OPEN vs ENDO for TAAA

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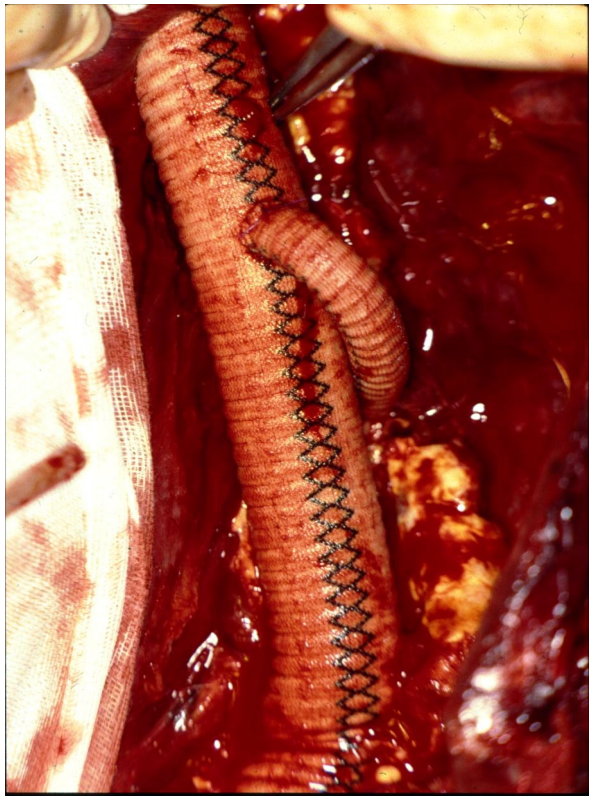

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Disclosure

Speaker name:

.....GEERT WILLEM SCHURINK.....

I have the following potential conflicts of interest to report:

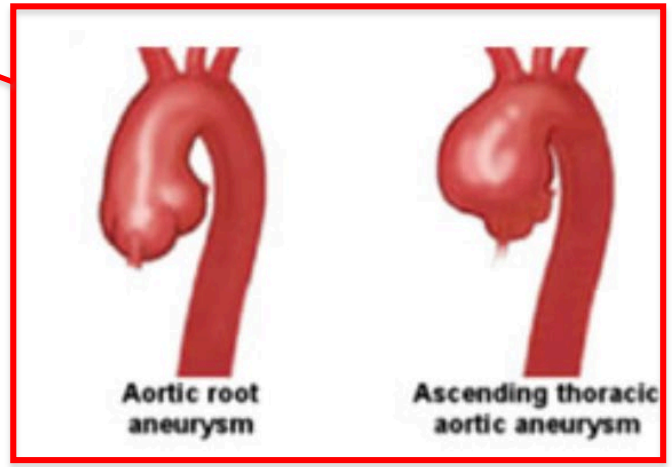
- ☐ **Consulting**
- ☐ **Employment in industry**
- ☐ **Stockholder of a healthcare company**
- ☐ **Owner of a healthcare company**
- ☐ **Other(s)**

- ■ **I do not have any potential conflict of interest**

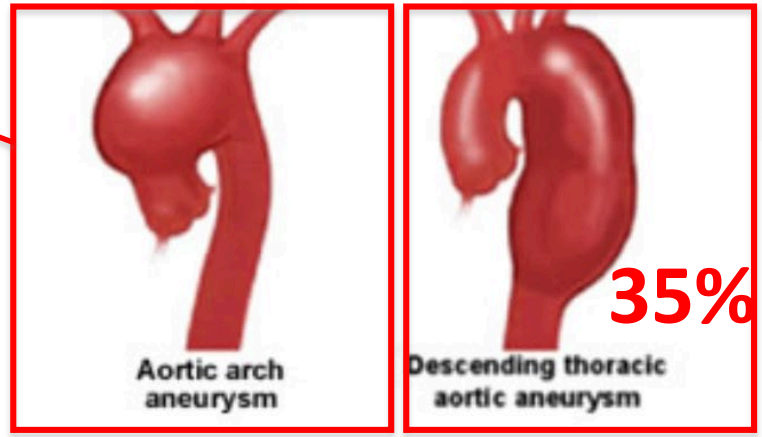
Incidence Thoracic Aneurysm

6 per 100.000 person year

40%



10%



35%

15%

(>50% type IV)

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So……

3/100.000 DTAA/TAAA

–2.1/100.000 DTAA

–0.9/100.000 TAAA

Should we treat them??

How many are treated?

336 new DTAA each year in NL

140 new TAAA each year in NL

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Open or Endo:Decisive starting questions

- Type of pathology (degenerative, CTD, post-dissection, mycotic)
- Type of morphology (local, extensive, side-branches, kinked, stenosed, calcified)
- Previous open or endovascular procedures
- Co-morbidity (cardiac, pulmonary, renal, obese)
- Age
- Experience in open surgery, hybrid procedures, endovascular procedures
- Local infrastructure
- Preference of the Patient

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Precondition for open TAAA repair

- Experience and infrastructure
- Extracorporeal circulation for distal aortic perfusion and selective organ protection
- Neuromonitoring
- Multidisciplinary team
- Perfect intensive care

Precondition for endo TAAA repair

- Experience and infrastructure **(incl. Hybrid OR)**
- ~~Extracorporeal circulation for distal aortic perfusion and selective organ protection~~
- Neuromonitoring
- Multidisciplinary team
- Perfect intensive care

Open TAAA repair in CoE

	Number	30-day mort	Acute RF	SCI
Crawford	1509	8%	9,0%	15,5%
Coselli	2286	5%	5,6%	3,8%
Safi	355	7%	2,1%	1,3%

