EVAR for ruptured AAA
Early results

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“Early results”

- First case by F. Veith in 1994
- First EVAR in Ghent was for RAAA (1997)
- EVAR for RAAA promising
  - High mortaltity and morbidity with OAR
  - EVAR
    - Fast control of bleeding
    - Less need for anesthesia
    - Less invasive -> less morbidity
    - Avoids hypothermia and coagulopathy
    - Less dissection

Early experience with REVAR

Peppelenbosch 2003	PCS†	80%	4/26 (15)
Reichart 2003	PCS	42%	1/6 (16.6)
Resch 2003	PCS	79%	4/14 (29)
Scharrer-Pamler 2003	CS		3/24 (12.5)
Van Herzeele 2003	CS		1/9 (11)
Verhoeven 2002	PCS	34%	1/9 (11)
Yilmaz 2002	PCS	81%	4/17 (24)
Doss 2002	CS		0/6 (0)
Lachat 2002	CS		2/21 (9.5)
Orend 2002	CS		4/21 (19)
Van Sambeek 2002	CS		6/22 (19)
Hinchcliffe 2001	CS		9/20 (45)
Ohki 2000	PCS	80%	2/20 (10)
Greenberg 2000	CS		0/3 (0)
Ohki 1999	CS		2/12 (17)

17,8%

Harkin EJVES 207

Collected World and Single Center Experience With Endovascular Treatment of Ruptured Abdominal Aortic Aneurysms

F. Veith Ann Surg 2009

- Mortality in 1037 patients: 21,2%
- EVAR vs OAR in selected centres

TABLE 5. Updated (to January 15, 2009) Deaths and 30-Day Mortality Outcomes for EVAR and OR at Centers Using EVAR for RAAA Treatment Whenever Possible‡

Surgeon(s) City	No. RAAAs Treated by EVAR (+No. Not in Table 1)	EVAR Deaths/30-d EVAR Mortality (No./%)	No. RAAAs Treated by OR	OR Deaths/30-d OR Mortality (No./%)	% RAAAs Treated by EVAR	Aortic Balloon Use (% EVAR Cases)	ACS (% EVAR Cases)
Lachat, Mayer Zurich	111 (+61)	15/13.5	110	36/32.4	50	18	23
Malina, Holst Malmo, Sweden	111 (+56)	34/30.6	102	34/33.3	52	21	3
Mehta, Darling Albany	92 (+65)	16/17.4	84	34/40.5	52	23	17
Larzon Örebro, Sweden	62	8/12.9	52	21/40.4	54	39	19
Coppi, Gennai Modena, Italy*	56	18/32.1	101	44/43.6	36	13	5
Verhoeven Groningen	53 (+22)	9/17.0	135	39/28.9	28	11	8
Veith, Lipsitz, Gargiulo New York	45 (+7)	6/13.3	12	1/8.3	79		7
Van der Vliet, Blankensteijn Nijmegen	41 (+26)	7/17.1	59	31/52.5	41	12	12
Buth Eindhoven†	41 (+17)	12/29.3	27	12/44.4	60	2	2
Lee Gainesville, US	29 (+29)		43		40	7	3
Biasi, Deleo Milan	21 (+10)		33		39	48	14
Kasirajan Atlanta	11 (+11)		—		—	18	18
Cayne New York	7 (+7)		5		58	14	29
Total	680 (+311)	134/19.7%	763	277/36.3%	Mean 49.1 ± 12.9%	Mean 19.1 ± 12.0%	Mean 12.2 ± 8.3%

