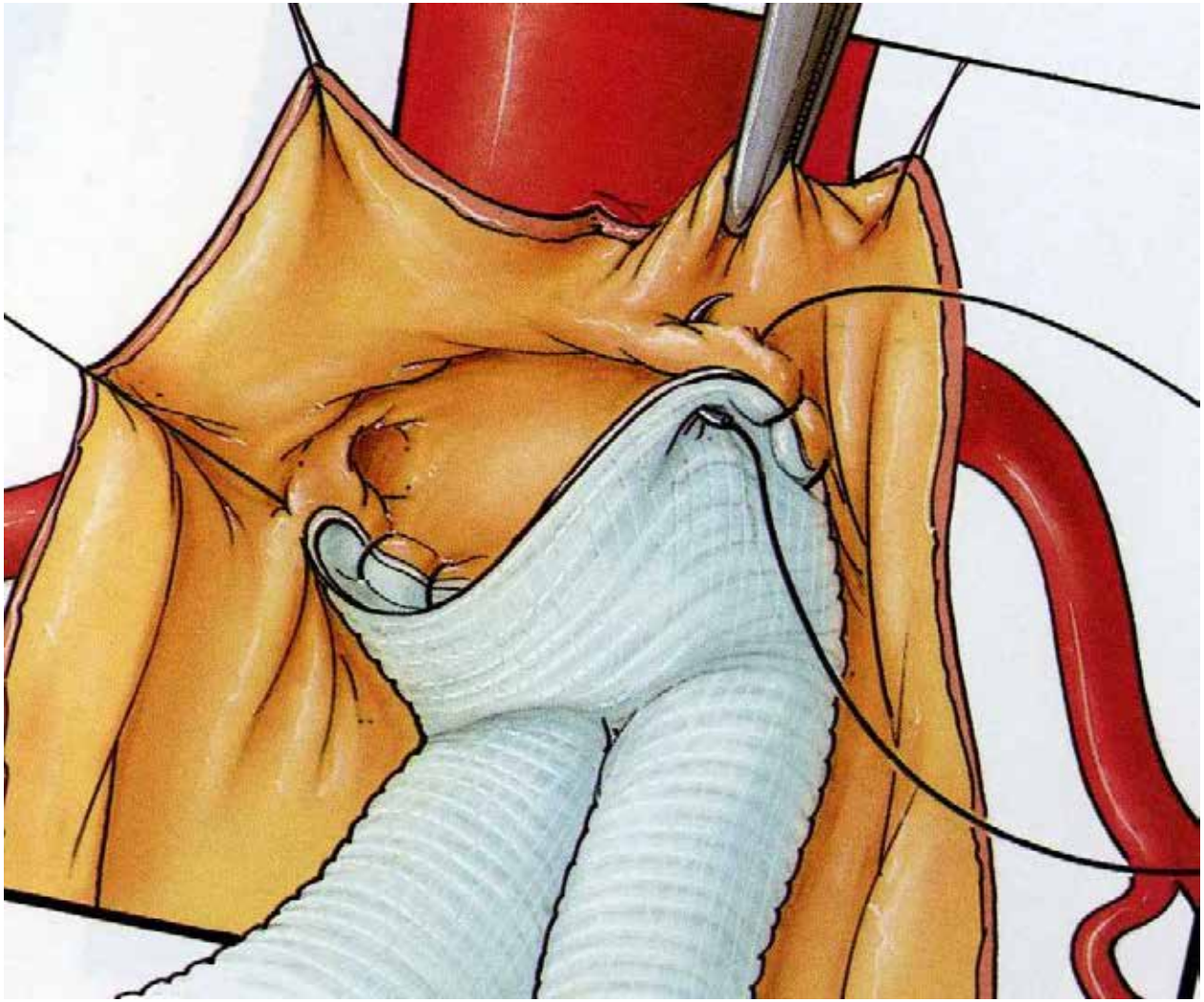


SVC: - risk factor for post-operative mortality
- risk factor for postoperative renal dysfunction

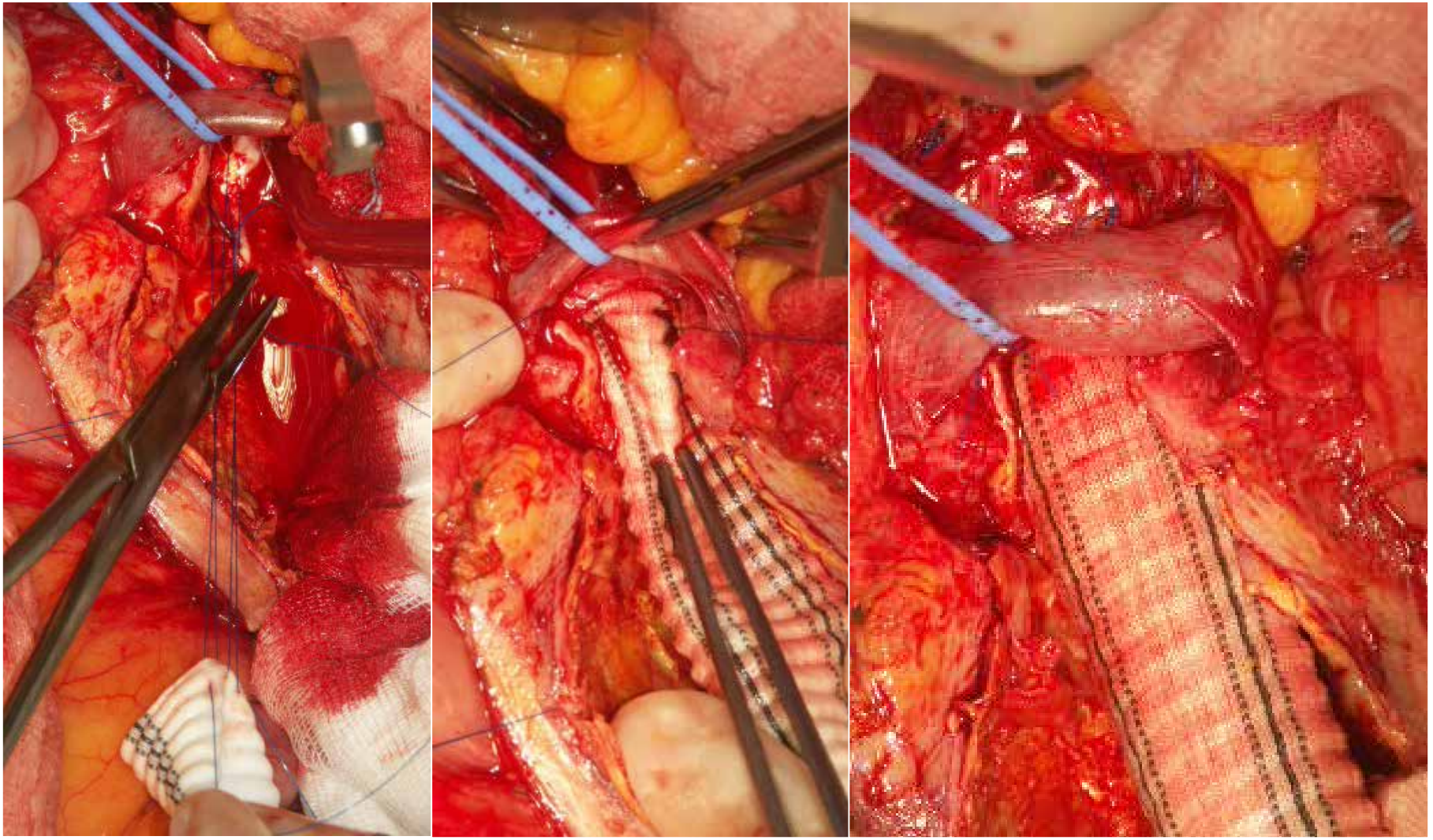
Knott AW et al JVS 2008
Shortell CK et al Ann Vasc Surg 2003

Juxtarenal aortic aneurysms – tips and tricks





Juxtarenal aortic aneurysms – tips and tricks



Abdominal aortic aneurysms with short proximal neck: comparison between standard endograft and open repair

Freyrie A, Gargiulo M, Gallitto E et al.
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Results

	Surgery
n.	44
Perioperative mortality (30 gg)	**3 (6.8%)**
Perioperative mortality + morbidity (30gg)	**20 (45.4%)**
# Creatinine value ≥ 30%	8 (18.2%)
Perioperative reinterventions (30 gg)	4 (9.1%)

Vascular Surgery – Bologna University

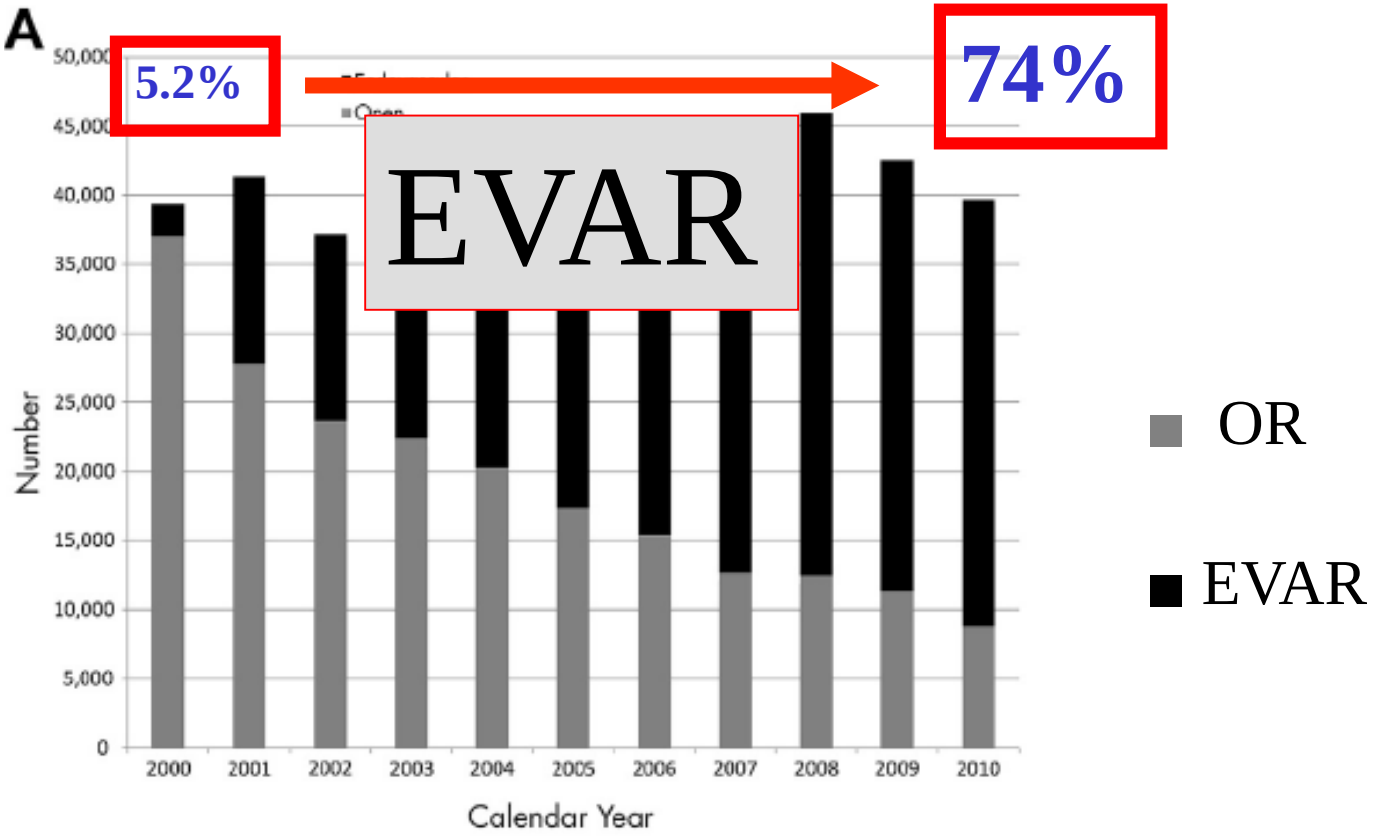
Juxtarenal aortic aneurysms – Open Repair Results

	2005-2009	2008-2012
n	44	**56**
30-days mortality	6.8%	**3.6%**
30-days C/P morbidity	38.6%	**26.8%**
Peri-operative RF worsening	18.2	**19.6%**