Open TAAA repair: CoE vs REAL WORLD

	Number	30-day mort	Acute RF	SCI
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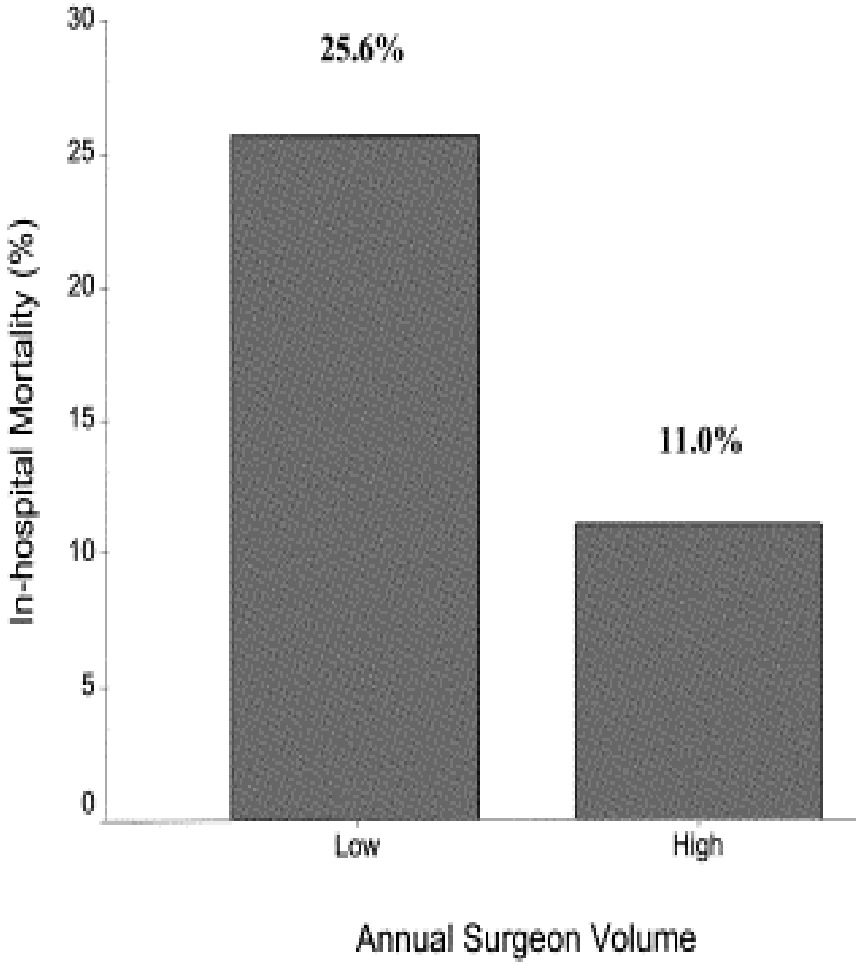
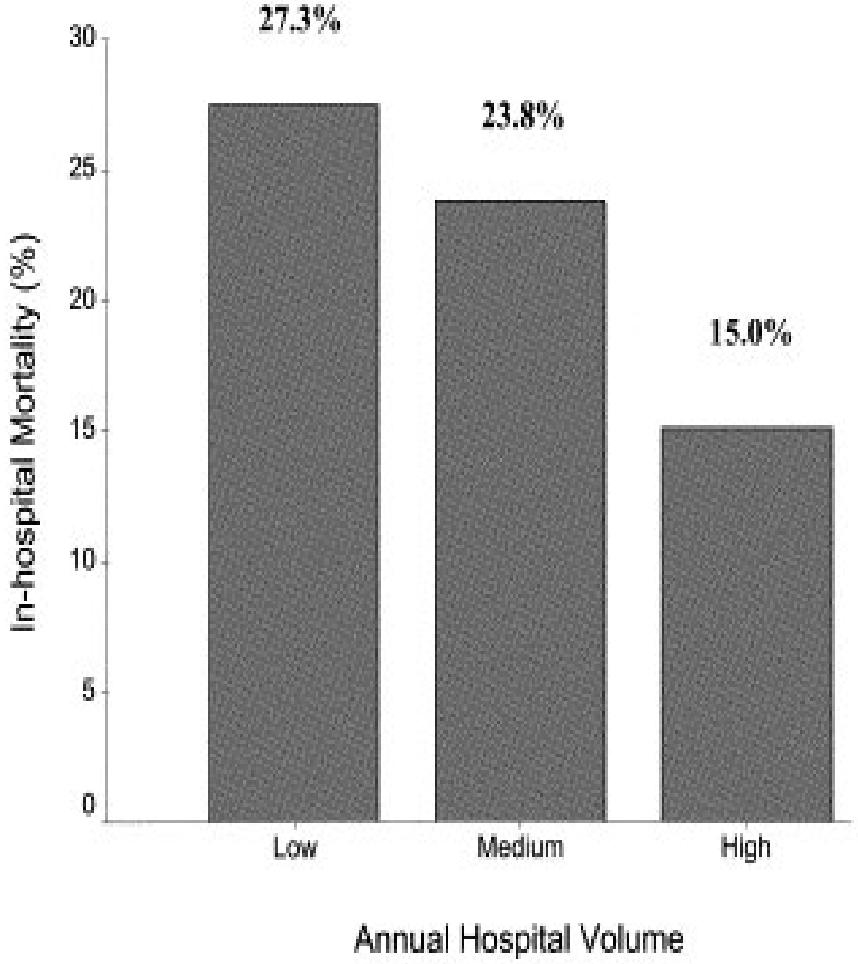
REAL WORLD Cowan JVS 2003	1542	22%	14%	nv
REAL WORLD Derrow JVS 2001	540	20%	nv	nv