19,7%

36,3%

Meta-analysis of EVAR vs OAR for RAAA

Figure 2

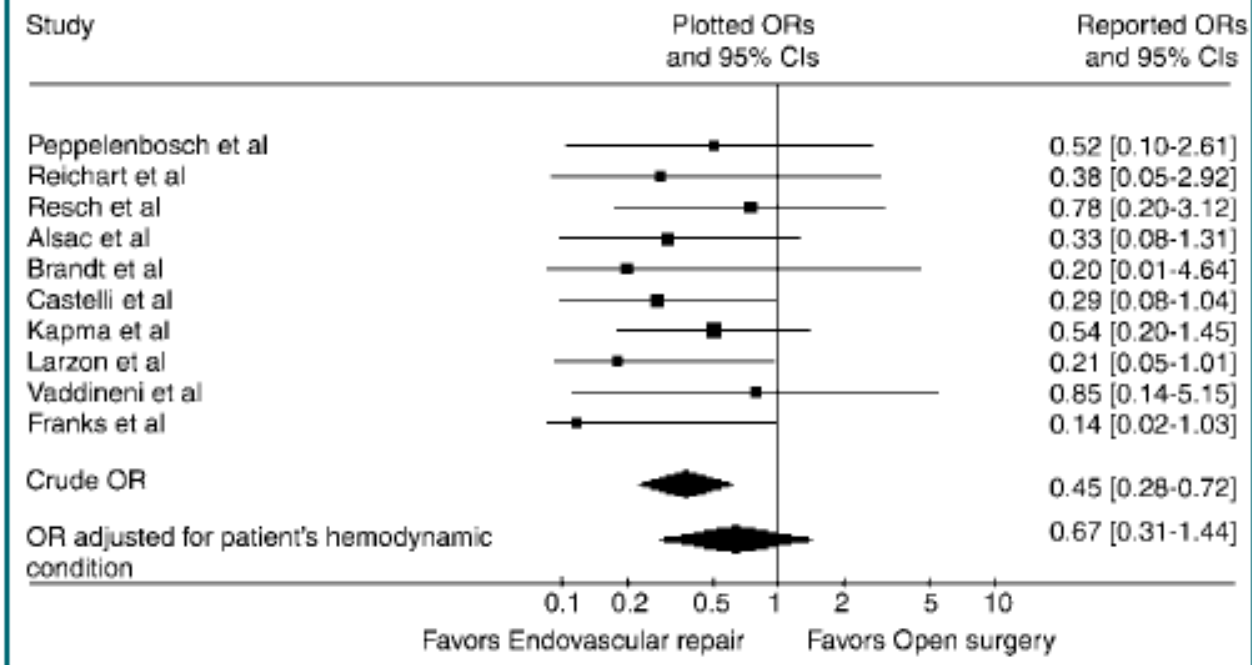


Figure 2: Comparative analysis of endovascular repair versus open surgery. Forest plot of ORs (with 95% CIs in square brackets) of reported and pooled 30-day mortality of each study included in the analysis. Random-effects model was used to pool data.

Visser et al. Radiology 2007

Randomized trials - 2006

A Randomised Trial of Endovascular and Open Surgery for Ruptured Abdominal Aortic Aneurysm – Results of a Pilot Study and Lessons Learned for Future Studies