Epidemiology of aortic aneurysm repair in the United States from 2000 to 2010

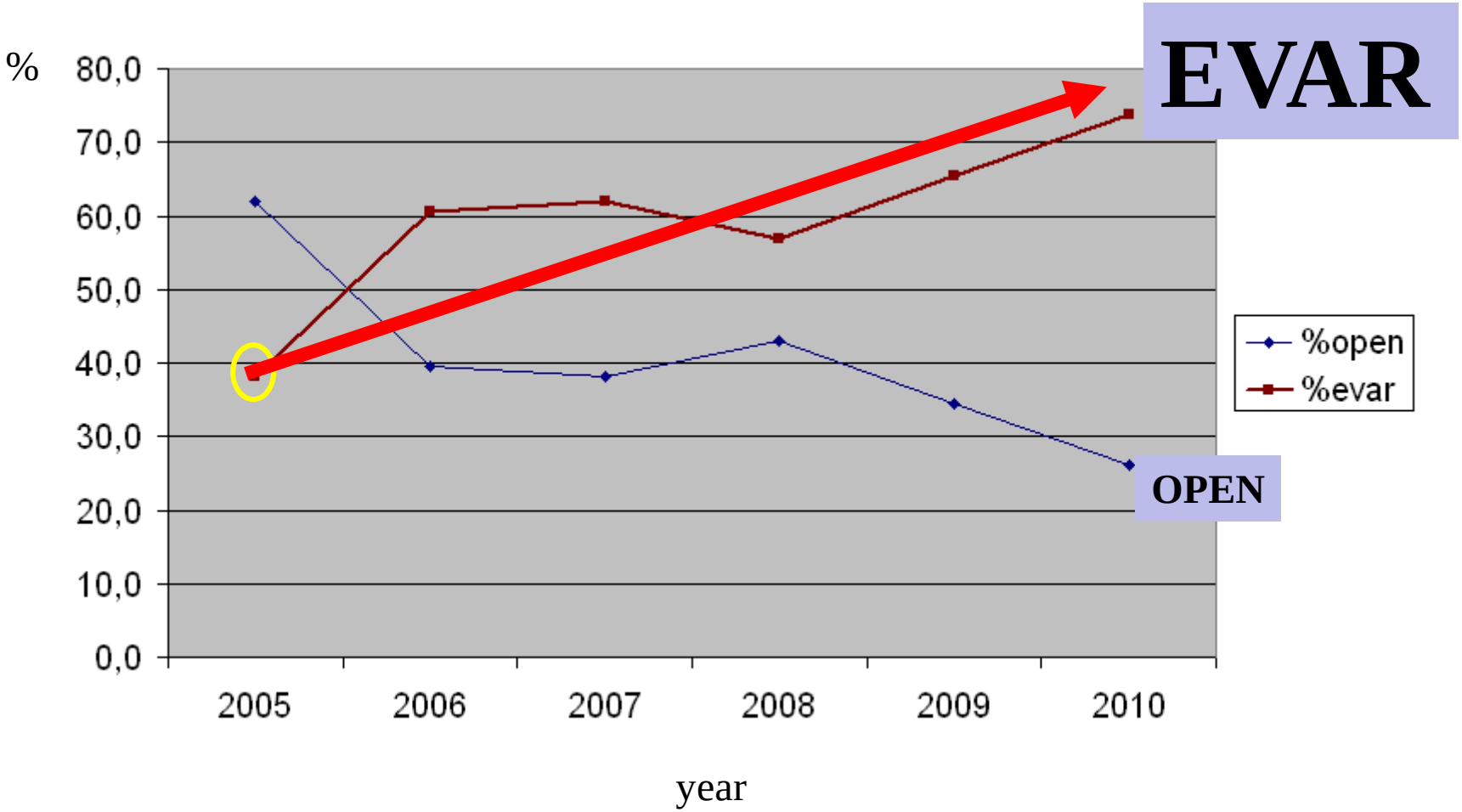
Anahita Dua, MD, MS,[a,b] SreyRam Kuy, MD, MHS,[b] Cheong J. Lee, MD,[b] Gilbert R. Upchurch Jr, MD,[c] and Sapan S. Desai, MD, PhD, MBA,[d] *Houston, Tex; Milwaukee, Wisc; Charlottesville, Va; and Durham, NC*

JVS 2014; 59(6): 1512-7



Vascular Surgery – Bologna University

AAA 2005 - 2010



Manufacters' device IFU

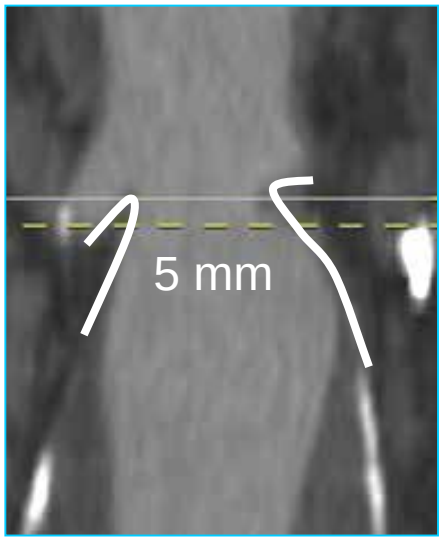
	AAA neck			
	Lenght (mm)	Diameter (mm)	Angle (α - β)	Calcifications Thrombosis
Vascutek	**≥ 15**	16 - 31	< 60%	not severe
Gore	**≥ 15**	19 – 29	< 60°	-
Medtronic	**10** **≥ 15**	19 – 32	≤ 60° ≤ 60° - ≤ 75°	not severe
Cook	**≥ 15**	18 – 32	< 45° - <60°	< 50%

Long-term results of standard supra-renal fixation endografts for abdominal aortic aneurysms with **neck length 5-10 mm**

Gallitto E, Gargiulo M, Freyrie A et al
EJVES submitted

- Prospective, mono-center
- 2005 – 2010
- **SN-AAA (neck length 5 – 10 mm) unfit for OR and FEVAR**
- Standard suprarenal fixation endograft (SF-EVAR)
  - Cook Zenith Flex
  - Medtronic Endurant

Neck length 5-10 mm
distance between the lowest renal artery and the point in which the neck diameter increased ≥ 50% of the aortic diameter at the level of the renal arteries



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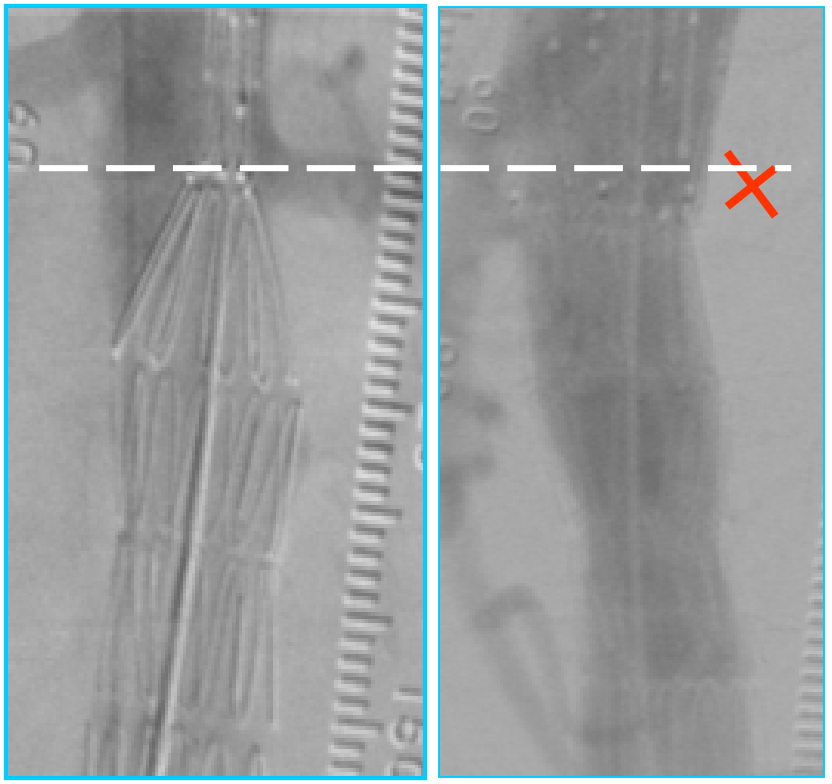
Intraoperative results

	n	%	mean	range
ELI / ELIII	0	0	-	-
Mortality	0	0	-	-
Conversion to OR	0	0	-	-
Renal artery occlusion	2	3	-	-
Iliac leg stenting	11	18	-	-
Medium contrast (cc)	-	-	170	100-410
Fluoroscopy (min)	-	-	23	13–80
Procedure time (min)	-	-	169	95-420



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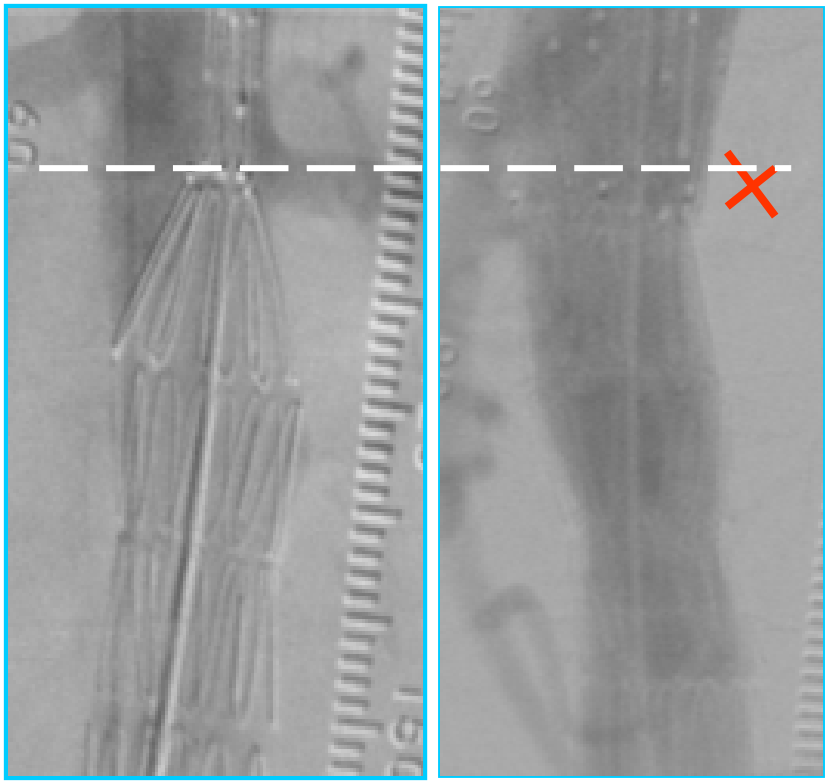
Conversion to OR	0	0	-	-
Renal artery occlusion	2	3	-	-
Iliac leg stenting	11	18	-	-
Medium contrast (cc)	-	-	170	100-410
Fluoroscopy (min)	-	-	23	13–80
Procedure time (min)	-	-	169	95-420



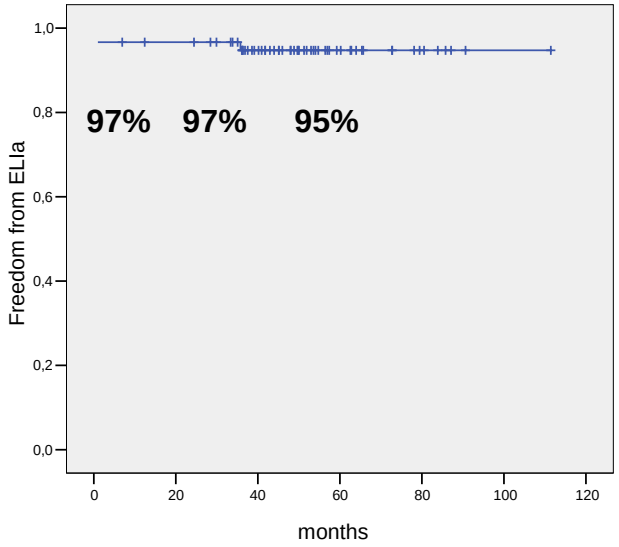
Mean F-up 51 ± 18 months

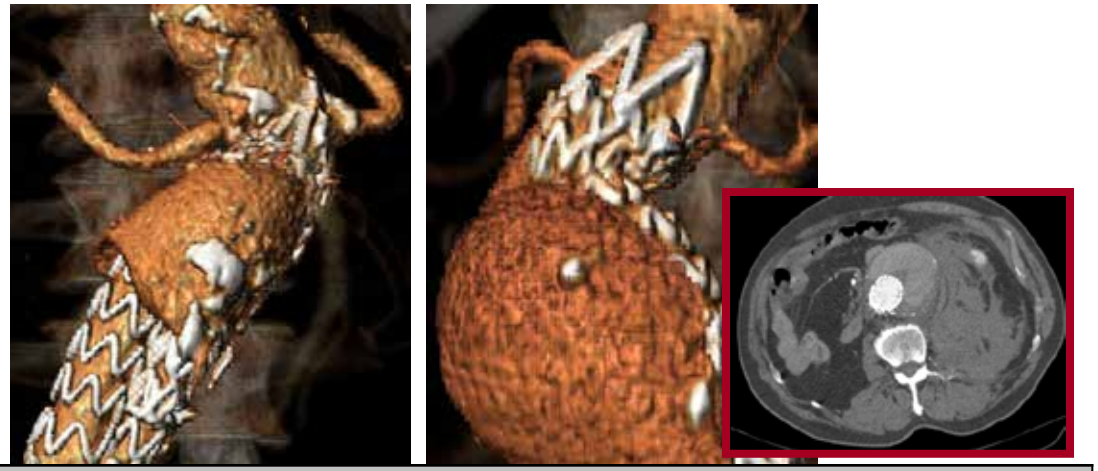
33 pts (55%) had f-up > 48 months

Long-term results of standard supra-renal fixation endografts for abdominal aortic aneurysms with **neck length 5-10 mm**