TAAA and volume-related outcome





Cowan et al, JVS 2003;37:1169-74

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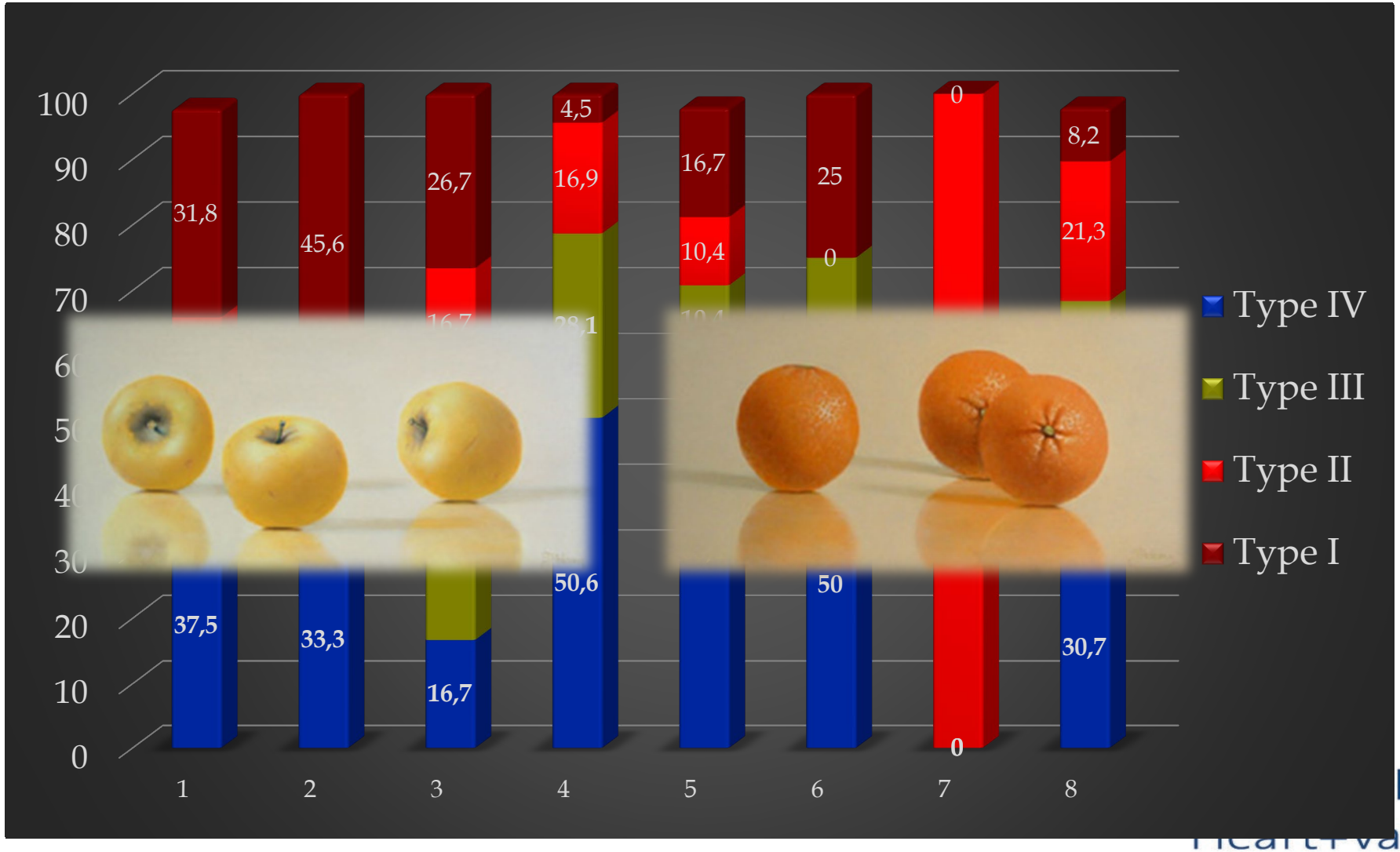
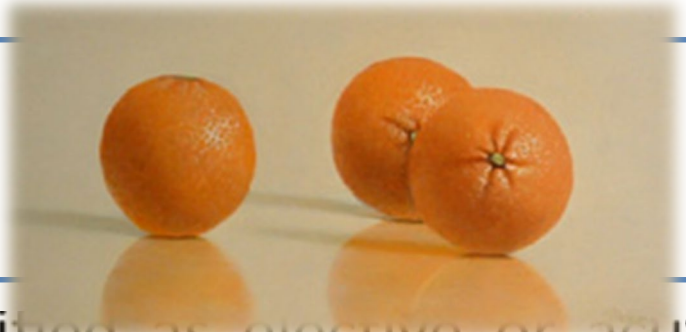
Distribution of types of endoTAAA in published series





eurysms. Procedures were classified as elective or acute (symptomatic and ruptured). Aneurysms were classified according to the Crawford classification grading the anatomy and not the endovascular repair. Technical success was defined according to the reporting standards,[6] including the

Dias NV, Sonesson B, Kristmundsson T, Holm H, Resch T EJVES. 2015.

or IV repairs were staged, and consequently those repairs have been excluded from this analysis. It has always been our practice to categorize patients on the basis of the repair rather than the aneurysm; thus, a proportion of the type II patients would have had type III aneurysms but required aortic cover above T6 to achieve a durable repair.

O'Callaghan A, Mastracci TM, Eagleton MJ. JVS 2015;61(2):347-54 e1.