R.J. Hinchliffe, L. Bruijstens, S.T.R. MacSweeney and B.D. Braithwaite*

Mortality EVAR: 53% = OAR: 53%

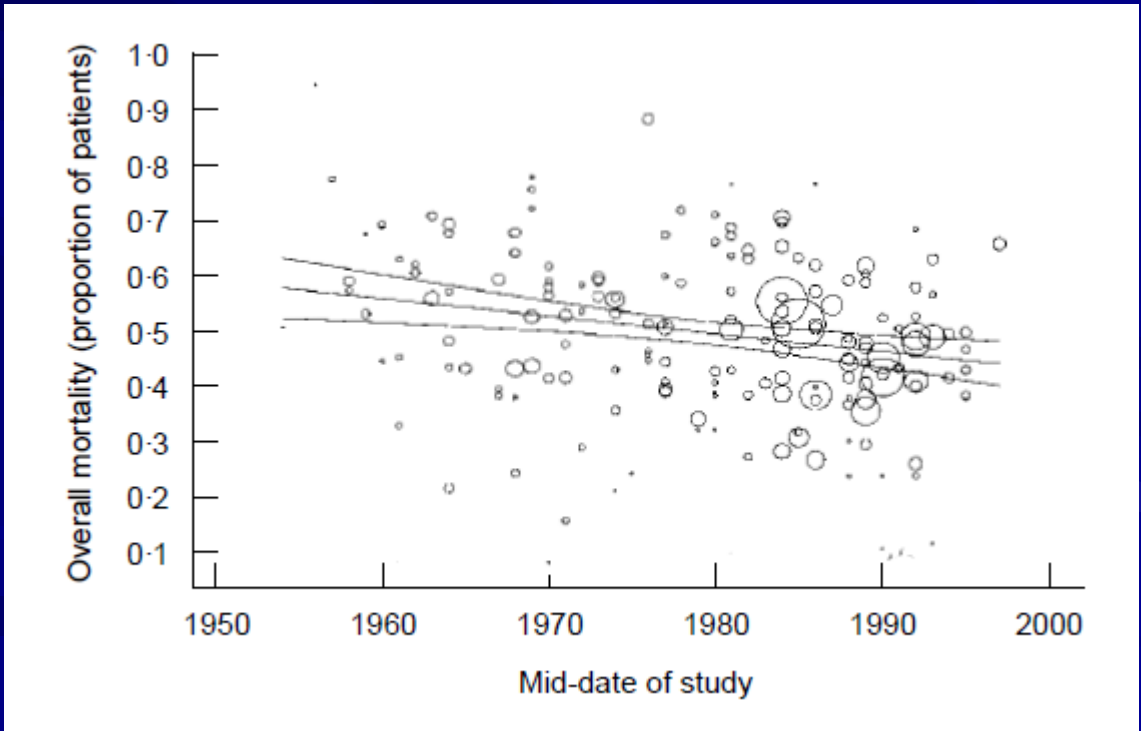
Endograft treatment of ruptured abdominal aortic aneurysms using the Talent aortouniiliac system: An international multicenter study

Noud Peppelenbosch, MD,[a] Robert H. Geelkerken, MD, PhD,[b] Chee Soong, MD, FRCS,[c] Piergiorgio Cao, MD, FRCS,[d] Oren K. Steinmetz, MD,[e] Joep A. W. Teijink, MD, PhD,[f] Mauri Lepäntalo, MD, PhD,[g] Jan De Letter, MD, PhD,[h] Frank E. G. Vermassen, MD, PhD,[i] Guy DeRose, MD, FRCSS, FACS,[j] Erik Buskens, MD, PhD,[k] and Jaap Buth, MD, PhD, FRCS,[a] *Eindhoven*

Mortality EVAR: 35% ~ OAR: 39%

Trend in mortality after ROAR

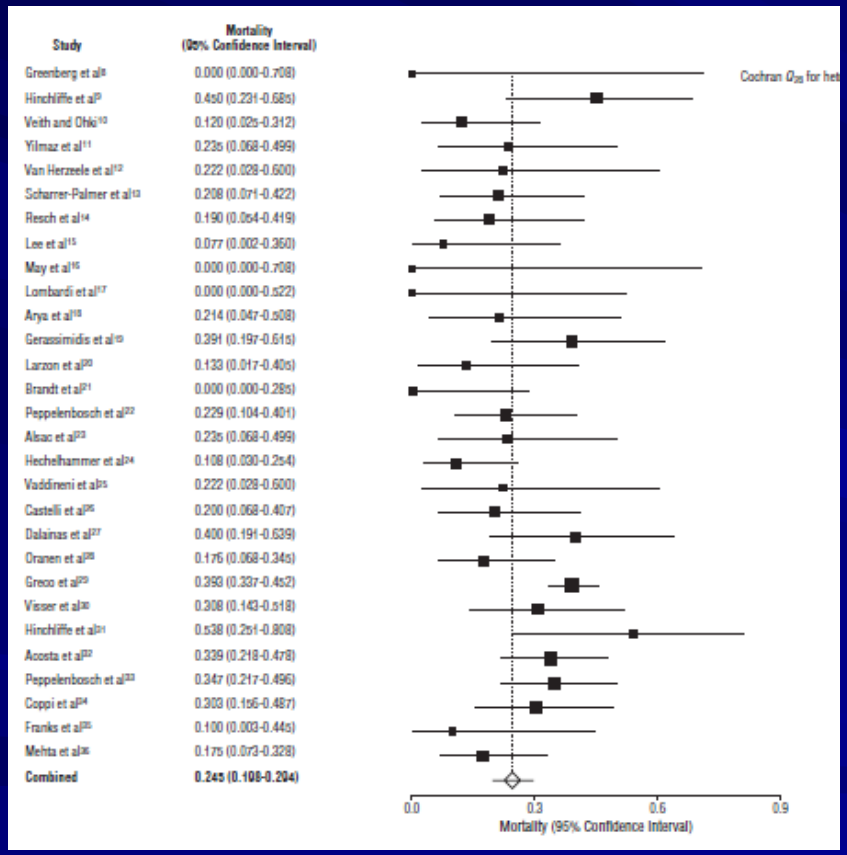
- Decline in mortality after open repair for RAAA: -3.5%/decade