Gallitto E, Gargiulo M, Freyrie A et al
EJVES submitted

Results: ELIa n. 3





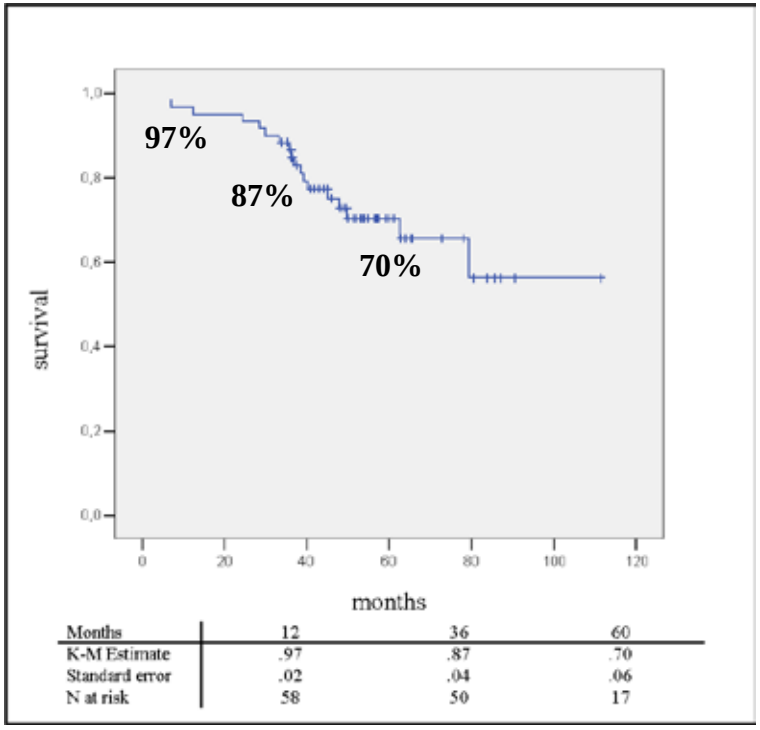
ELIa

	Un-adjusted Cox analysis			Adjusted Cox analysis		
	HR	95% CI	p	HR	95% CI	p
Neck length < 7mm	5.18	0.46-57.49	0.18	1.55	0.06-36.46	0.78
α ≥ 60°	25.76	2.19-302.39	0.01	29.83	1.32-673.48	**0.03**
β ≥ 60°	207.32	0.00-365.55	0.32	-	-	-
Severe NC	2.42	0.22-26.73	0.17	0.84	0.05-12.91	0.90
Severe NT	6.00	0.54-66.43	0.14	6.35	0.33-118.88	0.29
Oversize <15%	0.02	.001-446.33	0.45	-	-	-

Long-term results of standard supra-renal fixation endografts for abdominal aortic aneurysms with **neck length 5-10 mm**

Gallitto E, Gargiulo M, Freyrie A et al
EJVES submitted

Results: Survival

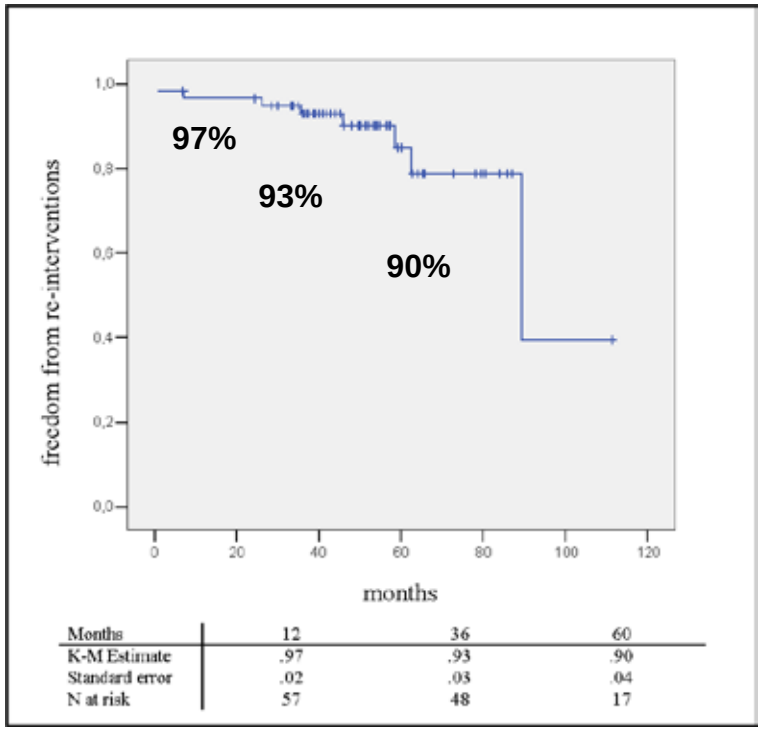


	n	%
Mortality	**18**	**30**
Cause	**n**	**%**
Cardiac	8	44.4
Cancer	3	16.6
Pulmonary infection/failure	2	11
Stroke	1	6
Bowel occlusion	6	11
AAA-related	**2**	**11**
Tot	18	100

Long-term results of standard supra-renal fixation endografts for abdominal aortic aneurysms with **neck length 5-10 mm**

Gallitto E, Gargiulo M, Freyrie A et al
EJVES submitted

Results: freedom from re-interventions



Re-interventions						
	Un-adjusted Cox analysis			Adjusted Cox analysis		
	HR	95% CI	p	HR	95% CI	p
Neck length < 7mm	5.17	1.17-22.81	0.03	4.40	0.96-20.07	**0.055**
α ≥ 60°	11.68	1.57-86.39	0.01	8.48	1.13-63.56	**0.03**
β ≥ 60°	1.77	0.43-7.28	0.42	-	-	-
Severe NC	0.98	0.11-8.39	0.99	-	-	-
Severe NT	1.37	0.26-7.11	0.70	-	-	-
Oversize <15%	0.02	0.00-13.74	0.24	-	-	-

Long-term results of standard supra-renal fixation endografts for abdominal aortic aneurysms with **neck length 5-10 mm**

Gallitto E, Gargiulo M, Freyrie A et al
EJVES submitted

Conclusion

- Feasible therapeutics option in high risk patients unfit for OR and FEVAR

- Safe and effective **in straight and 7-10 mm** neck length according to the long-term results

- Severe proximal neck angles reduce outcomes

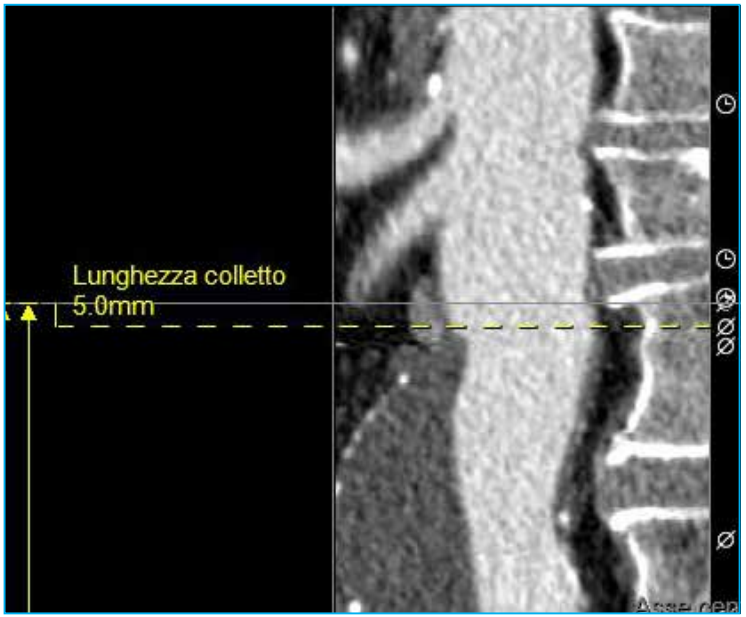
Vascular Surgery – Bologna University

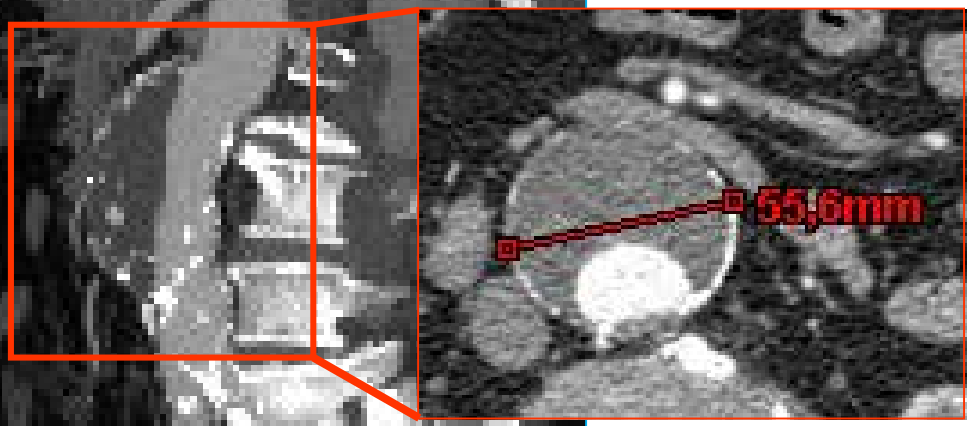
AAA neck lenght	**Treatment September 2014 -**
> 1.5 cm	Endograft with infrarenal fixation (repositionable delivery)
1.5 – 1.0 cm	Endograft with infrarenal fixation (repositionable delivery) Endograft with suprarenal fixation
1.0 - 0.7 cm a.+ angle < 60° b.+ angle ≥ 60°	**Endograft with suprarenal fixation *(Endurant, Zenith)*** **FEVAR** **Surgery**

Vascular Surgery – Bologna University

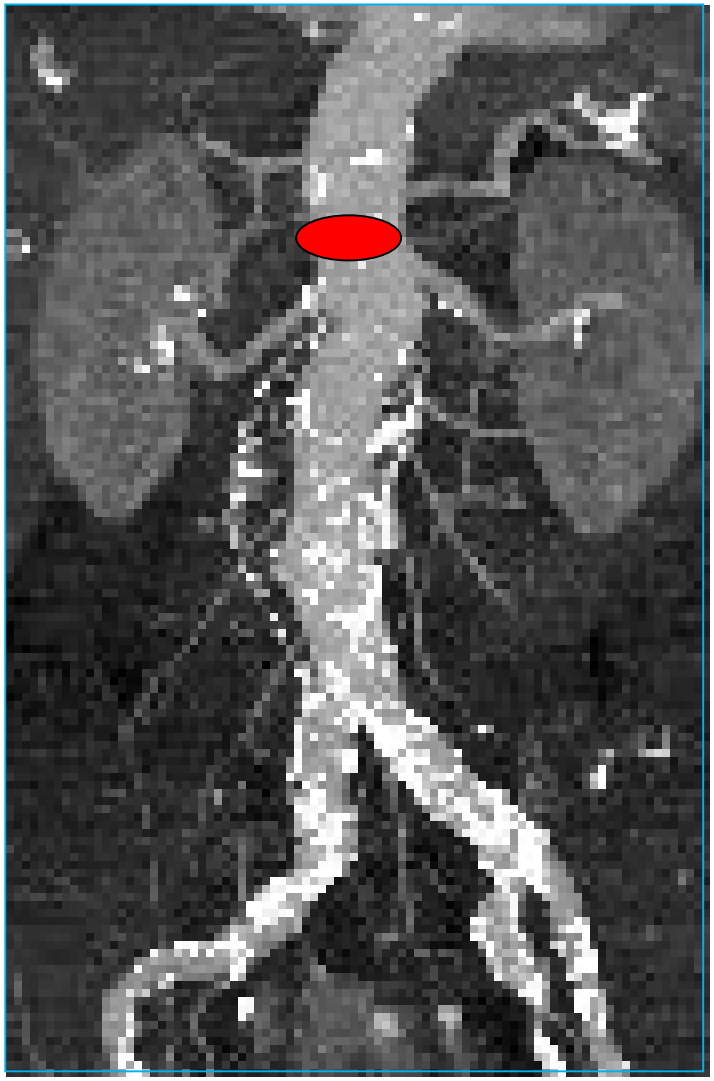
AAA neck lenght	**Treatment September 2014 -**
> 1.5 cm	Endograft with infrarenal fixation (repositionable delivery)
1.5 – 1.0 cm	Endograft with infrarenal fixation (repositionable delivery) Endograft with suprarenal fixation
1.0 - 0.7 cm a.+ angle < 60° b.+ angle ≥ 60°	**Endograft with suprarenal fixation *(Endurant, Zenith)*** **FEVAR** **Surgery**
≤ 0.7 cm	

Juxtarenal AAA





Juxtarenal AAA - *Endovascular Treatment*



Sealing zone

Open repair of juxtarenal aortic aneurysms (JAA) remains a safe option in the era of fenestrated endografts

Knott AW et al.
JVS 2008; 47: 695-701

- Negative predictive factors of cardiac complications
  - age > 78 years
  - male gender
  - hypertension
  - previuos myocardial infarction
  - diabetes

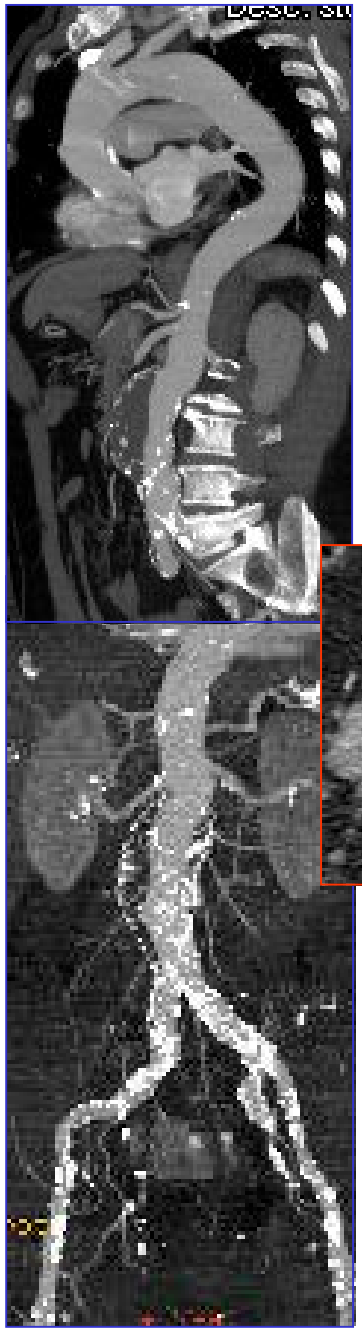
- Negative predictive factors of renal insufficiency
  - prolonged operative time
  - prolonged renal ischemia