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Arguments for treatment choice in TAAA

Open repair

- Definitive repair
- Excellent long-term results
- Endo is experimental
- Endo is too expensive
- Endo has questionable durability
- Connective tissue disease
- Young patient
- Post-dissection TAAA
- Mycotic aneurysm/infected grafts
- No anatomical restrictions
- Radiation exposure
- Covering of healthy aorta (SCI)
- Impossible to reconnect segmental arteries

Endovascular repair

- Open repair only excellent in CoE
- Less invasive
- Avoiding thoracotomy and visceral ischemia

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- **High risk patient**

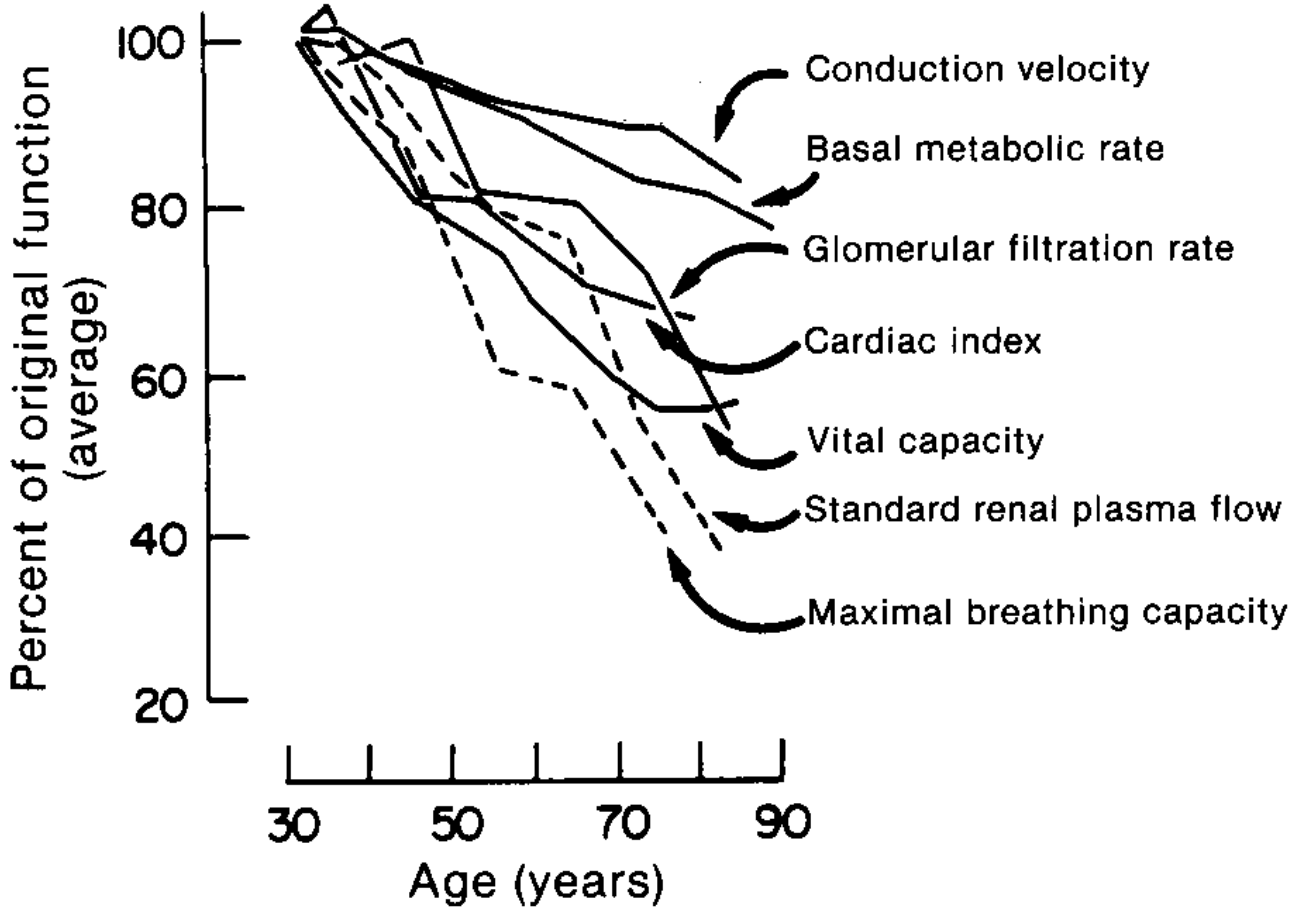
Remaining issues

- **Patient selection**
- Cost
- Long-term results

Independent predictors of major complications in noncardiac surgery

- High-risk surgery: Aortic surgery
- History of ischemic heart disease
- History of heart failure
- History of cerebrovascular disease
- Diabetes mellitus
- Pre-operative creatinine > 177 µmol/L

Organ functions during life



From Miller RD (ed): Anesthesia, ed 2. New York, Chirchill Livinstone, 1986, p 1802

