

**AAA RUPTURE THE OLD ENEMY IS STILL THERE: IS
ENDO THE RIGHT CHOICE?**

**RESULTS WORSE THAN
EXPECTED: WHAT IS THE
PROBLEM**

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On behalf of the UHZ & OBUH vascular teams

Disclosures

- **NONE**

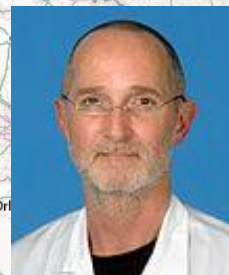
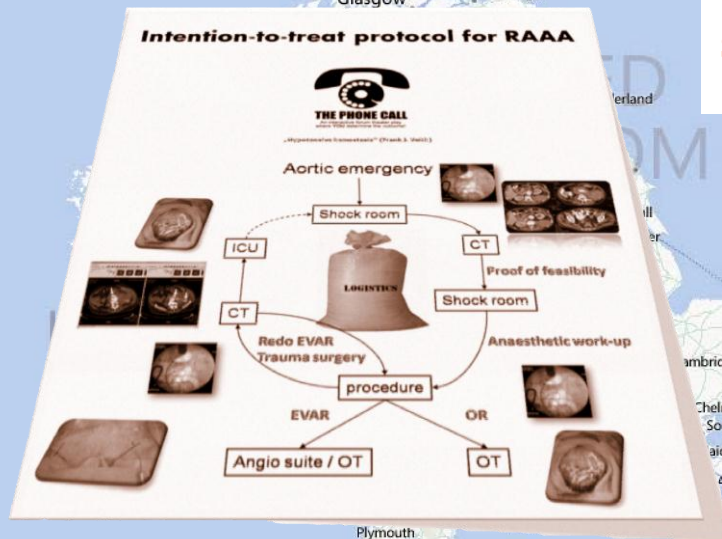


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Complete Replacement of Open Repair for Ruptured Abdominal Aortic Aneurysms by Endovascular Aneurysm Repair

A Two-Center 14-Year Experience

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Objective: To present the combined 14-year experience of 2 university centers performing endovascular aneurysm repair (EVAR) on 100% of 32 months.

Background: Endovascular aneurysm repair for RAAA feasibility is reported to be 20% to 50%, and EVAR for RAAA has been reported to have better outcomes than open repair.

Methods: We retrospectively analyzed prospectively gathered data on 473 consecutive RAAA patients (Zurich, 295; Örebro, 178) from January 1, 1998, to December 31, 2011, treated by an "EVAR-when-ever-possible" approach until April 2009 (EVAR/OPEN period) and thereafter according to a "100% EVAR" approach (EVAR-ONLY period).

Straightforward cases were treated by standard EVAR. More complex RAAA were managed during EVAR-ONLY with adjunctive procedures in 17 of 70 patients (24%): chimney, 3; open iliac debranching, 1; coiling, 8; onyx, 3; and chimney plus onyx, 2.

Results: Since May 2009, all RAAA but one have been treated by EVAR (Zurich, 31; Örebro, 39); 30-day mortality for EVAR-ONLY was 24% (17 of 70). Total cohort mortality (including medically treated patients) for EVAR/OPEN was 32.8% (131 of 400) compared with 27.4% (20 of 73) for EVAR-ONLY ($P = 0.376$). During EVAR/OPEN, 10% (39 of 400) of patients were treated medically compared with 4% (3 of 73) of patients during EVAR-ONLY. In EVAR/OPEN, open repair showed a statistically significant association with 30-day mortality (adjusted odds ratio [OR] = 3.3; 95% confidence interval [CI], 1.4–7.5; $P = 0.004$). For patients with no abdominal decompression, there was a higher mortality with open repair than EVAR (adjusted OR = 5.6; 95% CI, 1.9–16.7). In patients with abdominal decompression by laparotomy, there was no difference in mortality (adjusted OR = 1.1; 95% CI, 0.3–3.7).

Conclusions: The "EVAR-ONLY" approach has allowed EVAR treatment of nearly all incoming RAAA with low mortality and turnaround rates. Although the observed association of a higher EVAR mortality with abdominal decompression needs further study, our results support superiority and more widespread adoption of EVAR for the treatment of RAAA.

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Keywords: abdominal compartment syndrome, abdominal decompression, chimney graft, debranching, endovascular repair, open abdomen treatment, open repair, ruptured abdominal aortic aneurysm
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The collected world experience¹ and single-center reports of good results with endovascular aneurysm repair (EVAR) of ruptured abdominal aortic aneurysms (RAAA) have been challenged as being the result of selection or publication bias by various authors.^{2–4} Anatomical suitability for EVAR of RAAA has been claimed to range from 20% to 50%,^{5–7} and the better results that some have obtained with EVAR have been deemed a consequence of treating more stable, better-risk patients by EVAR.^{2,3,8} In this article, we present the combined 14-year experience of 2 university centers that have in the last 32 months been able to perform EVAR on 100% of consecutive noninfected RAAA.