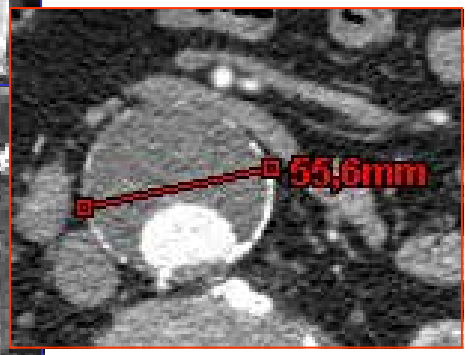
- Negative predictive factors of pulmonary complications
  - renal artery revascularization
  - prior MI

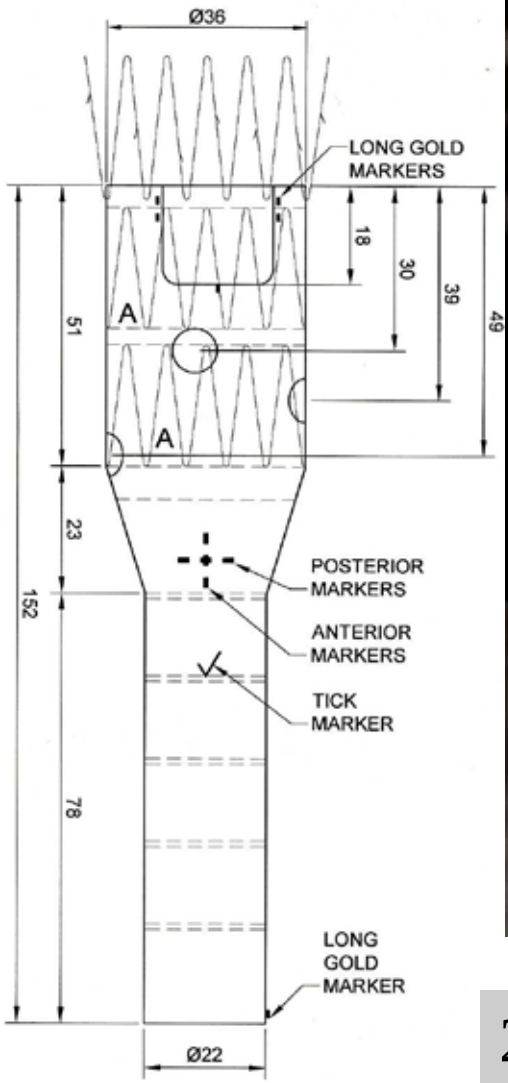
Conclusions: pts with a combination of physiologic and anatomic risk factors identified on multivariate analysis may benefit from fenestrated endograft repair

Vascular Surgery – Bologna University

AAA neck lenght	**Treatment September 2014 -**
> 1.5 cm	Endograft with infrarenal fixation (repositionable delivery)
1.5 – 1.0 cm	Endograft with infrarenal fixation (repositionable delivery) Endograft with suprarenal fixation
1.0 - 0.7 cm a.+ angle < 60° b.+ angle ≥ 60°	Endograft with suprarenal fixation (Endurant, Zenith) FEVAR Surgery
≤ 0.7 cm a.+ angle < 60° b.+ angle ≥ 60°	**FEVAR** Surgery

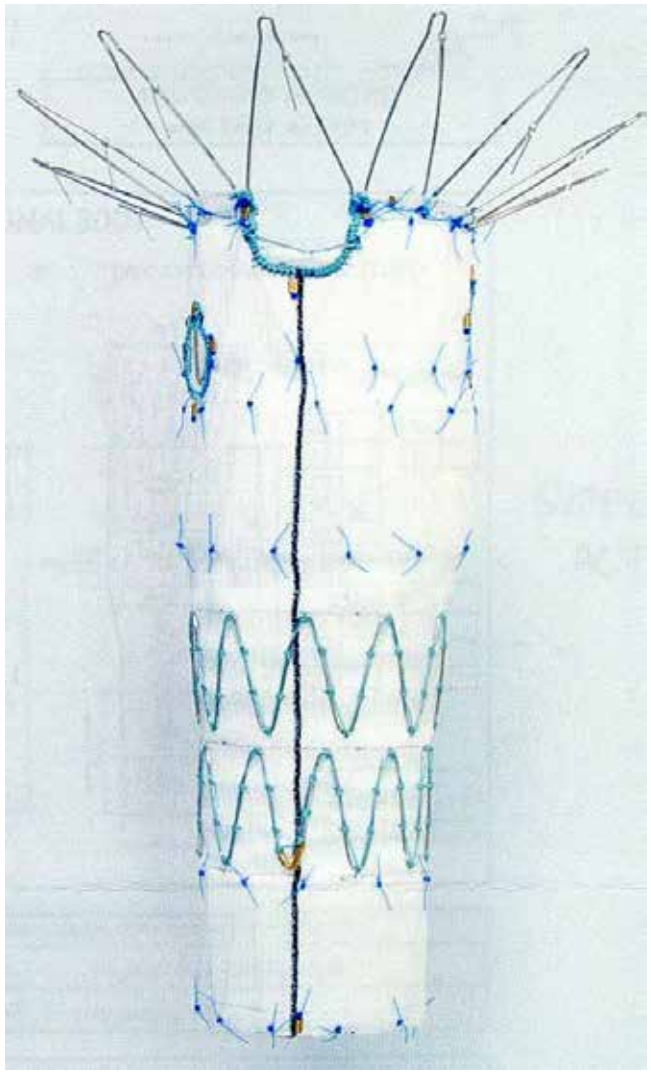


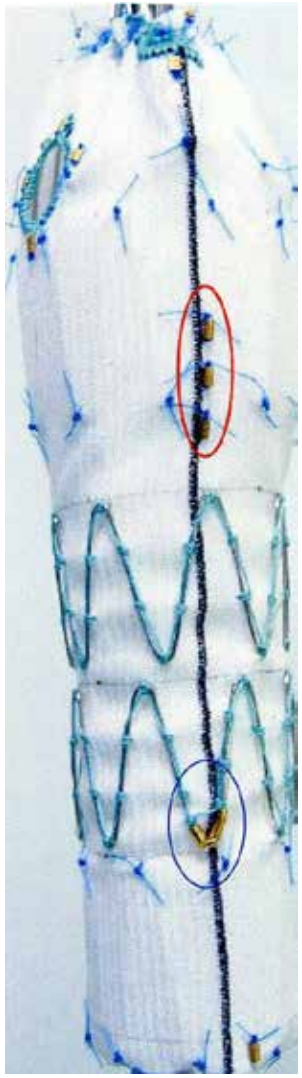




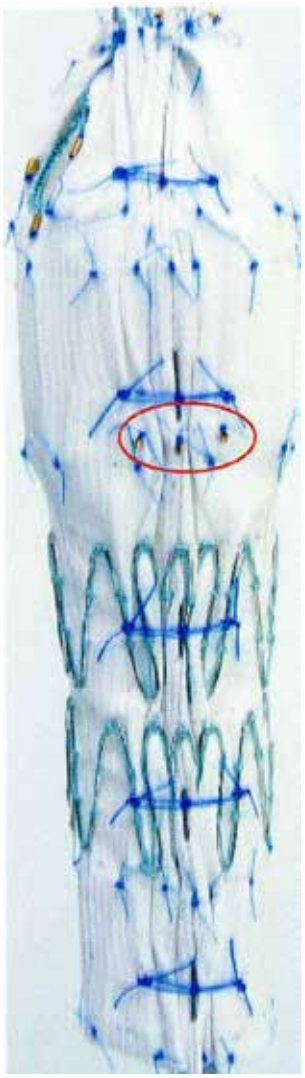
24 months follow up

Fenestrated Endograft n. 1 – April 2006





Front Markers



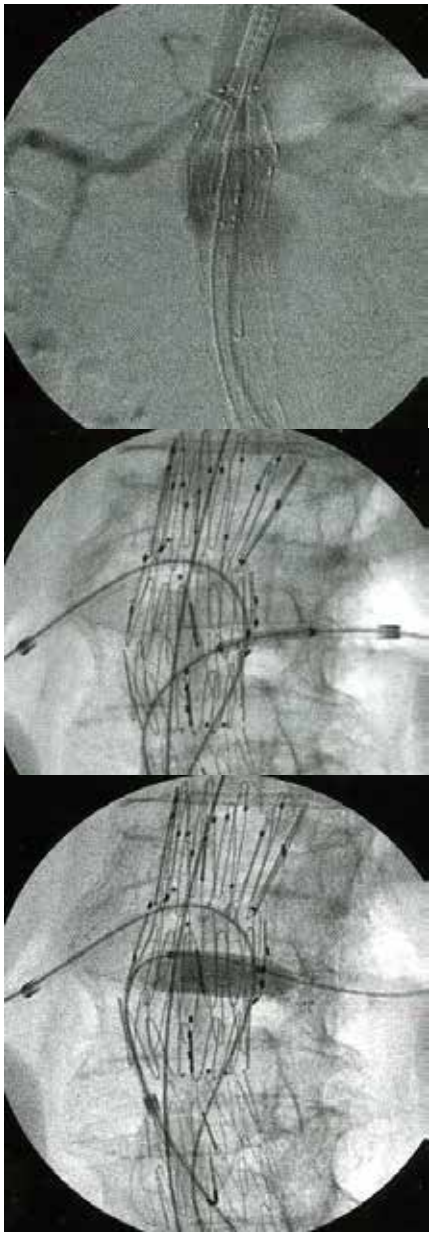
Back Markers

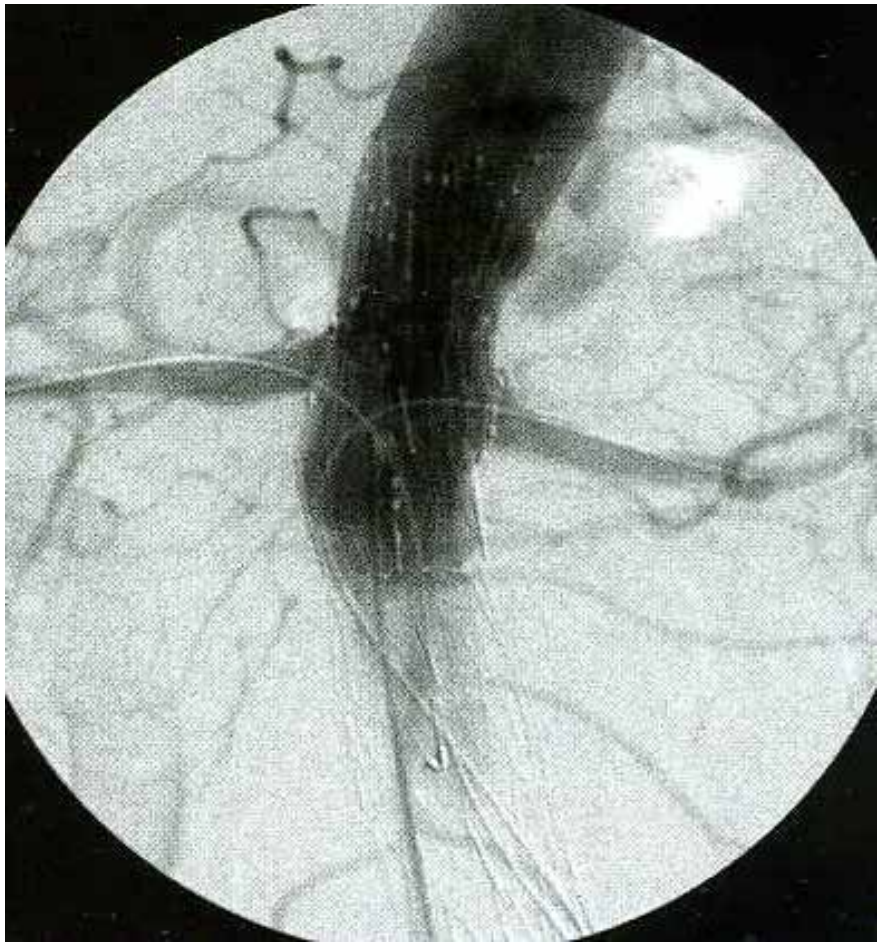
SMA

RRA

LRA

Fenestrated Endograft n. 1 – April 2006

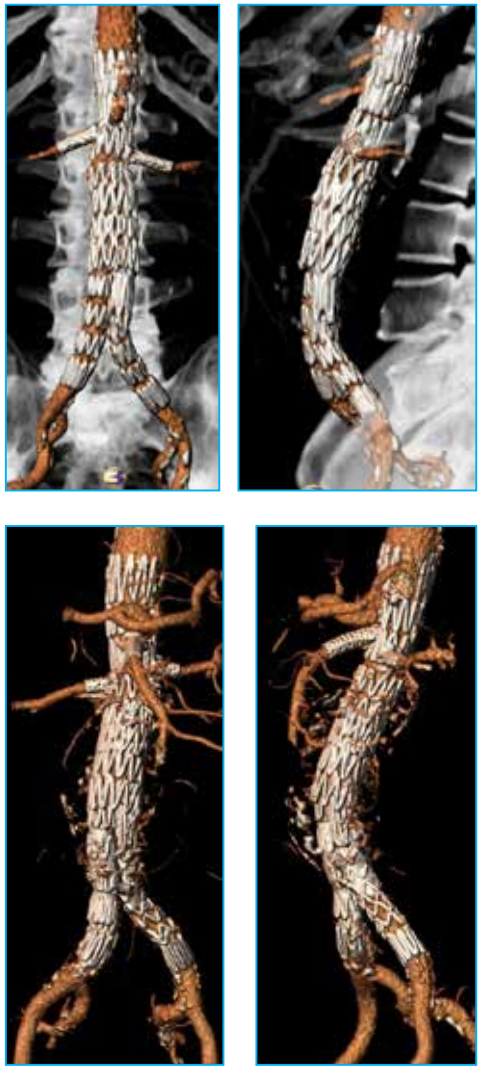




Follow up 3 years

Fenestrated endograft and aortic aneurysms

- 2 Fenestrations, 1 Scallop
- 3 Fenestrations, 1 Scallop
- 4 Fenestrations



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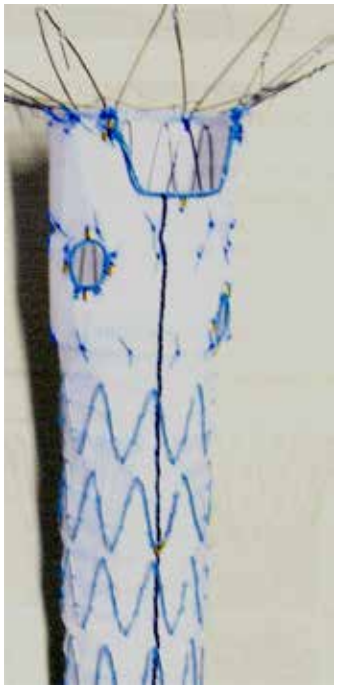
Iuxtarenal AAA and fenestrated endografts