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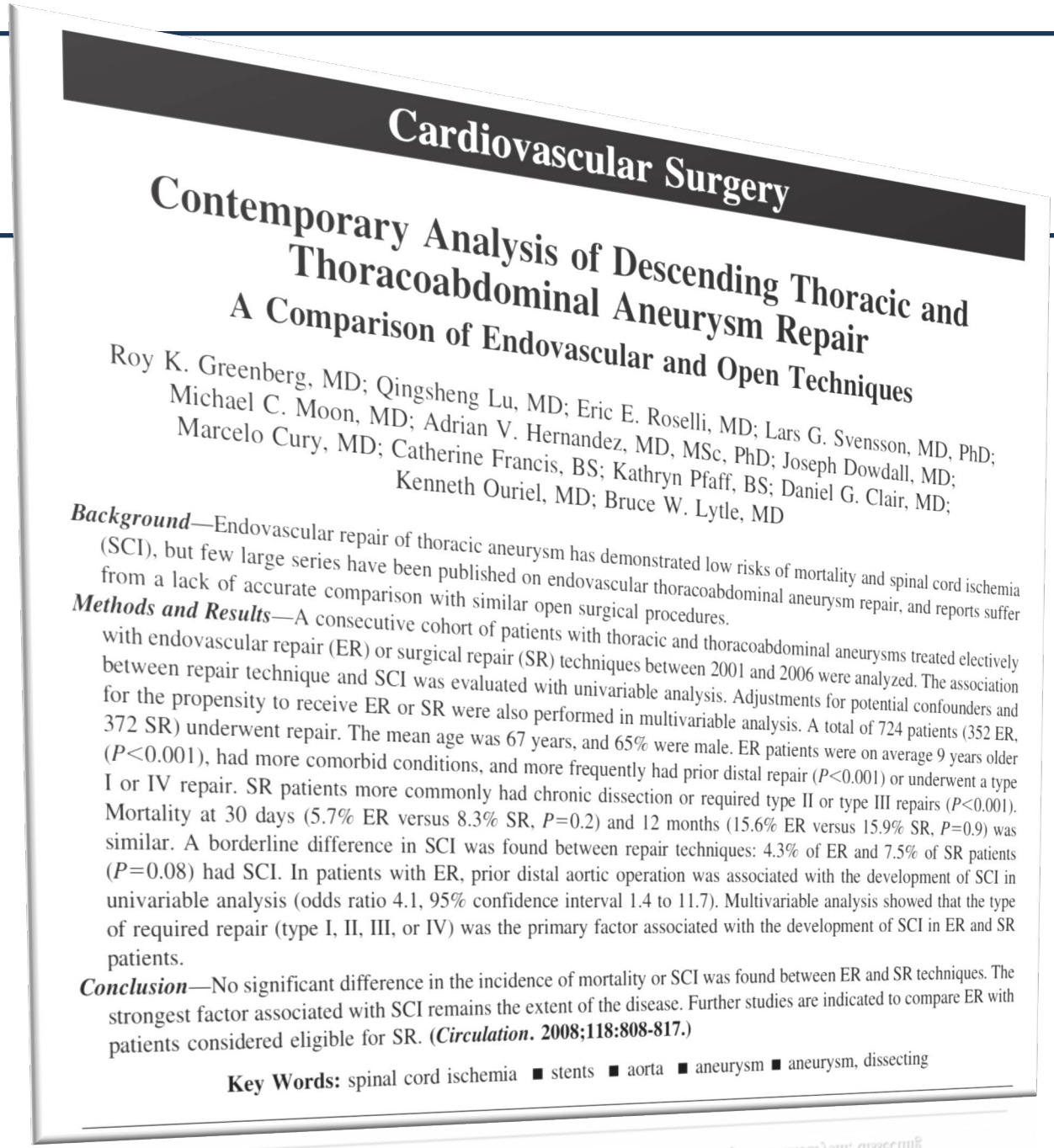

Cardiovascular Surgery

Contemporary Analysis of Descending Thoracic and Thoracoabdominal Aneurysm Repair

A Comparison of Endovascular and Open Techniques

Roy K. Greenberg, MD; Qingsheng Lu, MD; Eric E. Roselli, MD; Lars G. Svensson, MD, PhD; Michael C. Moon, MD; Adrian V. Hernandez, MD, MSc, PhD; Joseph Dowdall, MD; Marcelo Cury, MD; Catherine Francis, BS; Kathryn Pfaff, BS; Daniel G. Clair, MD; Kenneth Ouriel, MD; Bruce W. Lytle, MD

Background—Endovascular repair of thoracic aneurysm has demonstrated low risks of mortality and spinal cord ischemia (SCI), but few large series have been published on endovascular thoracoabdominal aneurysm repair, and reports suffer from a lack of accurate comparison with similar open surgical procedures.

Methods and Results—A consecutive cohort of patients with thoracic and thoracoabdominal aneurysms treated electively with endovascular repair (ER) or surgical repair (SR) techniques between 2001 and 2006 were analyzed. The association between repair technique and SCI was evaluated with univariable analysis. Adjustments for potential confounders and for the propensity to receive ER or SR were also performed in multivariable analysis. A total of 724 patients (352 ER, 372 SR) underwent repair. The mean age was 67 years, and 65% were male. ER patients were on average 9 years older ($P<0.001$), had more comorbid conditions, and more frequently had prior distal repair ($P<0.001$) or underwent a type I or IV repair. SR patients more commonly had chronic dissection or required type II or type III repairs ($P<0.001$). Mortality at 30 days (5.7% ER versus 8.3% SR, $P=0.2$) and 12 months (15.6% ER versus 15.9% SR, $P=0.9$) was similar. A borderline difference in SCI was found between repair techniques: 4.3% of ER and 7.5% of SR patients ($P=0.08$) had SCI. In patients with ER, prior distal aortic operation was associated with the development of SCI in univariable analysis (odds ratio 4.1, 95% confidence interval 1.4 to 11.7). Multivariable analysis showed that the type of required repair (type I, II, III, or IV) was the primary factor associated with the development of SCI in ER and SR patients.

Conclusion—No significant difference in the incidence of mortality or SCI was found between ER and SR techniques. The strongest factor associated with SCI remains the extent of the disease. Further studies are indicated to compare ER with patients considered eligible for SR. **(*Circulation*. 2008;118:808-817.)**

Key Words: spinal cord ischemia ■ stents ■ aorta ■ aneurysm ■ aneurysm, dissecting

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Cont.