METHODS

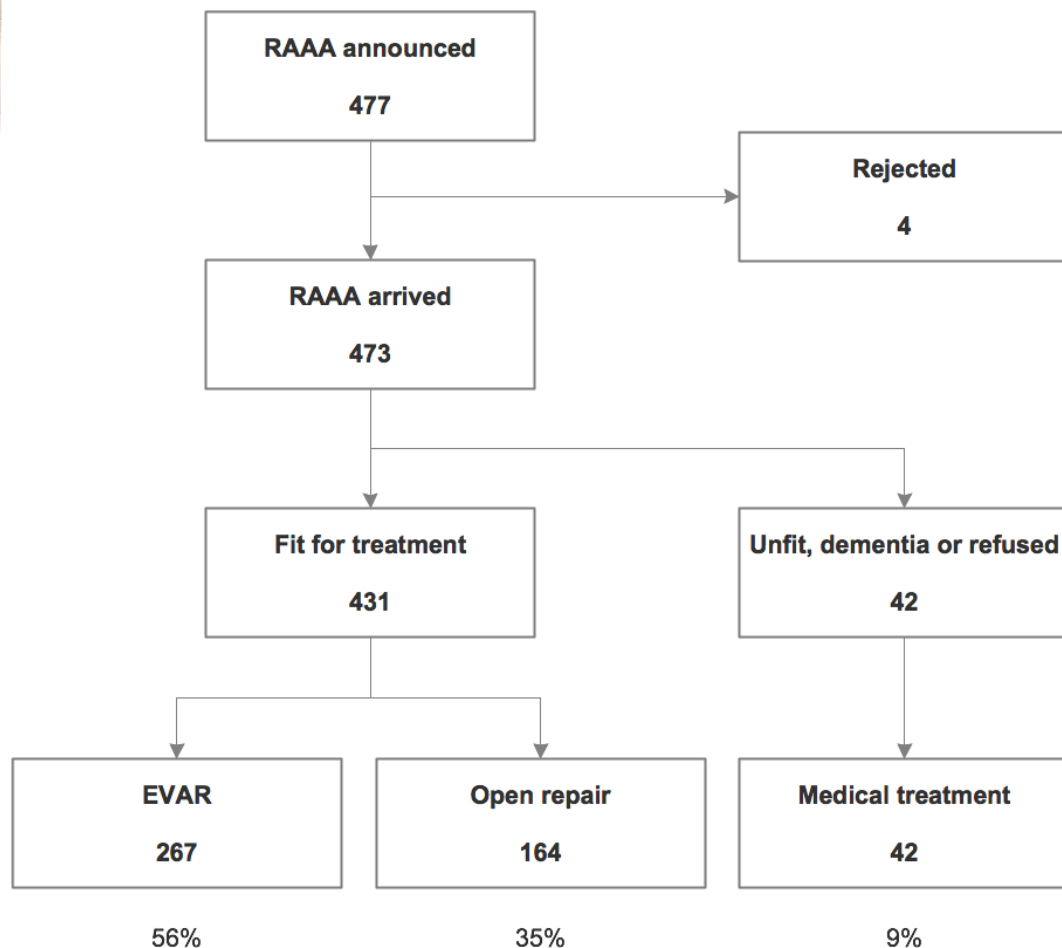
Study Design

We retrospectively analyzed combined, prospectively gathered data on 473 consecutive RAAA patients (Zurich, 295; Örebro, 178; Fig. 1) from January 1, 1998, to December 31, 2011. These patients were treated by an intention-to-treat "EVAR-when-ever-possible" approach^{2,3} until April 2009, and after that by an intention-to-treat, "100% EVAR" approach. Exclusion criteria were ruptured thoracoabdominal aortic aneurysms, Crawford type I–IV, and suprarenal RAAA. Hemodynamic instability was not considered to be a selection criterion for preferential open surgery. No patients were excluded from this analysis because of hypotension, circulatory collapse, or cardiac arrest after presentation to the hospitals. The retrospective analysis was approved by the regional ethical review board, and patients gave informed consent whenever possible. Data from both centers were merged into one single database (see the "Definitions" section).