- Prospective, mono-centre
- 2008 – 2012
- **j-AAA** **neck lenght < 5 mm**
  neck angle < 60°
  asymptomatic AAA, 50 mm < Ø < 70mm
- FEVAR Custom made Cook-Zenith

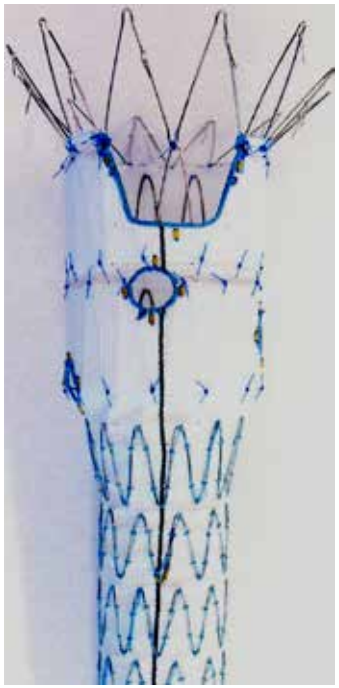
Vascular Surgery – Bologna University

Iuxtarenal AAA and fenestrated endografts

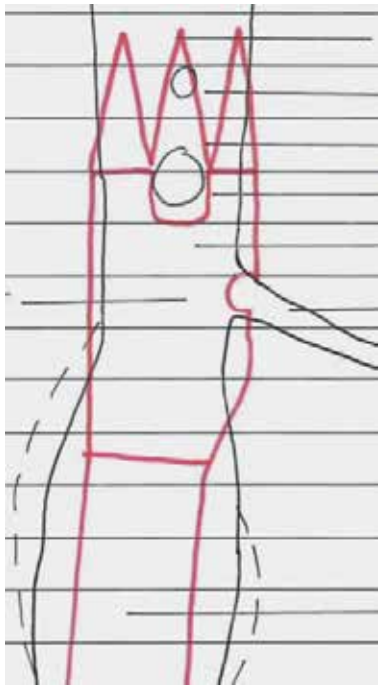
Patients	**20**
Age (yrs)	73.4 ± 5.9
Ø jAAA (mm)	54.9 ± 5
Neck length (mm)	**2 ± 1.4**
ASA III/IV	**17/3**



(11/20) 55%
2 fenestrations
1 scallop



(8/20) 40%
3 fenestrations
1 scallop



(1/20) 5%
1fenestrations
1 scallop

Vascular Surgery – Bologna University

Iuxtarenal AAA and fenestrated endografts

- **TS 100%**

- Endograft deployment
- Treated Visceral Vessels Patency
- No Type I/III endoleaks
- No Conversion
- No Mortality

- **CS 95%**

- 30-day mortality 5%
- 30-day morbidity 0%

Modern treatment of juxtarenal abdominal aortic aneurysms with fenestrated endografting and open repair: A systematic review

Nordon Im et al.. EJVES 2009; 38: 35-41

First author	Country/Year	Type of study	n	30-day mortality (%)
Fenestrated				
Anderson	Australia 2001	Prospective	13	0
Halak	Australia 2006	Single centre	17	0
Muhs	Netherlands 2006	Prospective	38	2.6
O'neill	USA 2006	Prospective	119	1
Semmens	Australia 2006	Retrospective	58	3.4
Ziegler	Germany 2007	Retrospective	63	0
Scurr	UK 2008	Retrospective	45	2.2
Bicknell	UK 2008	Prospective	15	0
Open				
Ayari1	France 2001	Retrospective	53	11
Sarac	USA 2002	Prospective	138	5.1
Bicknell	UK 2003	Prospective	44	4.5
Shortell1	USA 2003	Retrospective	112	6
Kudo	Japan 2004	Retrospective	18	0
Ryan	USA 2004	Retrospective	44	0
Back	USA 2005	Retrospective	78	2.6
Chiesa	Italy 2006	Retrospective	119	4.2
West	USA 2006	Retrospective	247	2.5
Ockert	Germany 2007	Case-Control	35	5.7
Pearce	USA 2007	Retrospective	150	2.7
Knott	USA 2008	Retrospective	126	0.8

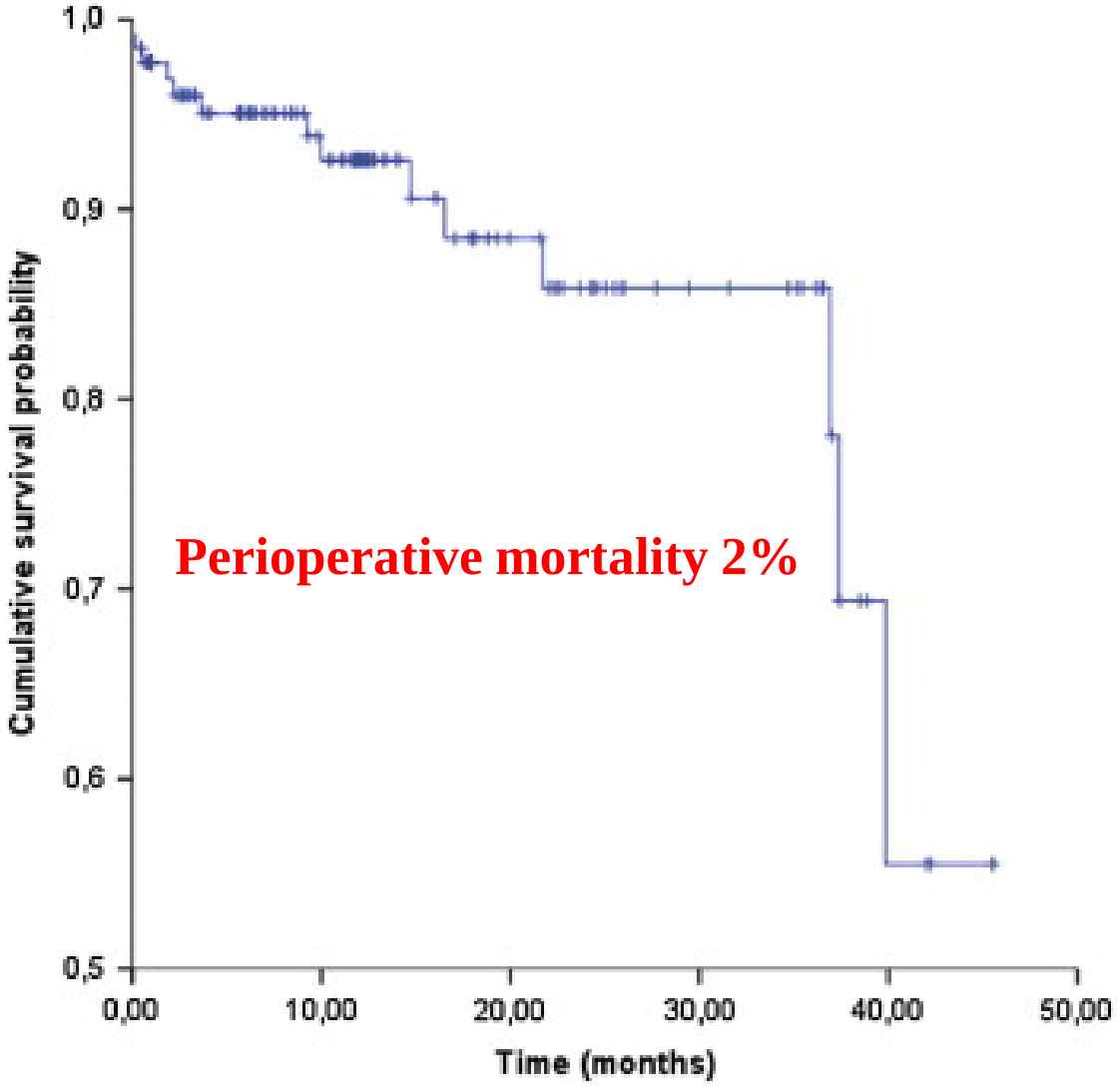
Mean 1.4%

Mean 3.6%

Groups were well matched for gender, ischaemic heart disease, preop. renal impairment