Extent	Repair Technique	n	Mortality at 30 d n	Mortality at 30 d %*	SCI n	SCI %
None	ER	163	8	5	1	1
	SR	136	8	4	1	1
I	ER	82	6	7	8	10
	SR	51	1	2	7	14
II	ER	16	1	6	3	19
	SR	59	10	17	13	22
III	ER	22	2	9	1	5
	SR	62	8	13	6	10
IV	ER	69	3	4	2	3
	SR	64	4	6	1	2
All	ER	352	20	6	15	4
	SR	372	31	7	28	8

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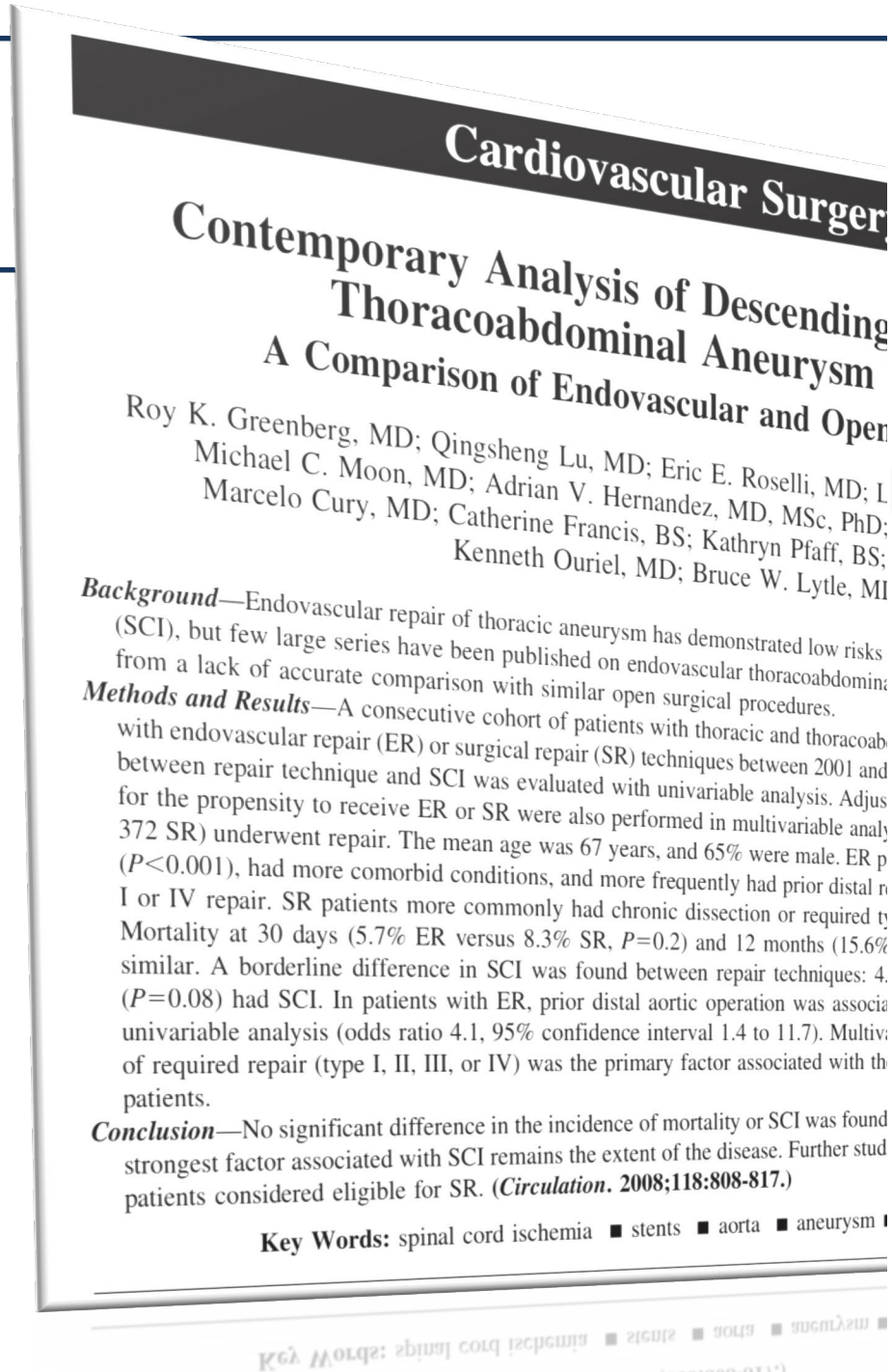

Cardiovascular Surger

Contemporary Analysis of Descending Thoracoabdominal Aneurysm

A Comparison of Endovascular and Oper

Roy K. Greenberg, MD; Qingsheng Lu, MD; Eric E. Roselli, MD; L
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Conclusion—No significant difference in the incidence of mortality or SCI was found strongest factor associated with SCI remains the extent of the disease. Further stud patients considered eligible for SR. (***Circulation***. **2008;118:808-817.**)