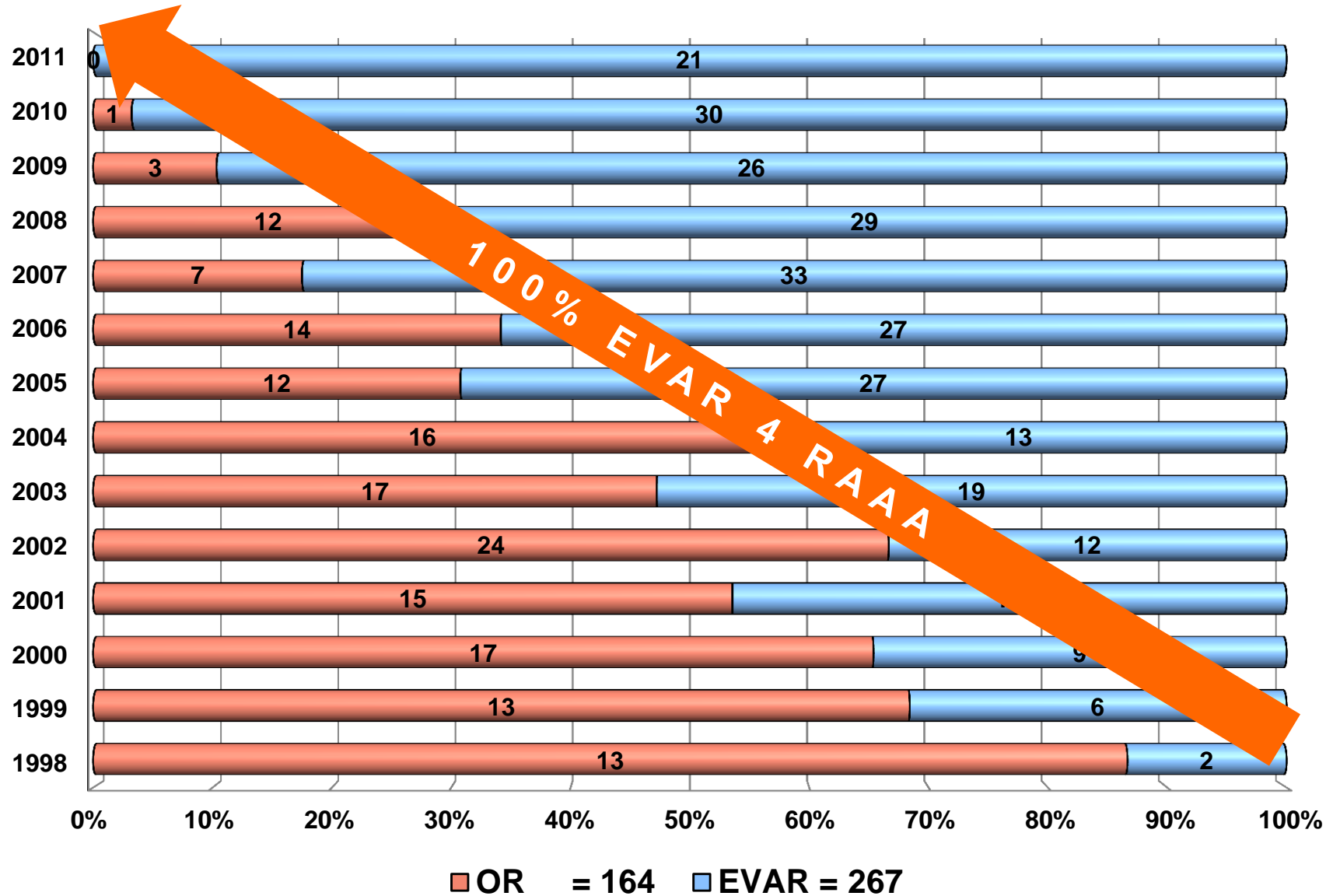
Institutional Settings

The University Hospital of Zurich is a tertiary referral center with a catchment area of 1 million inhabitants. A round-the-clock service is provided for vascular emergency procedures including EVAR for RAAA. At all times, a senior interventional radiologist, a cardiovascular anesthesiologist, and a vascular surgeon are available. As an institution with vast activity in elective EVAR procedures (approximately 1300 abdominal EVAR and 400 thoracic EVAR procedures to date), a broad stock of bifurcated and aorto-uni-iliac endografts is available. Beginning in April 2011, EVAR procedures were carried out in a fully equipped hybrid emergency operating room. Before that, they were performed in a fully equipped emergency operating theater or in an angiography suite. Computed tomographic scans are available within 5 to 15 minutes as the scanner is part of the shock

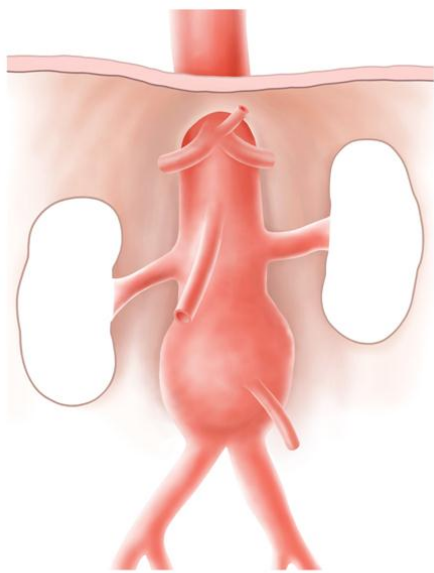
Overall 2C cohort 1998-2011



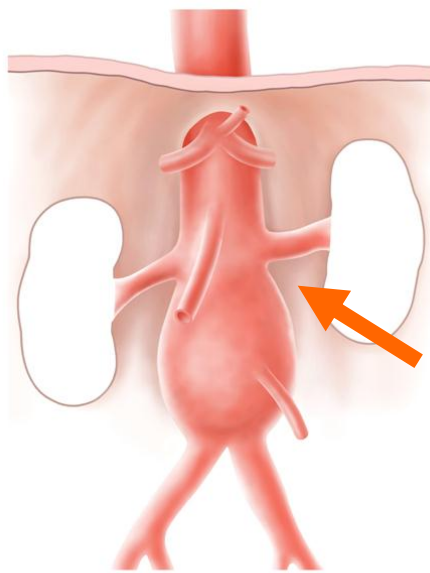
2C RAAA experience 1998-2011



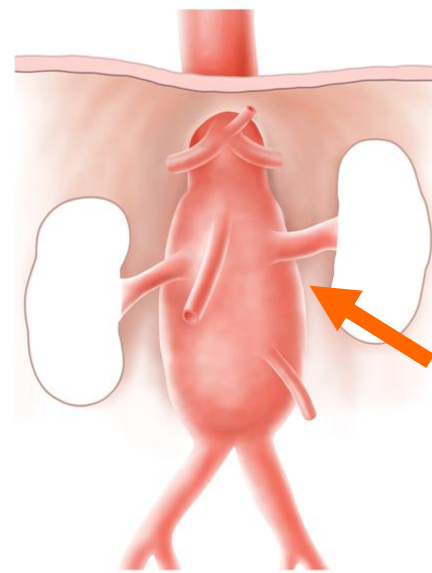
How to address short/missing necks?



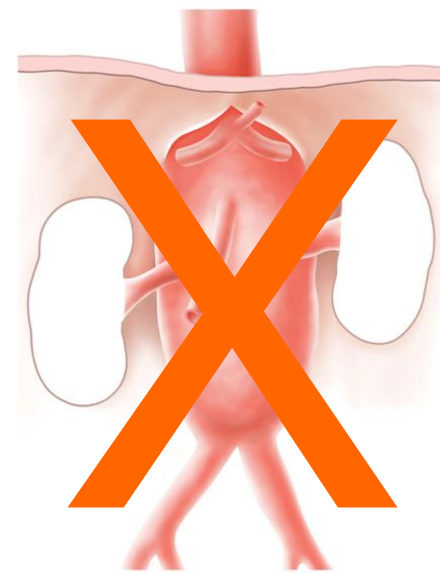
Infrarenal



Juxtarenal



Suprarenal



Crawford IV

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Pararenal

Ruptured juxtarenal AAA



No contrast in left RA
(preop CTA)