Bown, BJS 2002

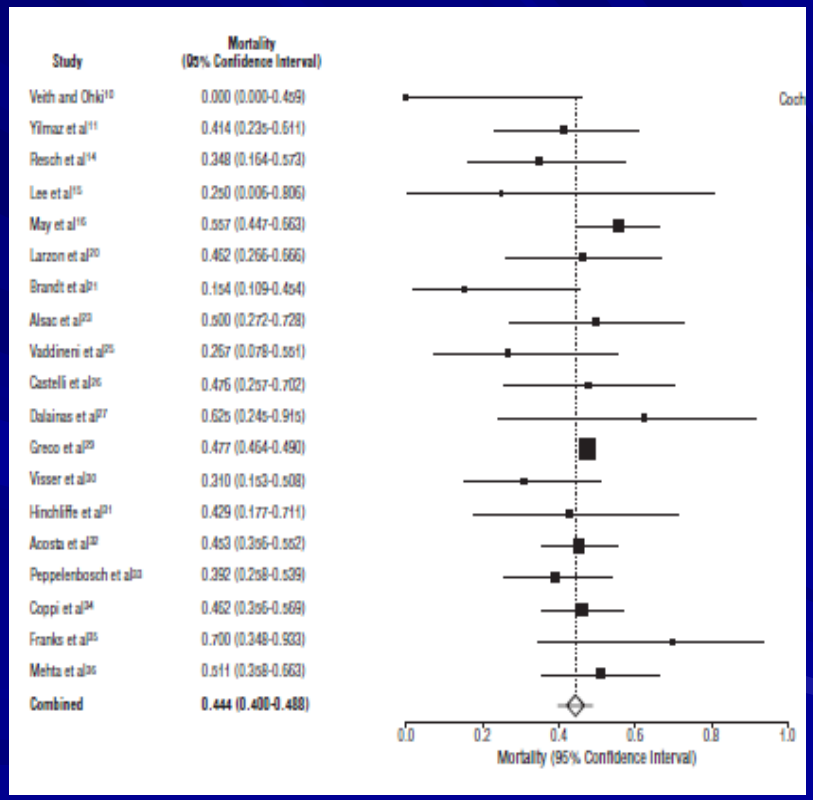
Meta-analysis comparing EVAR and OAR for RAAA (Karkos 2009)