Fenestrated endovascular grafting: the French Multicenter Experience

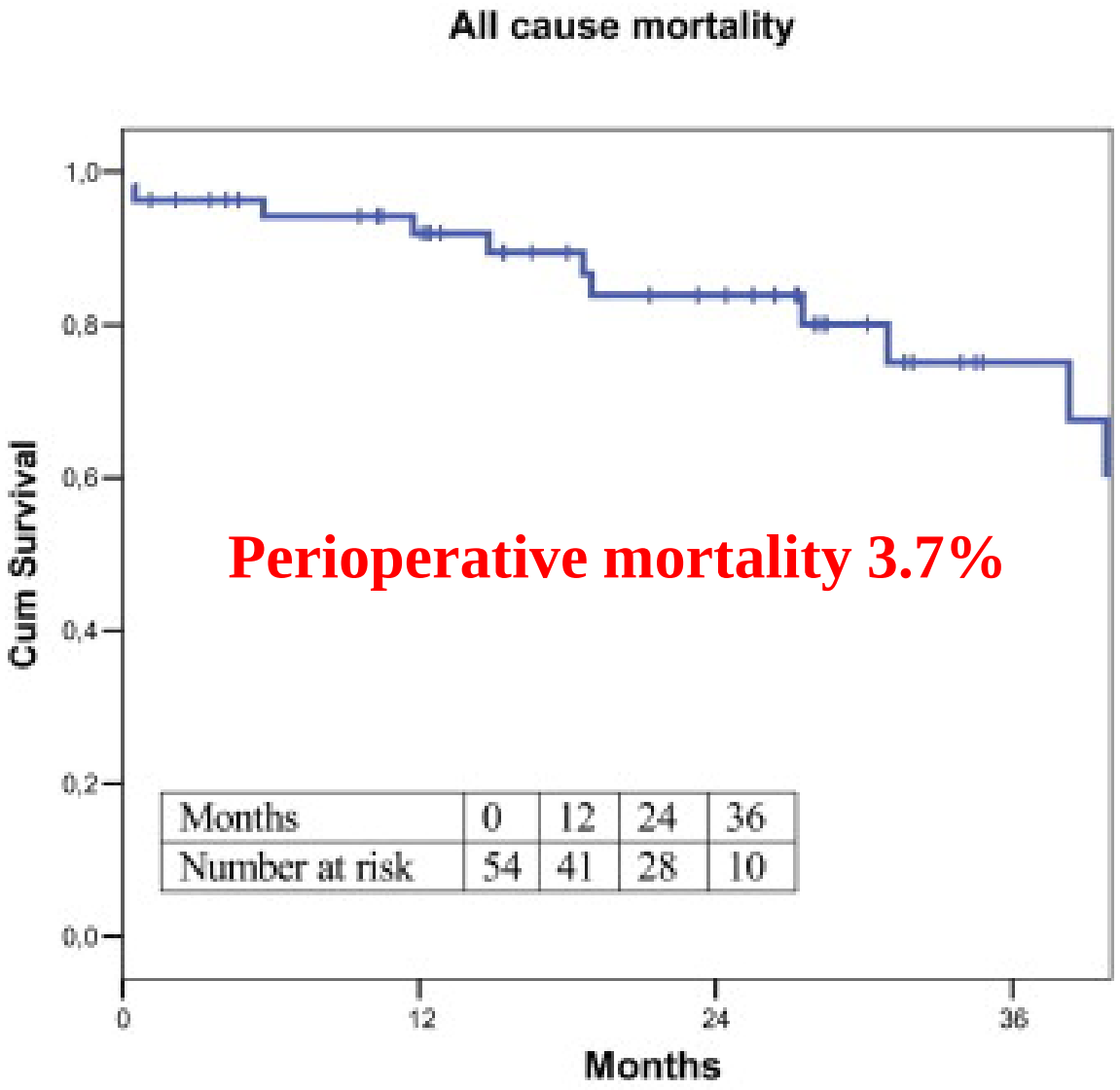
Amiot S. et al
EJVES 2010; 39: 537-544



Perioperative mortality 2%

Fenestrated endovascular repair for Juxtarenal aortic pathology

Kristmundsson T et al.
JVS 2009; 49; 568-75

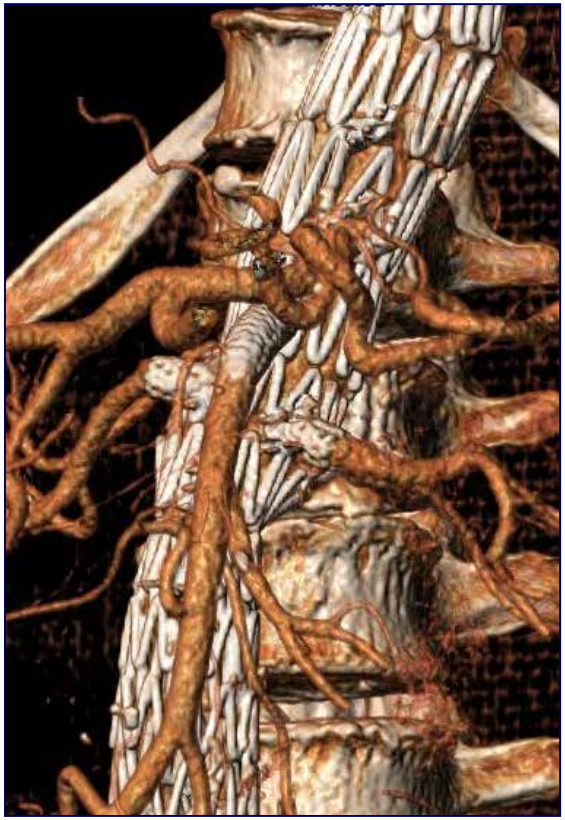


Perioperative mortality 3.7%

Early Results of Fenestrated Endovascular Repair of Juxtarenal Aortic Aneurysm in the United Kindom

Globalstar Registry
Circulation 2012 ; 125: 2707-15

- Graft successfully implanted 316/318
- Patent target vessels 97%
- ICU 38%
- **Perioperative mortality** **4.1%**
  - renal fenestration 2.7%
  - renal fenestration+scallop SMA 2.9%
  - incorporating CT 9.4%



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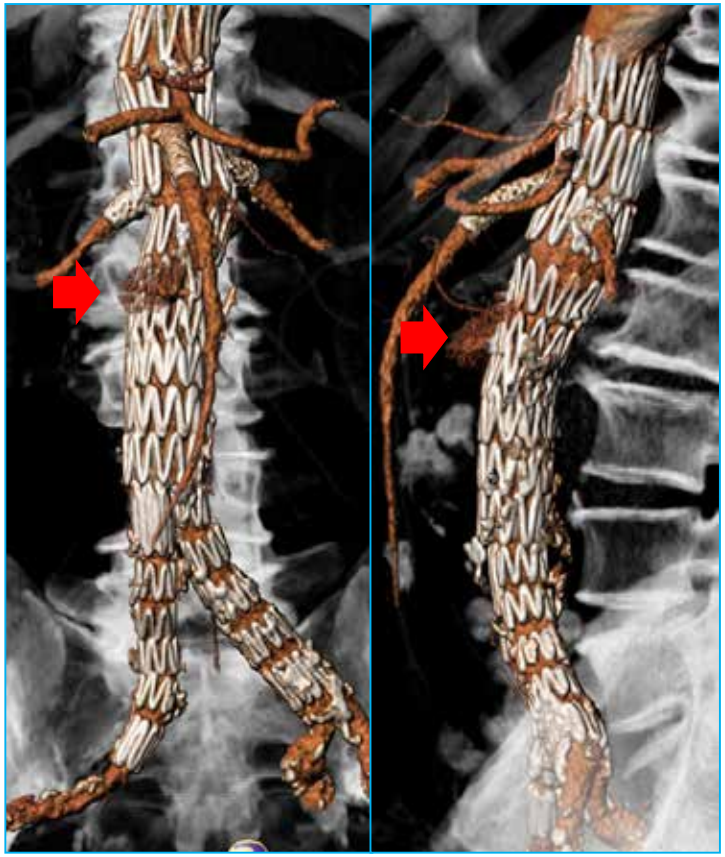
Iuxtarenal AAA and fenestrated endografts

Mean f.up 25±20 months (range:2-72)

	1 Month	6 Months	12 Months	24 Months	36 Months
EL I	-	-	-	-	-
EL III	5%	-	-	-	-

Vascular Surgery – Bologna University

Iuxtarenal AAA and fenestrated endografts



CTA: 24 months follow up

Vascular Surgery – Bologna University

Iuxtarenal AAA and fenestrated endografts

Mean f.up 25±20 months (range:2-72)

	1 Month	6 Months	12 Months	24 Months	36 Months
EL I	-	-	-	-	-
EL III	5%	-	-	-	-
VVTP	100%	100%	100%	100%	100%

Early Results of Fenetsrated Endovascular Repair of Juxtarenal Aortic Aneurysm in the United Kindom

Globalstar Registry
Circulation 2012 ; 125: 2707-15

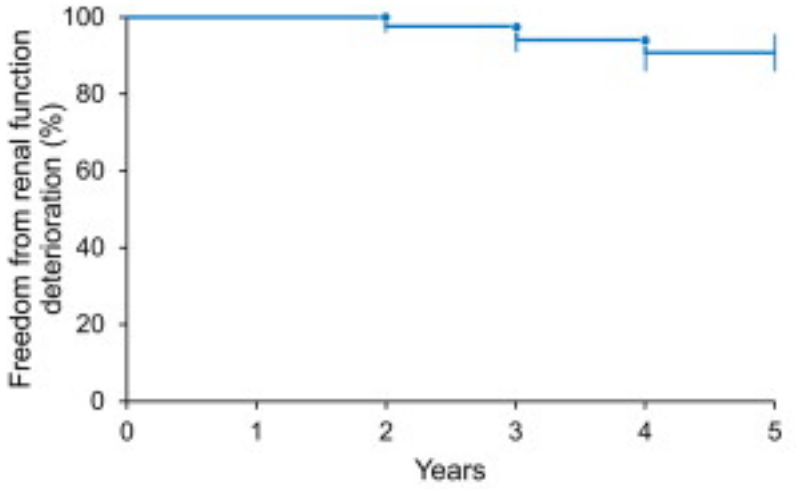
Median Follow up : 6 months

End Points	12 months	24 months	36 months
Suvival	94%	91%	89%
Target vessel patency	97%	97%	95%
Freedom from late secondary intervention	90%	86%	79%
Freedom from stent-graft migration	99%	92%	88%

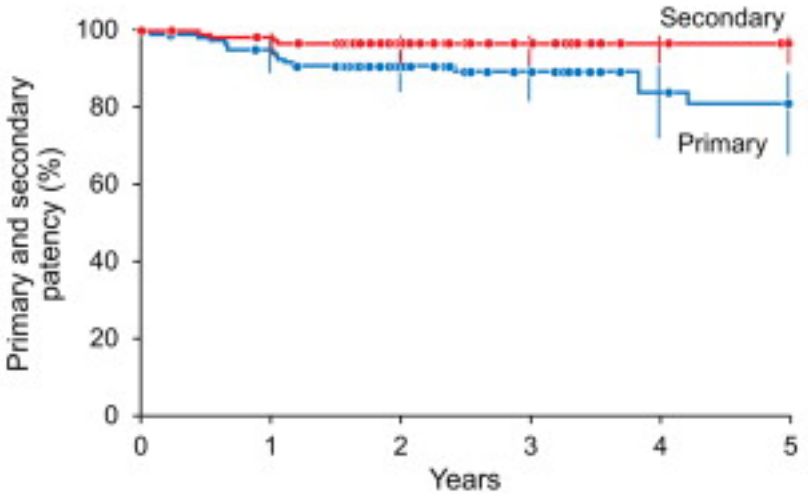
Results of the United States multicenter prospective study evaluating the Zenith fenestrated endovascular graft for treatment of JAAA

Oderich GS et al
JVS 2014 ; 60: 1420-8

- Graft successfully implanted 67/67
- Patent target vessels 100%
- Perioperative mortality 1.5%
- Endoleak Type I and III at discharge 0%



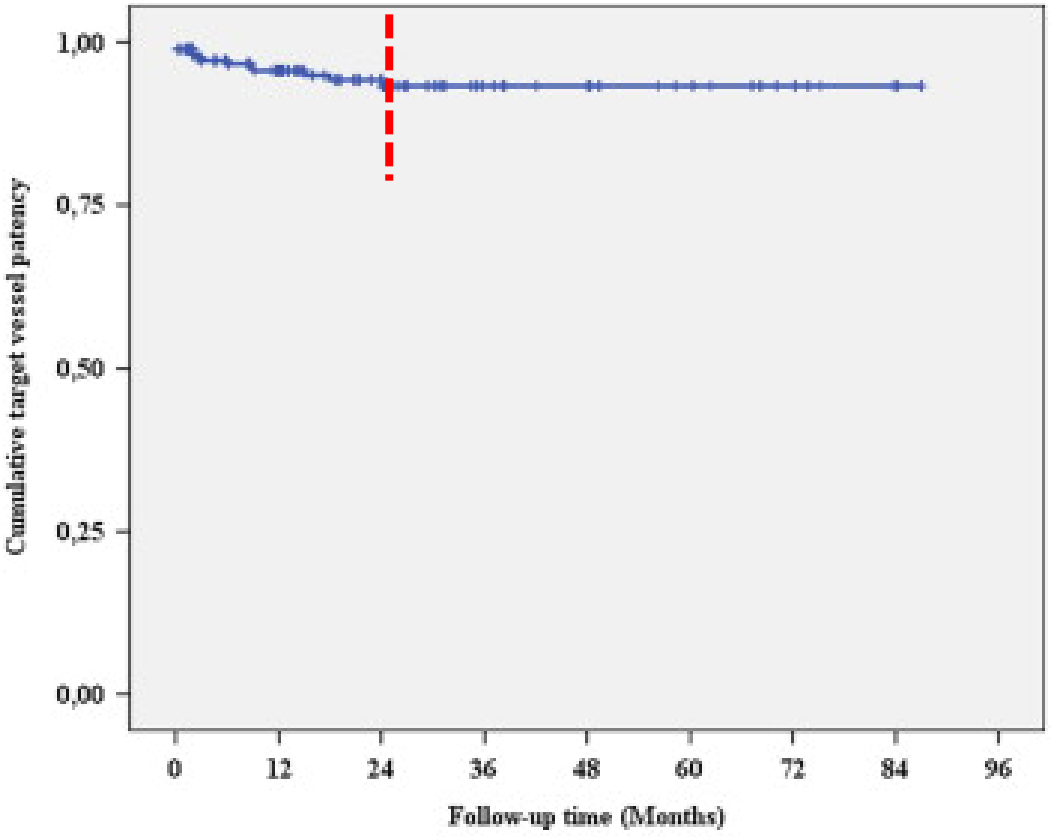
No. at risk	67	62	47	28	16	11
Cumulative events	0	0	1	2	3	3
Cumulative censored	0	4	18	36	47	52
Kaplan-Meier estimate	1.000	1.000	0.981	0.947	0.912	0.912
Standard error	0.000	0.000	0.019	0.038	0.050	0.050



No. at risk (secondary)	129	121	91	55	35	26
Cumulative events	0	2	4	4	4	4
Cumulative censored	0	6	34	70	90	99
Kaplan-Meier estimate	1.000	0.984	0.968	0.968	0.968	0.968
Standard error	0.000	0.011	0.016	0.016	0.016	0.016
No. at risk (primary)	129	117	86	51	31	23
Cumulative events	0	6	11	12	14	15
Cumulative censored	0	6	32	66	84	91
Kaplan-Meier estimate	1.000	0.952	0.911	0.896	0.842	0.813
Standard error	0.000	0.019	0.026	0.029	0.046	0.053

Fenestrated Stent Grafting for Short-necked and Juxtarenal AAA: An 8-year single-center Experience

Verhoeven ELG et al .
EJVES 2010; 39; 529-36



Time (months)	12	24	36	48	60	72	84
Number at risk	170	115	47	39	28	14	6
StandardError	0.014	0.017	0.019	0.019	0.019	0.019	0.019

Kaplan–Meier estimate of the cumulative overall **visceral branch patency.**

Vascular Surgery – Bologna University

Iuxtarenal AAA and fenestrated endografts

Mean f.up 25±20 months (range:2-72)

Ø jAAA shrinkage	n	%
≤ 5mm	13	65
Unchanged	7	35
≥ 5mm	0	0

no FEVAR – related reinterventions

Vascular Surgery – Bologna University

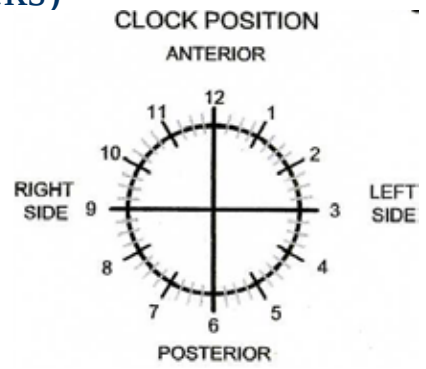
Iuxtarenal AAA and fenestrated endografts - Conclusions