Ruptured juxtarenal AAA

Treatment

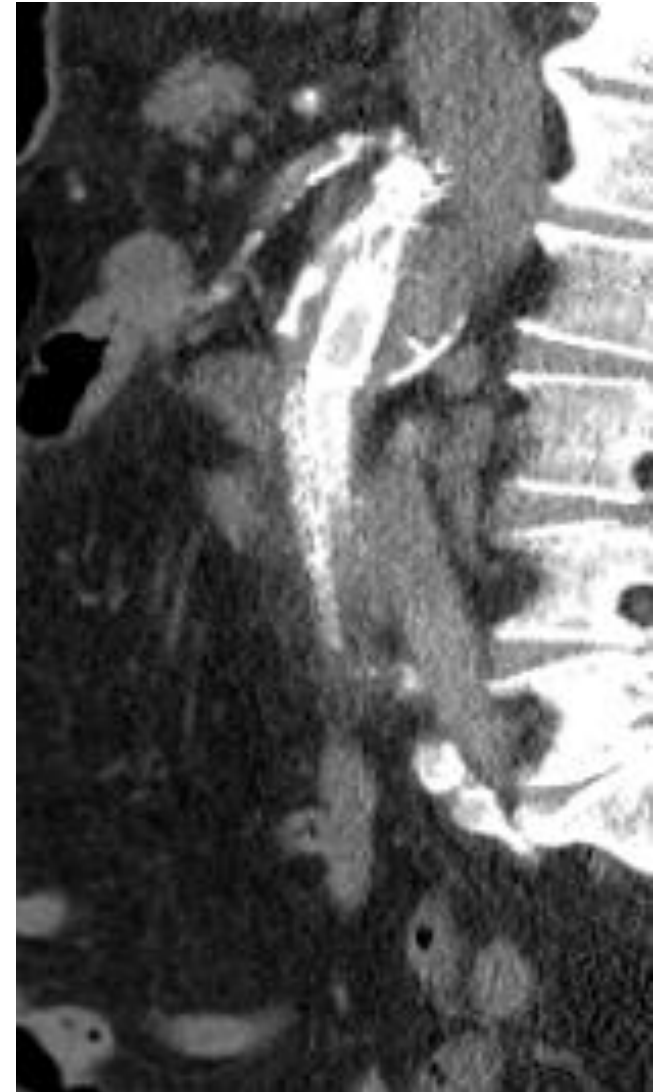
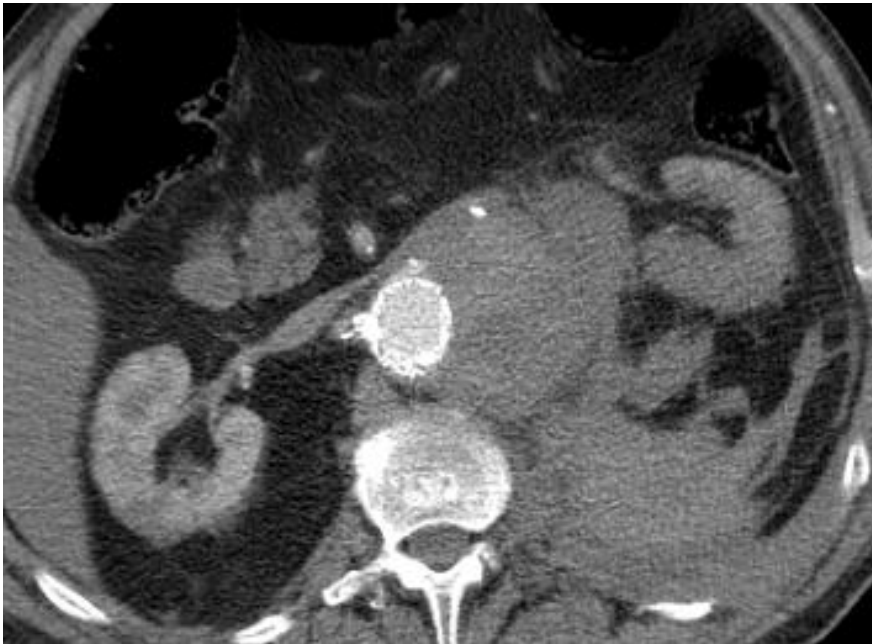
- Excluder
- SMA chimney
- Right RA chimney
- Left RA covered with intention