EVAR



Mortality: 24.5%
Heterogeneity p<0.001

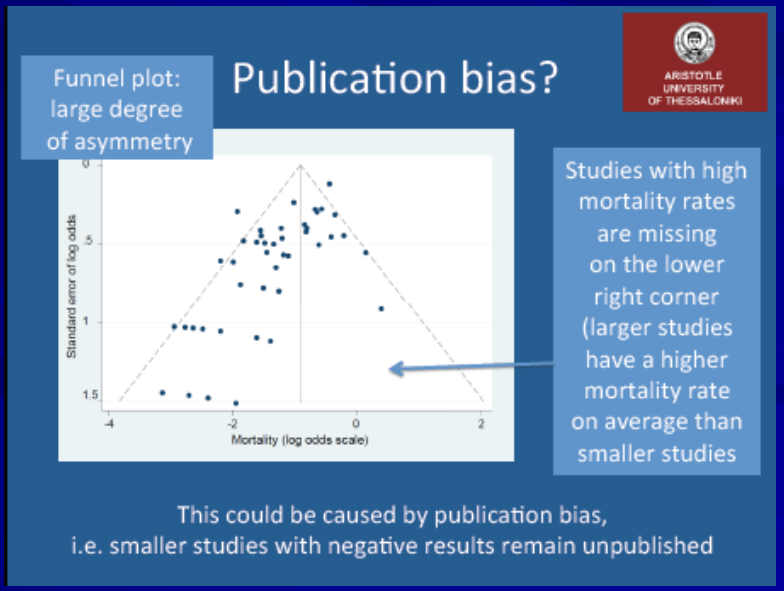
OAR



Mortality: 44.4%
Heterogeneity p=0.03

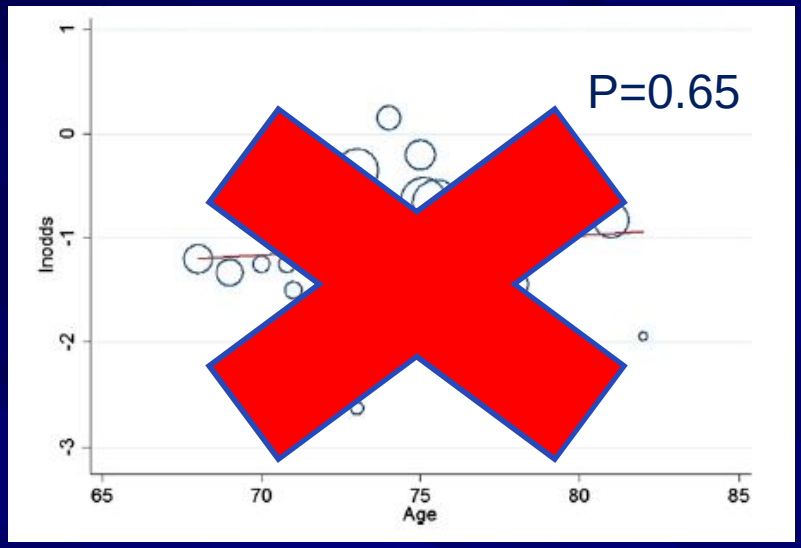
Factors influencing mortality after EVAR for RAAA

- Meta-analysis (Karkos EJVES 2012)
  - 46 studies – 1397 patients
  - Mortality: 24.3%
  - Meta-regression analysis