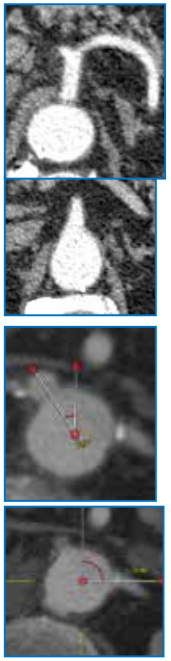
- FEVAR for **jAAA** effective
- Renal functions & TVVP
- Long term f.up
- First option in high risk patients for OR

Fenestrated grafts for abdominal aortic aneurysms

Limitations

- costs
- delay between diagnosis and treatment (4-8 weeks)
- at least 22F
- ensure 2 cm sealing zone above AAA
- no visceral vessels stenosis (>50 %)
- no small Ø visceral vessels (≥ 5 mm)
- no severe visceral vessels angulation
- adequate (> 15 mm) main visceral vessel lenght
- the procedure is technically demanding and time-consuming
- the role of Planning





CT - SMA

Early and mid-term results of a flexible treatment of Juxtarenal Aortic Aneurysms

- 2008 – 2012
- JAAA treated with OR, s-EVAR, f-EVAR
- Morphological criteria: neck lenght/angle, AAA diameter
- Clinical criteria: symptoms, surgical risk

Early and mid-term results of a flexible treatment of Juxtarenal Aortic Aneurysms

Results: J-AAA 150

	J-AAA
n	150
Intraoperative mortality	0%
30-days mortality	2.1%
30-days C/P morbidity	16.4%
Peri-operative RF worsening	11%

Early and mid-term results of a flexible treatment of Juxtarenal Aortic Aneurysms

Results: J-AAA 150

	J-AAA	**OR**	S-EVAR	F-EVAR
n	150	**56 (37.4%)**	74 (49.3%)	20 (13.3%)
Intraoperative mortality	0%			
30-days mortality	2.1%			
30-days C/P morbidity	16.4%			
Peri-operative RF worsening	11%			

Early and mid-term results of a flexible treatment of Juxtarenal Aortic Aneurysms

Results: J-AAA 150

	J-AAA	**OR**	S-EVAR	F-EVAR
n	150	**56 (37.4%)**	74 (49.3%)	20 (13.3%)
Intraoperative mortality	0%	**0%**	0%	0%
30-days mortality	2.1%	**3.6%**	0%	5%
30-days C/P morbidity				
Peri-operative RF worsening				

Early and mid-term results of a flexible treatment of Juxtarenal Aortic Aneurysms

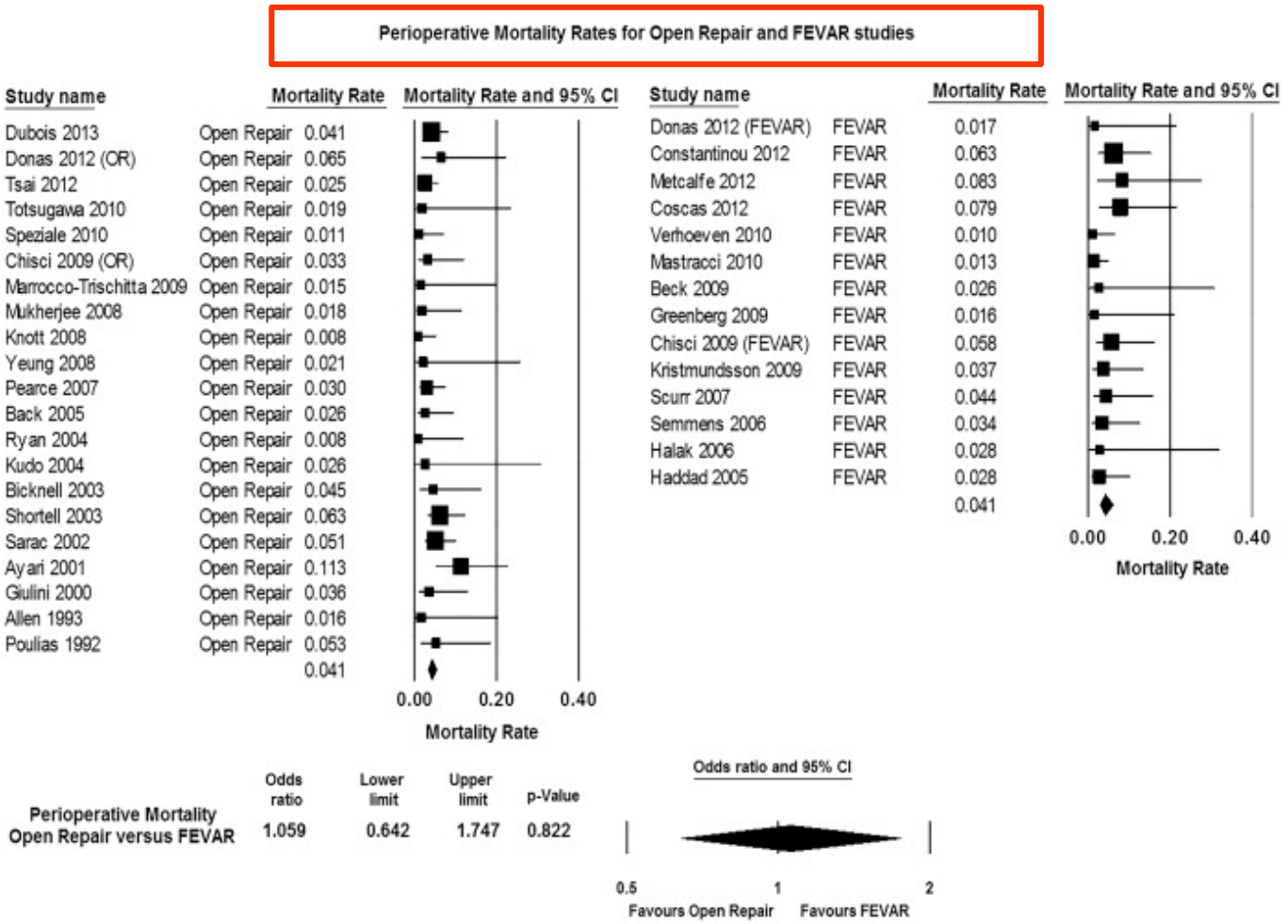
Results: J-AAA 150

	J-AAA	**OR**	S-EVAR	F-EVAR
n	150	**56 (37.4%)**	74 (49.3%)	20 (13.3%)
Intraoperative mortality	0%	**0%**	0%	0%
30-days mortality	2.1%	**3.6%**	0%	5%
30-days C/P morbidity	16.4%	**26.8%**	9.5%	10%
Peri-operative RF worsening	11%	**19.6%**	4.1%	10%

Open repair versus fenestrated endovascular aneurysm repair of juxtarenal aneurysms

Rao R et al.
JVS 2015 ; 61: 242-55

- Open Repair: 21 cases series
- FEVAR: 14 cases series



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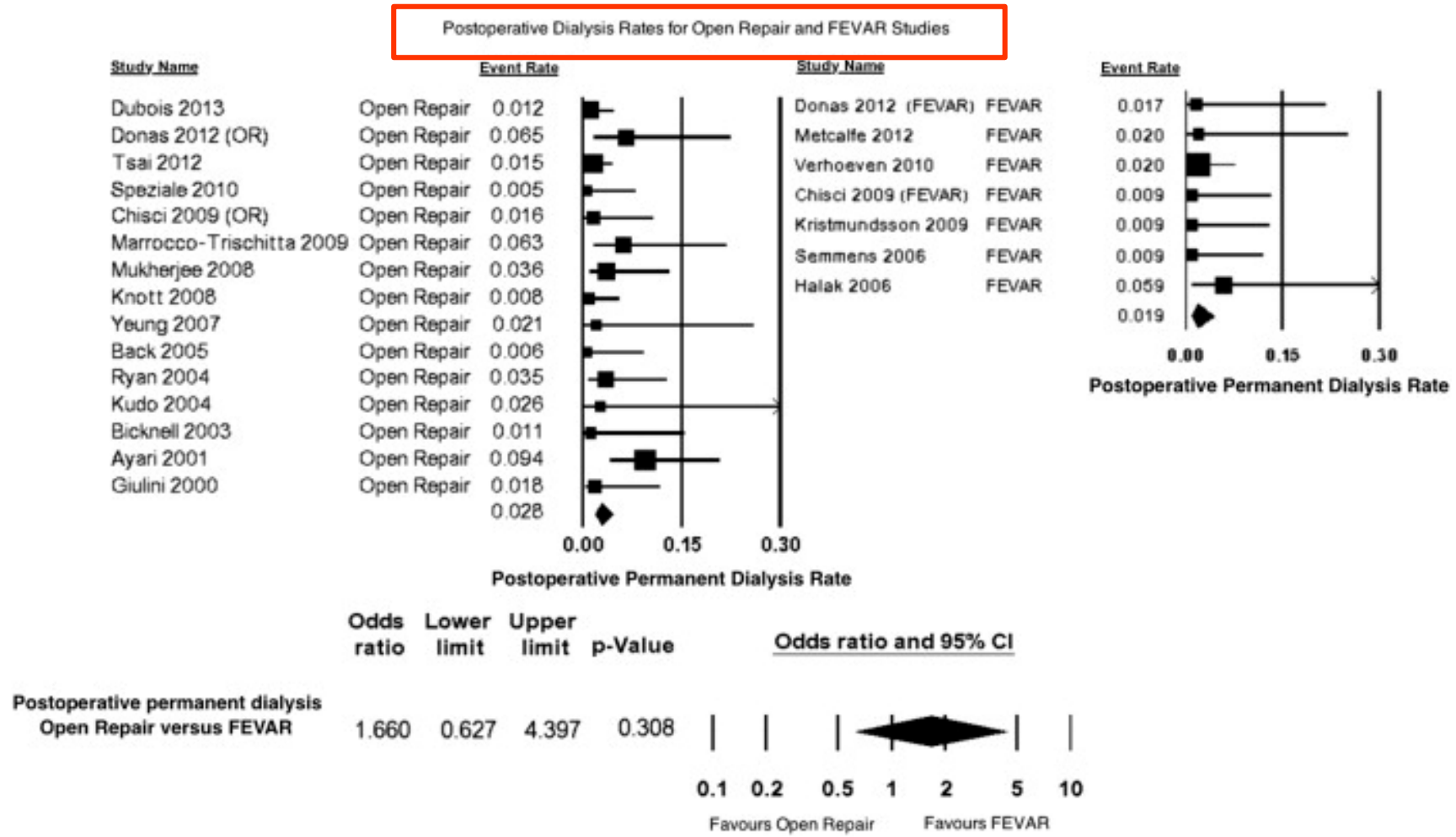

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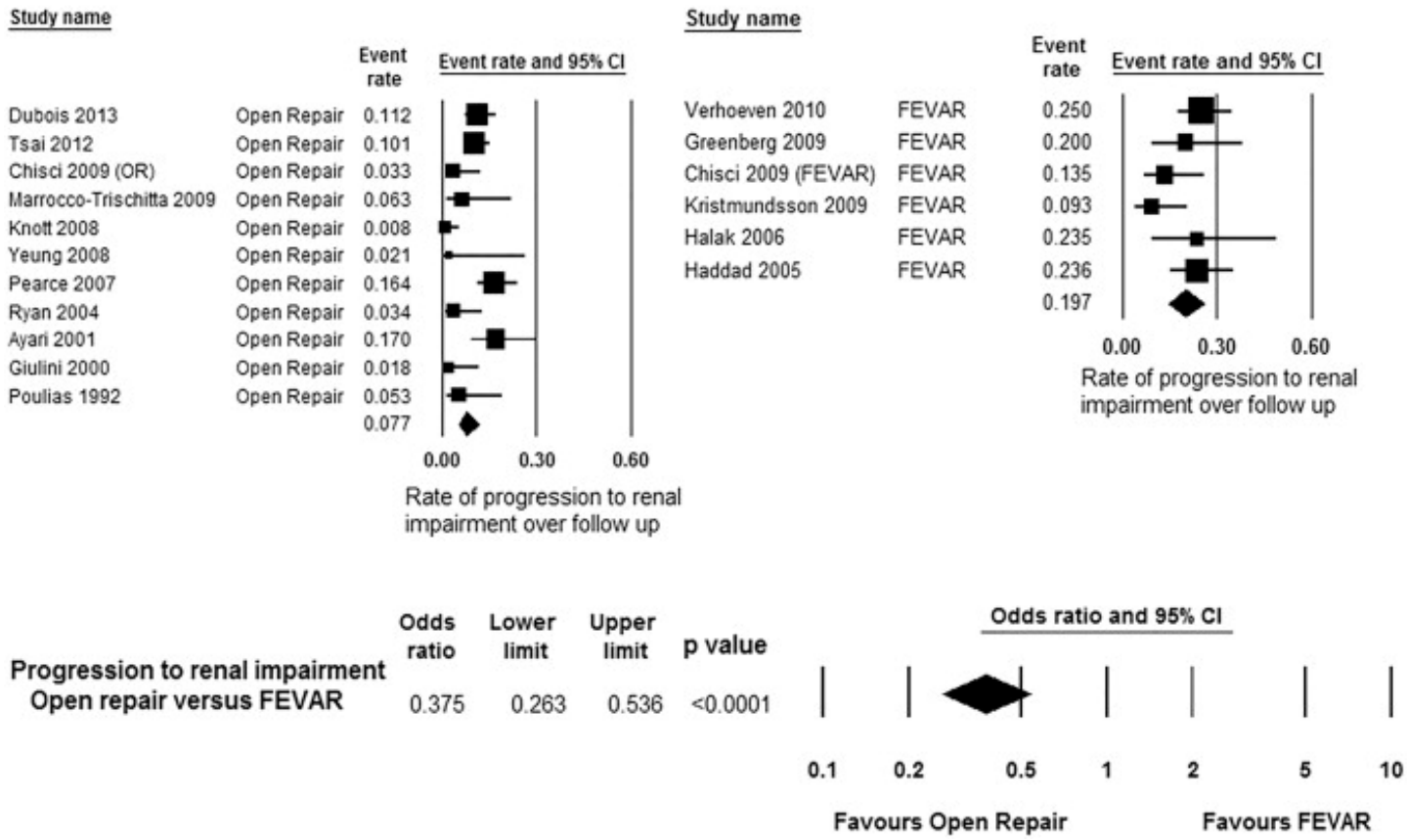
Progression to renal impairment over follow up for Open Repair and FEVAR studies