Ruptured juxtarenal AAA

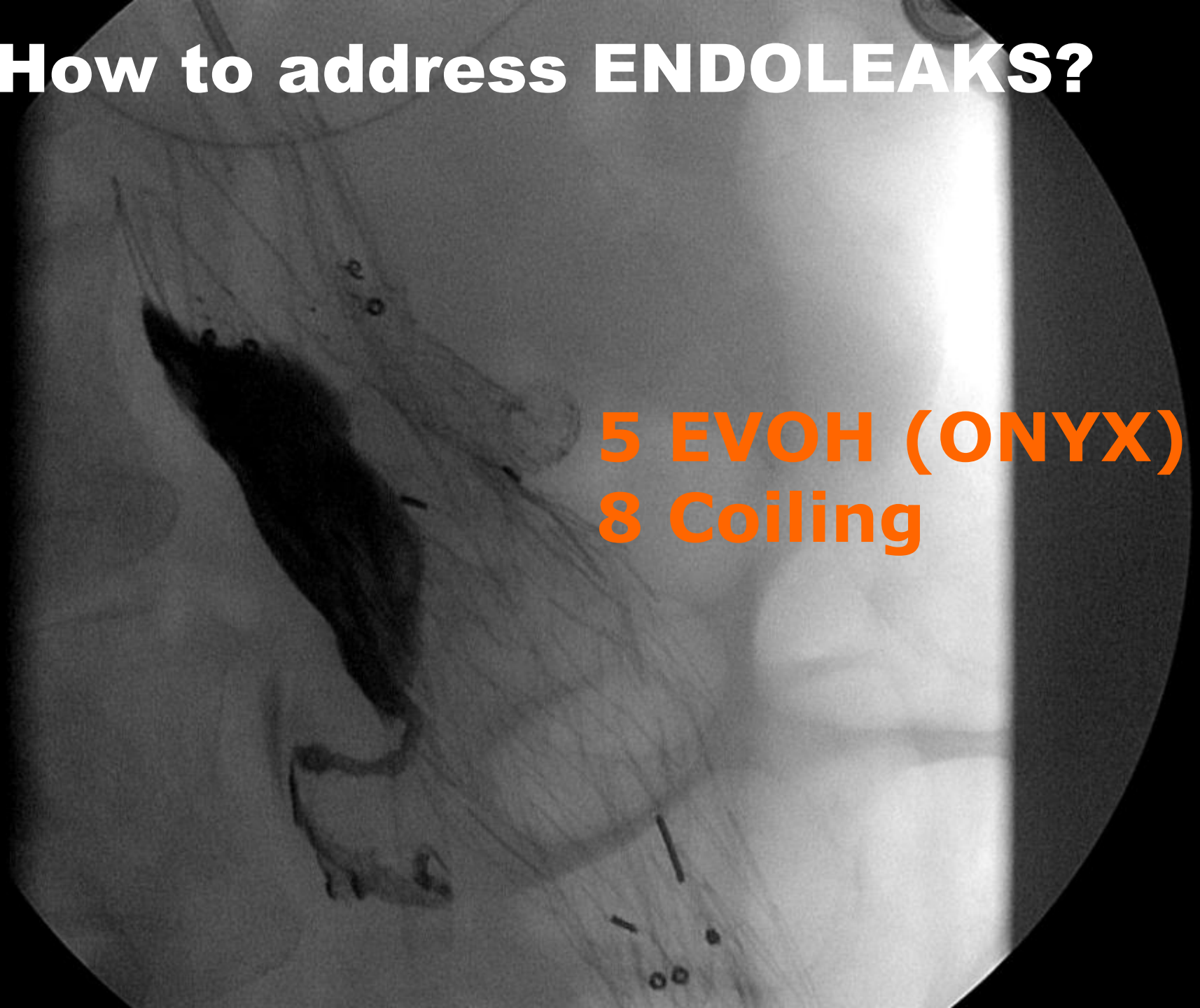
Postop CTA

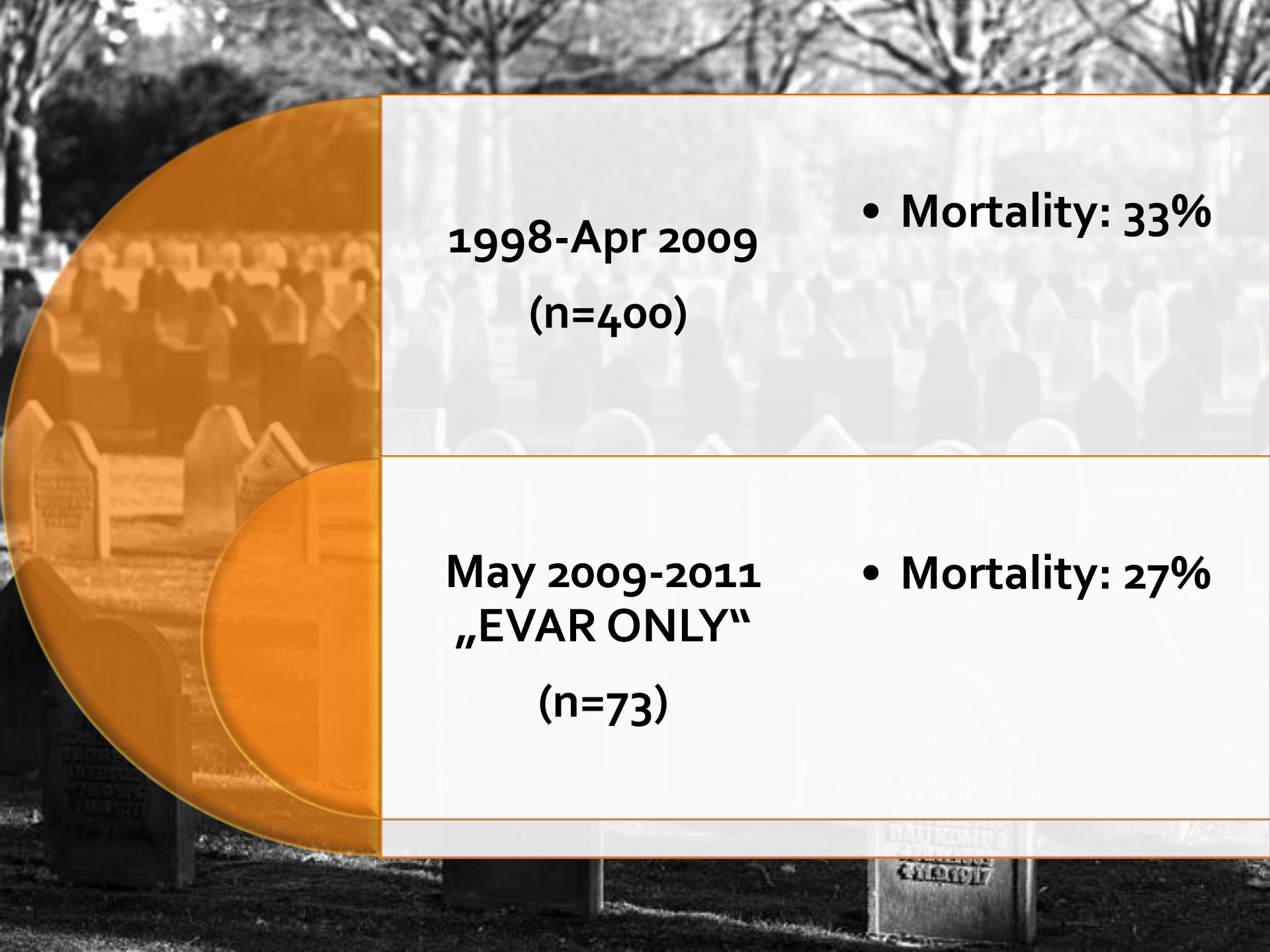
- No endoleak
- Patent SMA & right RA



How to address ENDOLEAKS?

**5 EVOH (ONYX)
8 Coiling**





1998-Apr 2009
(n=400)

- **Mortality: 33%**

May 2009-2011
„EVAR ONLY“
(n=73)