Key Words: spinal cord ischemia ■ stents ■ aorta ■ aneurysm

Table 3. Patient Characteristics for Open and Endovascular Repair Techniques

Patient Characteristics	SR (n=372)	ER (n=352)	*P*
Age, mean±SD	62.7±13	71.3±12	<0.001
Male gender, %	64	65	0.6
Black, %	10	7	0.1
Smoking, %	54	62	0.03
Diabetes mellitus, %	5	11	0.003
Cardiac			
History of CAD, %	33	50	<0.001
EF, mean±SD*	54.4±8.8	52.5±11.8	0.02
EF <0.30, %	3	6	0.03
Pulmonary			
History of COPD, %	17	30	<0.001
FEV1*	2.2±0.8	1.7±0.8	<0.001
FEV1 <1 L, %*	3	20	<0.001
FEF 25% to 75%*	1.7±0.9	0.9±0.7	<0.001
FEF 25% to 75% <30% of expected, %*	32	52	0.001
History of cancer, %	9	13	0.09
BMI, mean±SD*	27.5±10.2	26.8±5.1	0.4
Renal			
GFR, mean±SD†	77.7±30	66.1±28.5	<0.001
<40, %	9	17	0.001
<60, %	28	40	0.001
Aortic diameter, cm, mean±SD	6.2±1.3	6.3±1.3	0.9
Extent of aneurysm repair, %			
0	36	46	<0.0001
I	14	23	
II	16	5	
III	17	6	
IV	17	20	
Chronic dissections, %	30	13	<0.001
History of surgery for proximal aorta, %	31	18	<0.001
History of surgery for distal aorta, %	16	28	<0.001

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General Review

Open versus Endovascular Repair of Descending Thoracic Aortic Aneurysm Disease: A Systematic Review and Meta-analysis

Amer Harky,[1] Jeffrey Shi Kai Chan,[2] Chris Ho Ming Wong,[2] and Mohamad Bashir,[3] Chester and Manchester, United Kingdom, and New Territories, Hong Kong

Background: The purpose of this study was [illegible] repair reduces death [illegible]

	Open	Endovascular	*P* value
Number of patients	10,672	3,908	
Mean age (yrs)	65.1 ± 14	70 ± 12.5	0.0009
Male (%)	67.10	61.30	n/a
IHD/CAD (%)	3.99	9.13	<0.0001
HTN (%)	70.20	79.76	0.03
DM (%)	9.53	13.27	0.004
COPD (%)	21.66	30.96	0.01
CKD/renal failure (%)	5.24	12.98	<0.0001
Surgical acuity			
Emergency (%)	16.51	18.68	0.36
Nonemergency (%)	83.49	81.32	0.45

[illegible] endovascular and open repair groups ([illegible]% vs. [illegible]%, [illegible]) and [illegible] vs. 37.37%, $P = 0.49$).

Conclusions: The present meta-analysis shows that endovascular repair of thoracic aortic aneurysm gives better perioperative outcomes during inhospital stay although the 1- and 5-year mortality remains the same in both groups; but the long-term outcome is yet to be established. A long-term data and studies are required to give a better understanding of comparing these 2 techniques beyond 5 years of follow-up.

(Harky A, et all.. Ann Vasc Surg. 2018, in press.)

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	Open	Endovascular	*P* value
Postoperative data			
Paraplegia (%)	5.52	3.34	0.007
Stroke (%)	14.08	7.20	0.58
All neurology complications (%)	15.54	9.00	0.19
In-hospital (operative) mortality (%)	3.21	4.40	0.005
Renal failure (%)	8.29	6.20	0.01
Sepsis (%)	5.54	4.97	0.04
ICU stay—days (mean ± SD)	8.5 ± 7.44	4.5 ± 9.42	0.002
Total hospital stay—days (mean ± SD)	9.5 ± 8.94	5.7 ± 1.24	0.0004
Reoperation while in hospital (%)	8.68	11.12	0.02
Reintervention rate at 1 year (%)	9.11	10.73	0.001
Cardiac complications (%)	13.54	3.11	<0.0001
Vascular complications (%)	1.17	5.29	0.002
One-year mortality (%)	24.04	22.19	0.59
Five-year mortality (%)	37.37	44.26	0.49

IHD, ischemic heart disease; HTN, hypertension; DM, diabetes mellitus; CKD, chronic kidney disease; SD, standard deviation.

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Background

... noted in open repair group ($P = 0.007$). The rate of renal failure ($P = 0.01$) and cardiac complications ($P < 0.0001$) was higher in the open repair group. The rate of vascular complications was much higher in the endovascular group of patients (5.29% vs. 1.17%, $P = 0.002$). Operative mortality was higher in endovascular procedures (4.4% vs. 3.2%, $P = 0.005$); however, 1- and 5-year mortality showed no statistical difference between the endovascular and open repair groups (22.19%, vs. 24.04%, $P = 0.59$, and 44.26% vs. 37.37%, $P = 0.49$).

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Remaining issues

- Patient selection
- **Cost**
- Long-term results

From the Society for Vascular Surgery

Outcomes and cost of open versus endovascular repair of intact thoracoabdominal aortic aneurysm

Satinderjit Locham, MD, Hanaa Dakour-Aridi, MD, Besma Nejim, MBChB, MPH, Jasninder Dhaliwal, MD, Widian Alshwaily, MD, *and* Mahmoud Malas, MD, MHS, *Baltimore, Md*

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ABSTRACT

Objective: Many previous studies have evaluated the outcomes of open and endovascular repair of thoracoabdominal aortic aneurysms (TAAAs). However, little is known about the differences in cost of these procedures and the potential factors driving these differences. The aim of this study was to evaluate the outcomes and cost of open aortic repair (OAR) vs endovascular repair of intact TAAA.

Methods: All patients undergoing repair for intact TAAA were identified in the Premier Healthcare Database (July 2009-March 2015). Categorical and continuous variables were analyzed using the χ^2 test, Student *t*-test, and median test as appropriate. A multivariable generalized linear model was used to examine total in-hospital cost.