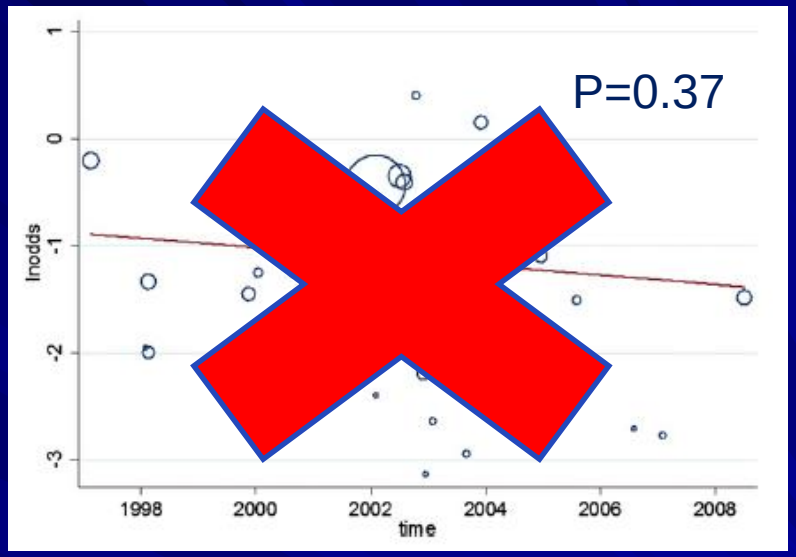


Courtesy by Karkos

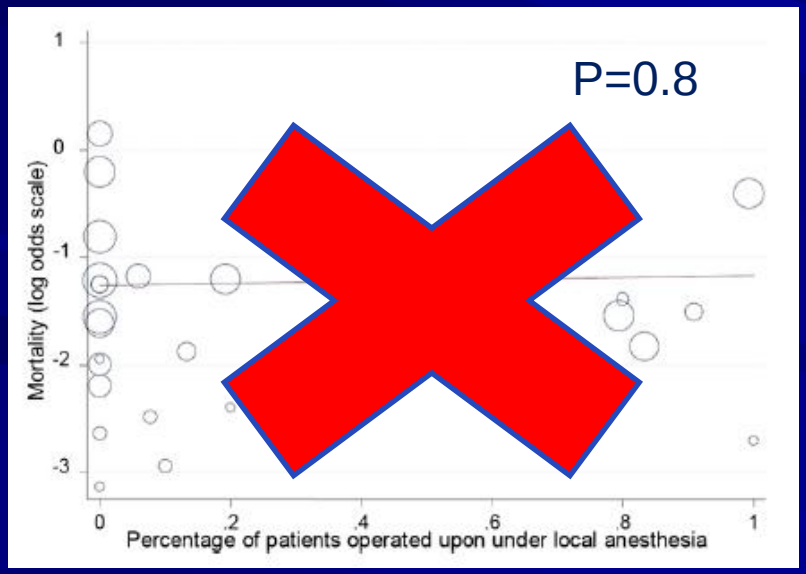
Age



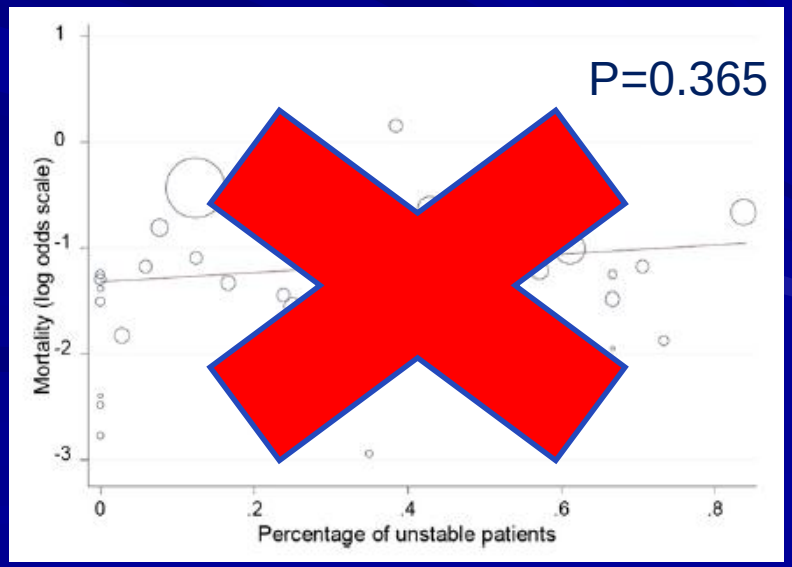
Mid time study point



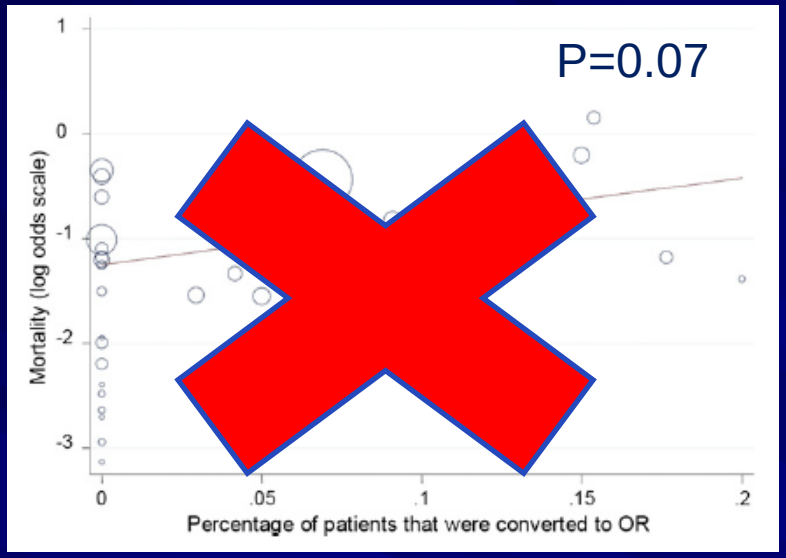
Local anesthesia



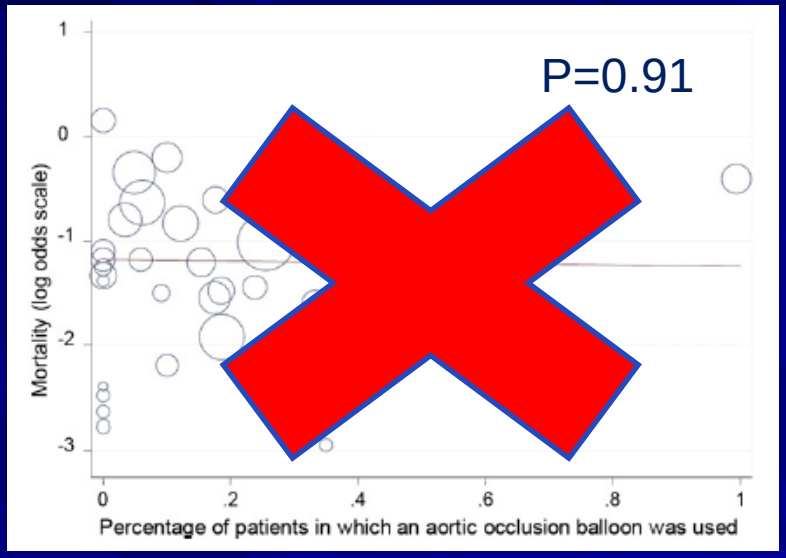
Hemodynamic instability



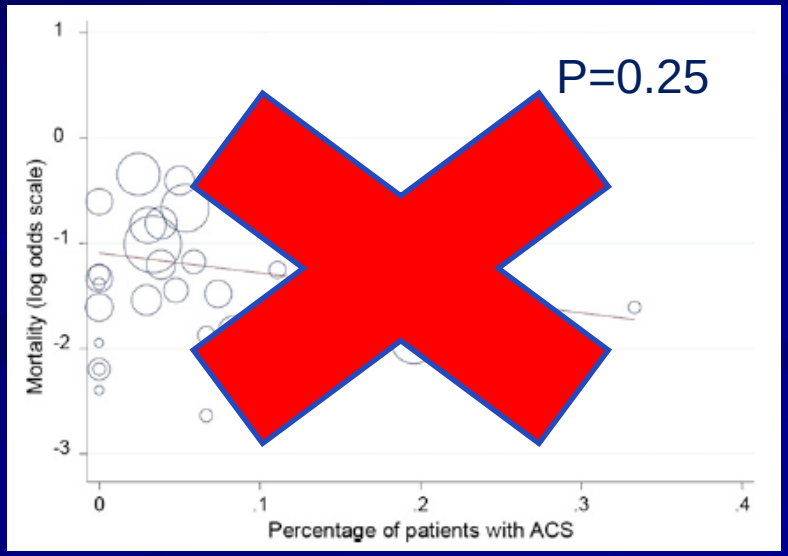
Operative conversion



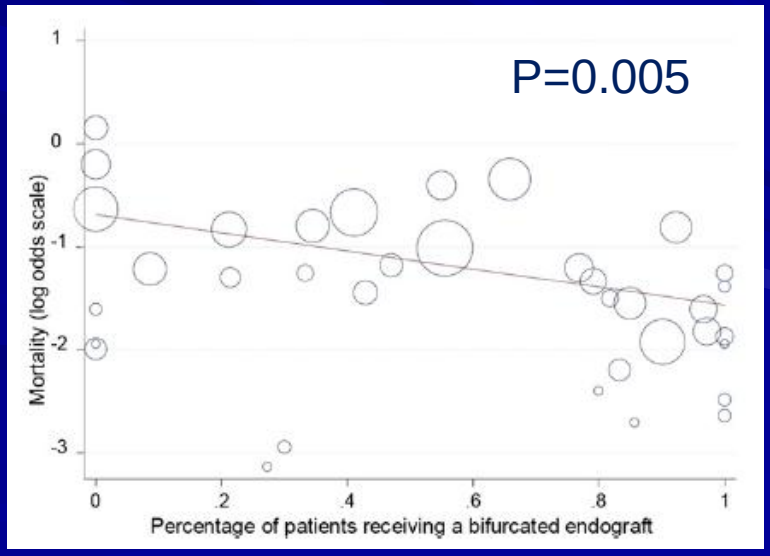
Use of aortic balloon



Abd compartment syndrome



Bifurcated graft



Endovascular suitability and outcome after open surgery for ruptured abdominal aortic aneurysm

F. Dick[1], N. Diehm[2], P. Opfermann[1], R. von Allmen[1,3], H. Tevaearai[1] and J. Schmidli[1]

BJS 2012

- 248 patients with RAAA treated with OAR
- Overall mortality: 15.3%
- Suitability for EVAR

	Number	Mortality	Odds-ratio
Suitable	70	4 %	1
Borderline	63	16%	6.8