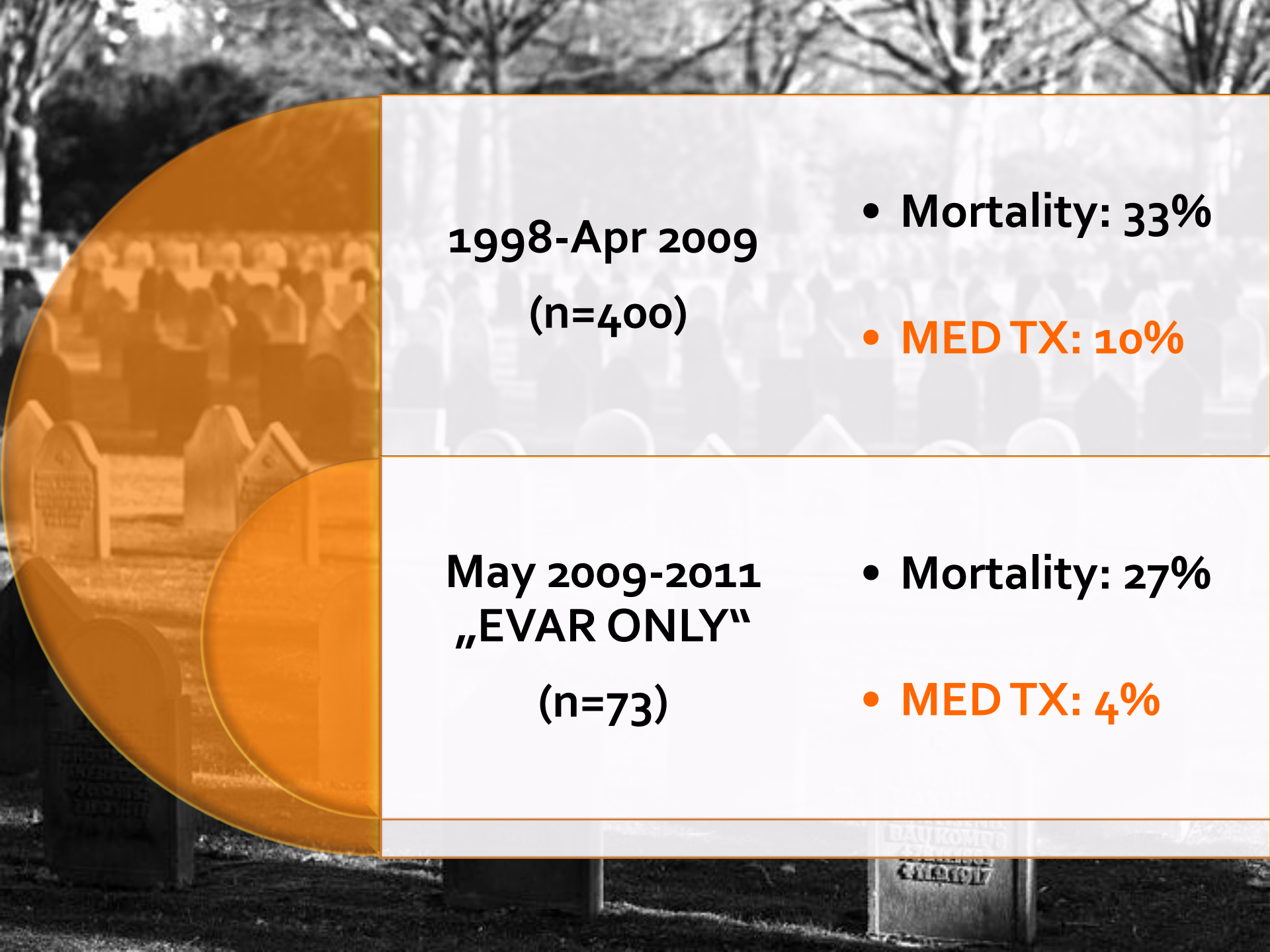
- **Mortality: 27%**

**RESULTS WORSE
THAN
EXPECTED?**

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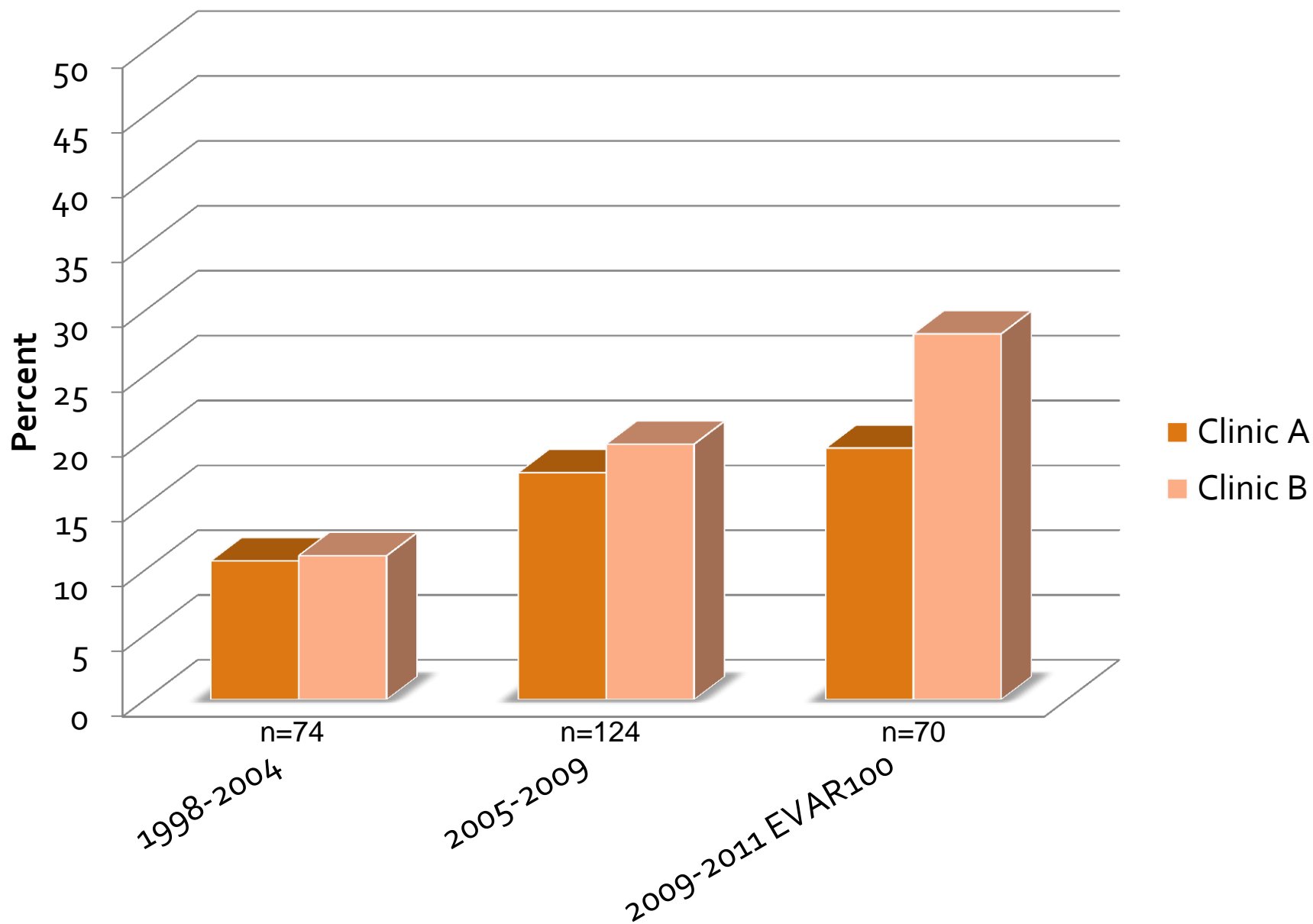
1998-Apr 2009
(n=400)