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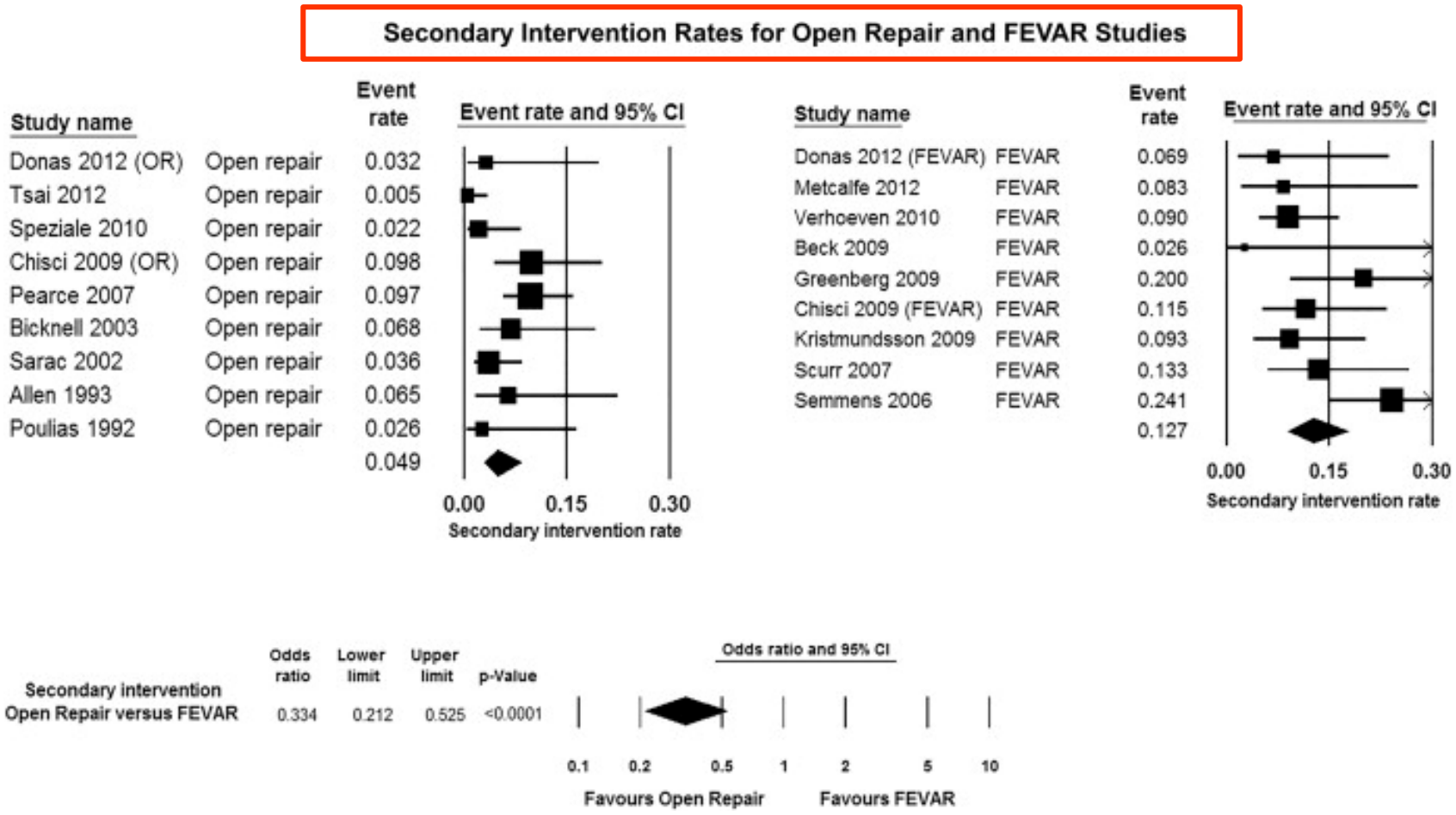


Juxtarenal AAA - *Endovascular Treatment*

- Primary stenting and standard endograft
- Large stent graft
- “Chimney Technique”
- Hybrid Technique
- Fenestrated aortic endograft
- ……

The role of open and endovascular treatment with fenestrated and chimney endografts for patients with juxtarenal aortic aneurysms

Donas KP et al.
JVS 2012;56:285-90

- Acceptable risk for open repair
- Young patient (< 68 years)
- Accessory polar renal artery

YES → **OPEN REPAIR**

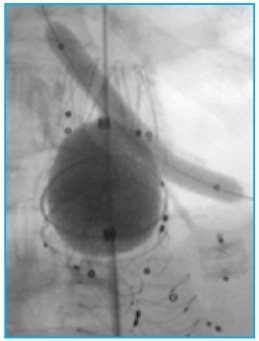
NO ↓

EVAR

↓

- symptomatic or rapid eccentric growth
- presence of at least 15 neck distance between the target vessel and the lower upper aortic side branch
- patent LSA
- absence of kinking of descending aorta
- thrombus of the aortic arch
- involvement of less than 2 aortic side branches

YES → **CHIMNEY**



NO ↓

FEVAR

Comparison of outcomes with open, fenestrated and chimney graft repair of juxtarenal aneurysms:

Are we ready for a paradigm shift?

Katsargyris A et al.
JET 2013;20:159-69

TABLE 3
Summary of Data From All Included Series Reporting Ch-EVAR for Juxtarenal Aortic Aneurysms

Author	N	Urgent, %	Operative Target Vessel Preservation, %	Proximal Type I Endoleak, %†	30-day Mortality, %	Follow-up, mo‡	CG Patency, %
Lee 2012[40]	28	0	98.2	7	7	10.7	98.2
Coscas 2011[11]	16	25	100	31.3	12.5	10.7	96.2
Bruen 2011[27]	21	5	97.3	5	4.8	6	97.2
Donas 2010[41]	15	33	100	0	0	6.7	93.3
Larzon 2008[9]	14*	42.9	93.8	7	0	17	100

Ch-EVAR: chimney graft endovascular aneurysm repair, CG: chimney graft.

* Total of 24 patients; excluded 10 patients with thoracic aortic aneurysms and dissection that were treated with CGs at the common carotid and left subclavian arteries.

† Includes both intraoperative and early (1-month) postoperative endoleak.

‡ Mean or median value depending on the reporting method of each study.

§ Represents the ratio of patent target vessels at latest follow-up to initially preserved target vessels.

Comparison of outcomes with open, fenestrated and chimney graft repair of juxtarenal aneurysms:

Are we ready for a paradigm shift?

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TABLE 4
Comparison of Preopertive Comorbidities and Main Outcomes in the Open, F-EVAR, and Ch-EVAR Cohorts

	Open	F-EVAR	Ch-EVAR	p
Comorbidities				
Coronary artery disease	48.5%*†	61%*	64%†	*<0.001, †<0.05
COPD	28.6%*†	35.1%*	47%†	*0.001, †<0.05
Renal insufficiency	17.9%*	26.3%*	25%	*<0.001
Diabetes	11.2%*	15.8%*	NR	*0.001
Outcomes				
Primary target vessel preservation	NR	98.6%	98%	NS
Mortality at 30 days	3.4%	2.4%	5.3%	NS
Renal impairment	18.5%*	9.8%*	12%	<0.001
New-onset dialysis	3.9%*	1.5%*	2.1%	<0.001
Cardiac complications	11.3%*	3.7%*	7.4%	<0.001
Pulmonary complications	16.1%*†	2.3%*	3.2%†	*†<0.001
Stroke	0.1%*	0.3%†	3.2%*†	*0.002, †0.012
Early proximal type I endoleak	NA	4.3%	10%	0.002
Estimated blood loss, L‡	1–3.2	0.2–0.8	0.35–0.4	NA
ICU LOS, d‡	2.1–8.9	0.8–1§	1	NA
Hospital LOS, d‡	6.8–24	3–9	4–8	NA

F-EVAR: fenestrated endovascular aneurysm repair, Ch-EVAR: chimney graft endovascular aneurysm repair, COPD: chronic obstructive pulmonary disease, NR: data could not be retrieved, ICU: intensive care unit, LOS: length of stay, NS: not statistically significant difference, NA: not applicable.

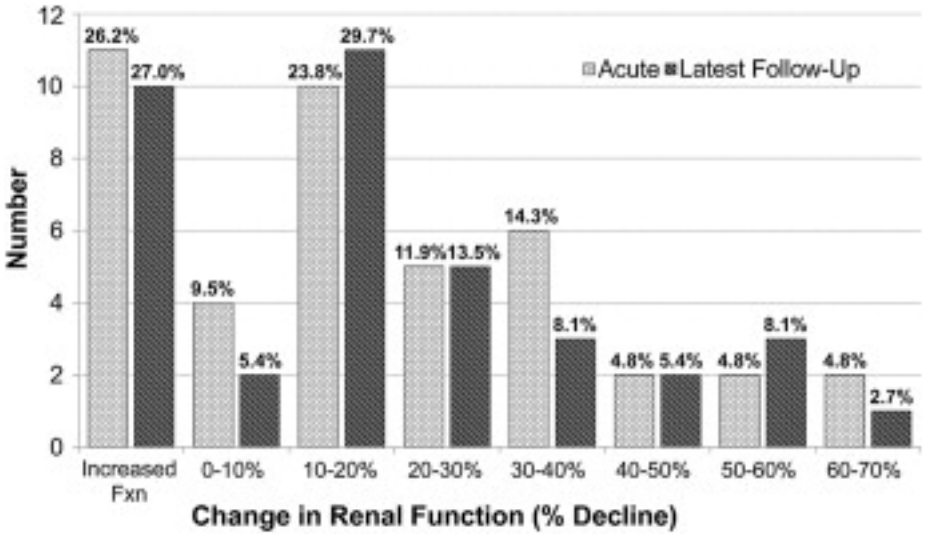
*† Indicates the pairs compared.

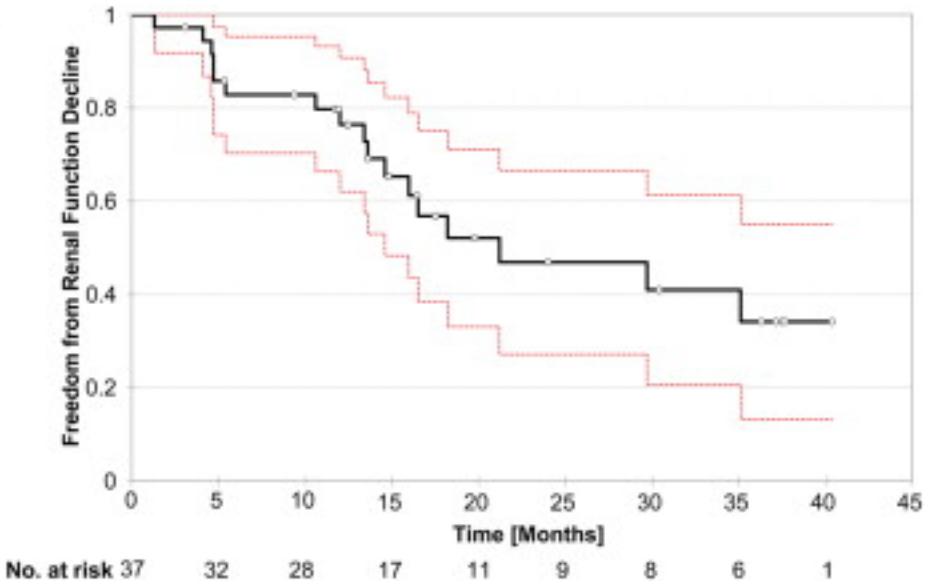
‡ Range of mean or median values (where available).

§ In many F-EVAR series, ICU was not routinely used postoperatively.

Renal function changes after snorkel/chimney repair of juxtarenal aneurysms

Lee JT et al.
JVS 2014;60:563-70





Surgical and Endovascular Treatment of Juxtarenal Aortic Aneurysms

Conclusion

- Repair of JAAA is more challenging than normal infrarenal AAA
- Open surgey has been the gold standard but with high mortality and morbidity rate; today in low surgical risk patients
- Standard EVAR with SF in JAAA with straight neck lenght ≥ 7 mm in patients unfit for OR and FEVAR is safe and effective
- FEVAR the future gold standard ? Today in high surgical risk patients and hostile abdomen without large JAAA
- Ch-EVAR, initially used as a bailout procedure or in acute JAAA, gained interest in centers where FEVAR was not yet available or reimbursed or in patients unfit for OR with large JAAA