Results: A total of 879 TAAA repairs were identified (481 [55%] endovascular repairs vs 398 [45%] OARs). Patients undergoing endovascular repair were on average 5 years older (71.2 [±10.0] years vs 66.5 [±10.9] years; $P < .001$) and more likely to be female (48% vs 42%; $P = .05$) and hypertensive (87% vs 80%; $P = .009$). Otherwise, there were no significant differences in comorbidities between the two groups. Patients undergoing OAR were more likely to stay longer in the hospital (median [interquartile range], 11 [7-20] days vs 5 [2-9] days; $P < .001$). In-hospital mortality (15% vs 5%; $P < .001$) and all major complications were two to three times higher after OAR. The median total cost of OAR was significantly higher compared with endovascular repair (cost [interquartile range], $44,355 [$32,177-$54,824] vs $36,612 [$24,395-$53,554]; $P = .004$). The majority of the cost attributed to TAAA repair was also higher in patients undergoing open repair: room and board ($11,561 vs $4720), operating room ($9230 vs $4929), pharmacy ($2309 vs $900), blood bank ($1189 vs $195), rehabilitation/physical therapy ($378 vs $236), and respiratory therapy ($875 vs $168; all $P < .001$). Only the cost of central supplies, which includes endovascular grafts and stents, was the highest among patients undergoing endovascular repair ($17,472 vs $5501; $P < .001$). The cost of diagnostic imaging ($625 vs $595) and anesthesia ($479 vs $478) was similar in both approaches. In a multivariable analysis, the adjusted total hospitalization cost for OAR was $5974 (95% confidence interval, $1828-$10,120; $P = .005$) higher compared with endovascular repair. However, after adjusting for in-hospital complications, no difference was seen between the two approaches (−$460; 95% confidence interval, −$4390 to $3470; $P = .82$).

Conclusions: In this large cohort of intact TAAAs, we showed a significantly higher adjusted total hospitalization cost of open compared with endovascular repair despite the additional cost of endografts. This is likely driven by longer length of stay and higher morbidity after OAR. (J Vasc Surg 2018;68:948-55.)

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Outcomes	Endovascular repair (n = 481; 54.7%)	Open repair (n = 398; 45.3%)	*P* value
Length of stay, days	5 (2-9)	11 (7-20)	<.001
Mortality	26 (5.4)	59 (14.8)	<.001
Any major complications	140 (29.1)	255 (64.1)	<.001
Renal failure	65 (13.5)	138 (34.7)	<.001
Stroke	11 (2.3)	26 (6.5)	.002
Paraplegia/spinal cord ischemia	14 (2.9)	31 (7.8)	.001
Cardiac complications	63 (13.1)	159 (40.0)	<.001
Pulmonary complications	49 (10.2)	86 (21.6)	<.001

Continuous data are presented as median (interquartile range [IQR]) and categorical data as number (%).
Some patients undergoing TAAA repair had more than one major complication.

2009-March 2015). Categorical and continuous variables were

as appropriate. A

	Endovascular repair, median cost, USD (IQR)	Open repair, median cost, USD (IQR)	*P* value
Pharmacy	900 (456-1651)	2309 (1412-3095)	<.001
Blood bank	195 (75-563)	1189 (490-2206)	<.001
Diagnostic imaging	595 (229-1288)	625 (303-1086)	.47
Laboratory cost	390 (179-689)	1120 (704-1536)	<.001
Central supply	17,472 (8683-27,931)	5501 (3152-9034)	<.001
Anesthesia	478 (216-988)	479 (231-1270)	.91
Room and board	4720 (2246-8772)	11,561 (7141-16,003)	<.001
Respiratory therapy	168 (38-438)	875 (589-1153)	<.001
Rehabilitation/physical therapy	236 (122-396)	378 (220-548)	.002
Operating room	4929 (3089-7598)	9230 (5949-12,489)	<.001

IQR, Interquartile range; *USD*, U.S. dollars.

stay and higher morbidity after OAR. (J Vasc Surg 2018;68:948-55.)

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From the Society for Vascular Surgery

Outcomes and cost of open versus endovascular repair of intact thoracoabdominal aortic aneurysm

Satinderjit Locham, MD, Hanaa Dakour-Aridi, MD,
Widian Alshwaily, MD, and

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CONCLUSIONS

This study demonstrated significantly higher mortality, complications, and adjusted total hospitalization cost after OAR compared with endovascular repair of TAAAs. This significant difference in cost was seen despite the expected additional costs of endografts used in endovascular procedures. The higher cost of OAR is mainly due to increased complication rates and longer length of stay. Further long-term studies looking at the durability and costs of reinterventions are warranted to determine the overall costs of endovascular repair vs OAR.

stay and higher morbidity after OAR. (J Vasc Surg 2018;68:948-55.)

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Remaining issues

- Patient selection
- Cost
- **Long-term results**

Efficacy and durability of endovascular thoracoabdominal aortic aneurysm repair using the caudally directed cuff techni

Linda M. Reilly

- mean follow-up of 21.2 months,
- no aneurysms ruptured,
- Primary patency was 94.8%, and primary-assisted patency was 95.1%.
- Overall, 73 of 81 patients (90.1%) were treated without procedure-related death, dialysis, paralysis, aneurysm rupture, or conversion to open repair

deaths. During a mean follow-up of 21.2 months, no aneurysms ruptured, but four (4.0%) ... of the perioperative or treatment-related

Conclusion:

Total endovascular TAAA/PRAA repair using caudally directed cuffs is **safe**, **effective**, and **durable** in the **intermediate term**.

AORTIC LIVE

Maastricht UMC+
Heart+Vascular Center

Conclusion 2018

- Both open and endovascular repair of TAAA are here to stay
- Comparing results is difficult because of selection bias.
- Choice of treatment will differ between centers according to local experience and results.

Conclusions 2018

- Open and endovascular repair of TAAA should be centralized in high volume institutes and performed by dedicated multidisciplinary teams
- Decision for open or endovascular repair shouldn't be dependent on skill of the team
- If your results and/or numbers are inadequate: refer the patient