- **Mortality: 33%**
- **MED TX: 10%**

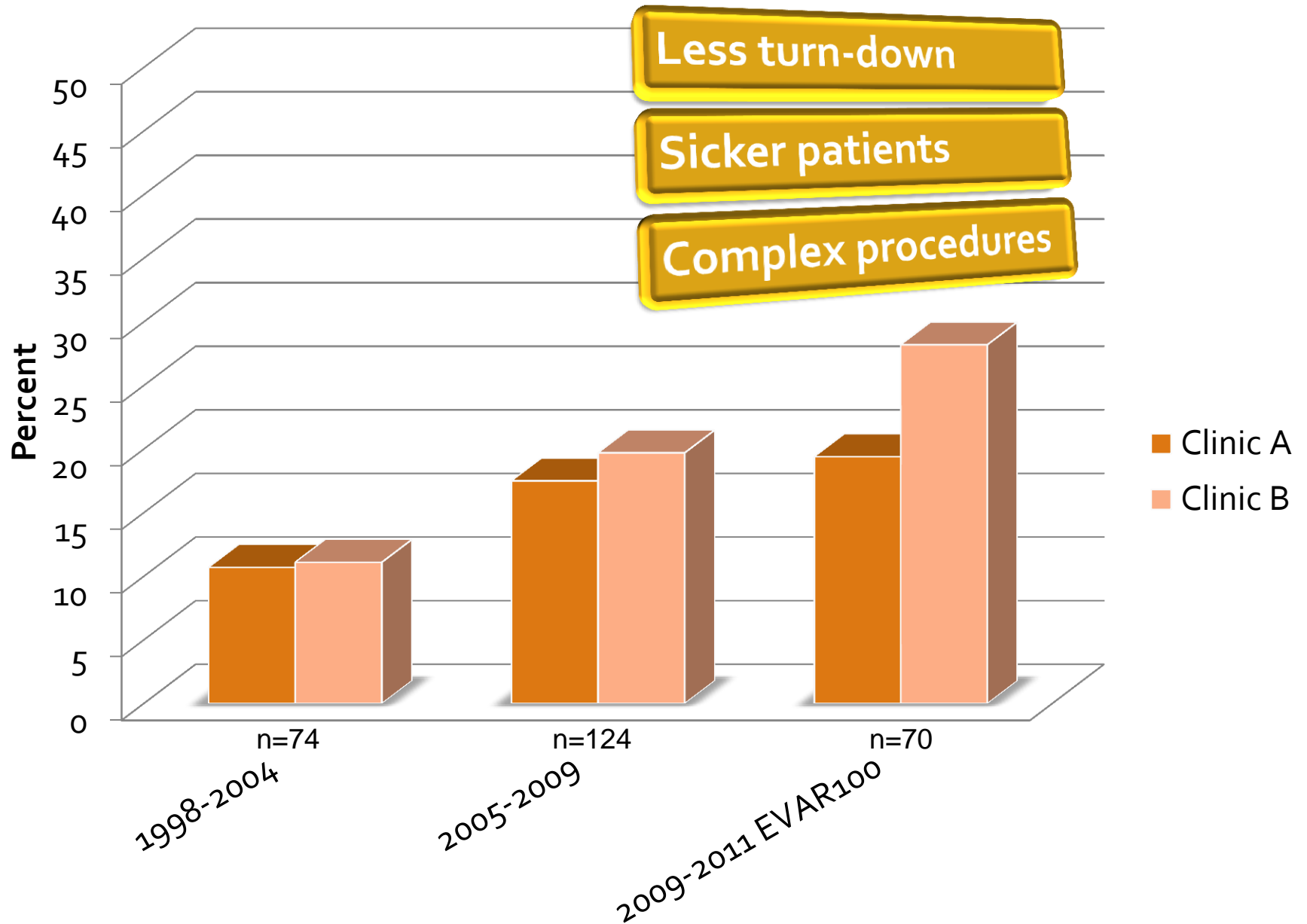
May 2009-2011
„EVAR ONLY“
(n=73)