Unsuitable	100	24%	9.2

Endovascular repair of ruptured abdominal aortic aneurysm does not confer survival benefits over open repair

Naveed Saqib, MD,[a] Sun Cheol Park, MD,[a] Taeyoung Park, PhD,[b] Robert Y. Rhee, MD,[a] Rabih A. Chaer, MD,[a] Michel S. Makaroun, MD,[a] and Jae-Sung Cho, MD,[a] *Pittsburgh, Pa; and Seoul, Korea*

- Single center experience (Pittsburgh)
- 148 matched patients (out of 312 RAAA)
- Mortality: 21.6% vs 31.5 % (NS)

Table III. Comparison of morbidity and mortality after REVAR and OSR

	REVAR	*OSR*	P *value*
Mortality	21.6 (8/37)	31.5 (35/111)	.35
Morbidity	54 (20/37)	66 (73/111)	.23
LOS (days)	7.4 ±	23.2 ±	.13
MI	17.6 (7/37)	37.7 (42/111)	.03
ARI	21 (8/37)	47 (52/111)	.008
Hemodialysis	5.9 (2/37)	24.5 (27/111)	.02
Pneumonia	8.8 (3/37)	24.5 (27/111)	.05
Tracheostomy	2.9 (1/37)	20.8 (23/111)	.015
ACS	11.4 (4/37)	11.3 (12/111)	1
Bowel resection	8.6 (3/37)	10.4 (11/111)	1
Postop hemorrhage	5.7 (2/37)	10.4 (11/111)	.51

Randomized trials

- AJAX
  - The Netherlands
  - Randomization after CT – 116 patients
- ECAR
  - France
  - Randomization after CT- 160 patients
- IMPROVE
  - UK
  - Randomization before CT – 600 patients

AJAX trial

- Amsterdam region
- All patients with RAAA in area
- Treatment centralized
- 520 patients identified
  - 395 had CTA
    - 240 unfavourable anatomy
    - 39 excluded for various reasons
  - 116 patients randomized
    - 57 EVAR, 59 OAR

AJAX trial

- Mortality
  - EVAR: 21% ~ OAR: 25%
- Mortality and severe complications
  - EVAR: 42% ~ OAR: 47%
- Morbidity
  - ICU stay: 28 hrs vs 48 hrs
  - LOS: 9 d vs 13 d
  - Blood loss: 500 ml vs 3500 ml ($p<0,001$)
  - Transfusion: 45/57 vs 56/59 ($p=0,01$)
  - Mechanical ventilation: 39/57 vs 52/59 ($p=0,002$)