- **Mortality: 27%**
- **MED TX: 4%**

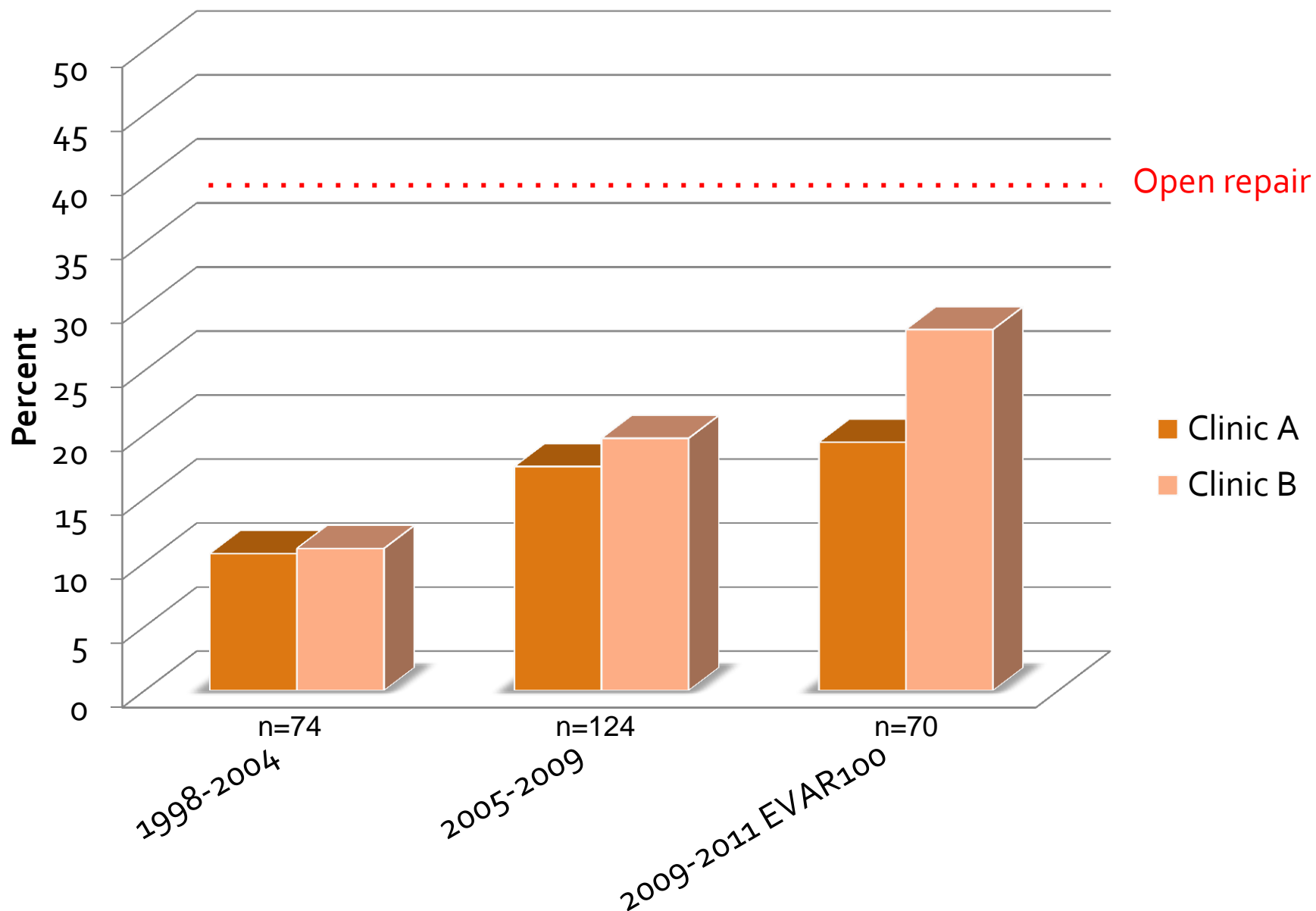
EVAR 30-day mortality over time periods



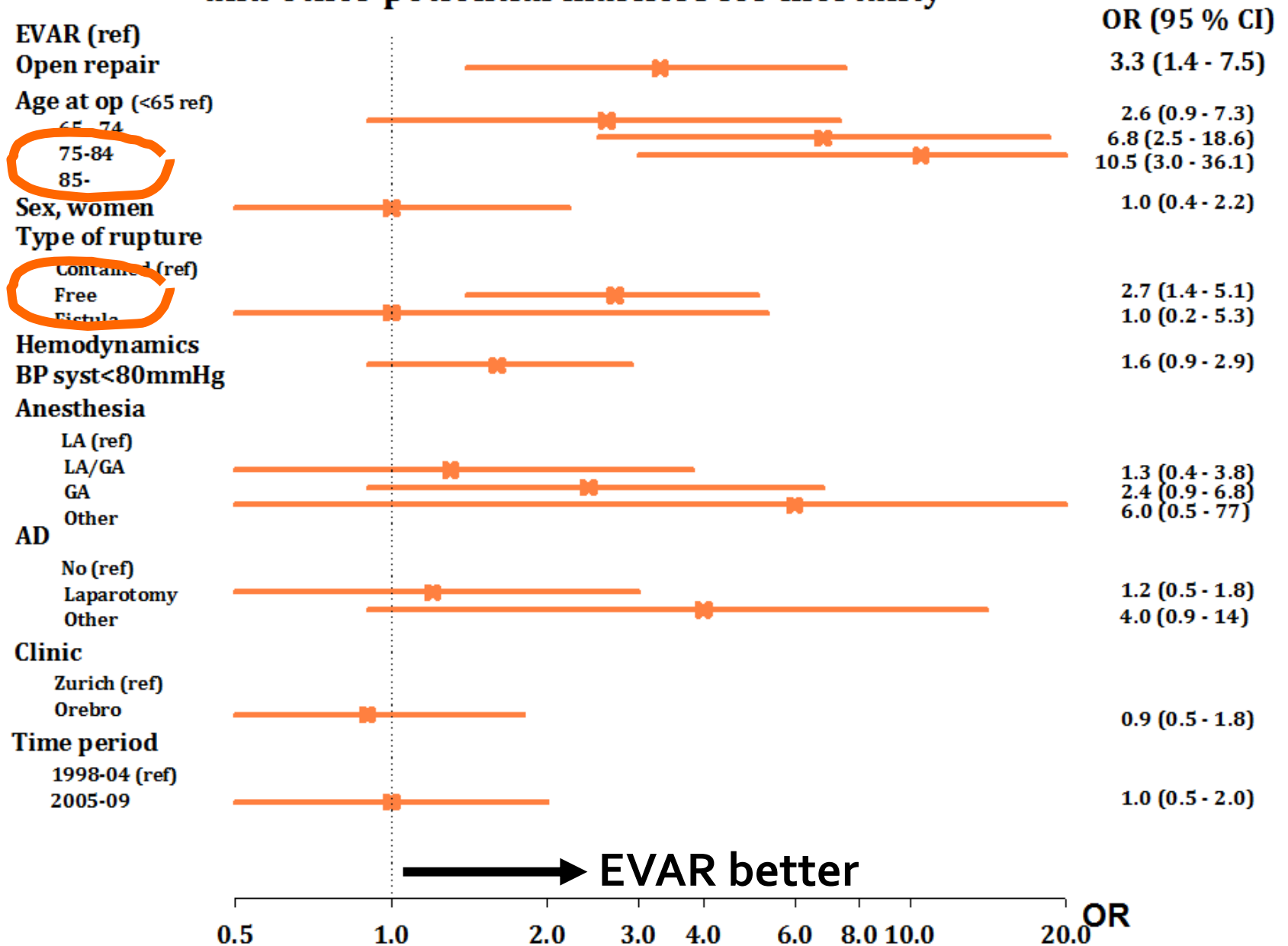
EVAR 30-day mortality over time periods



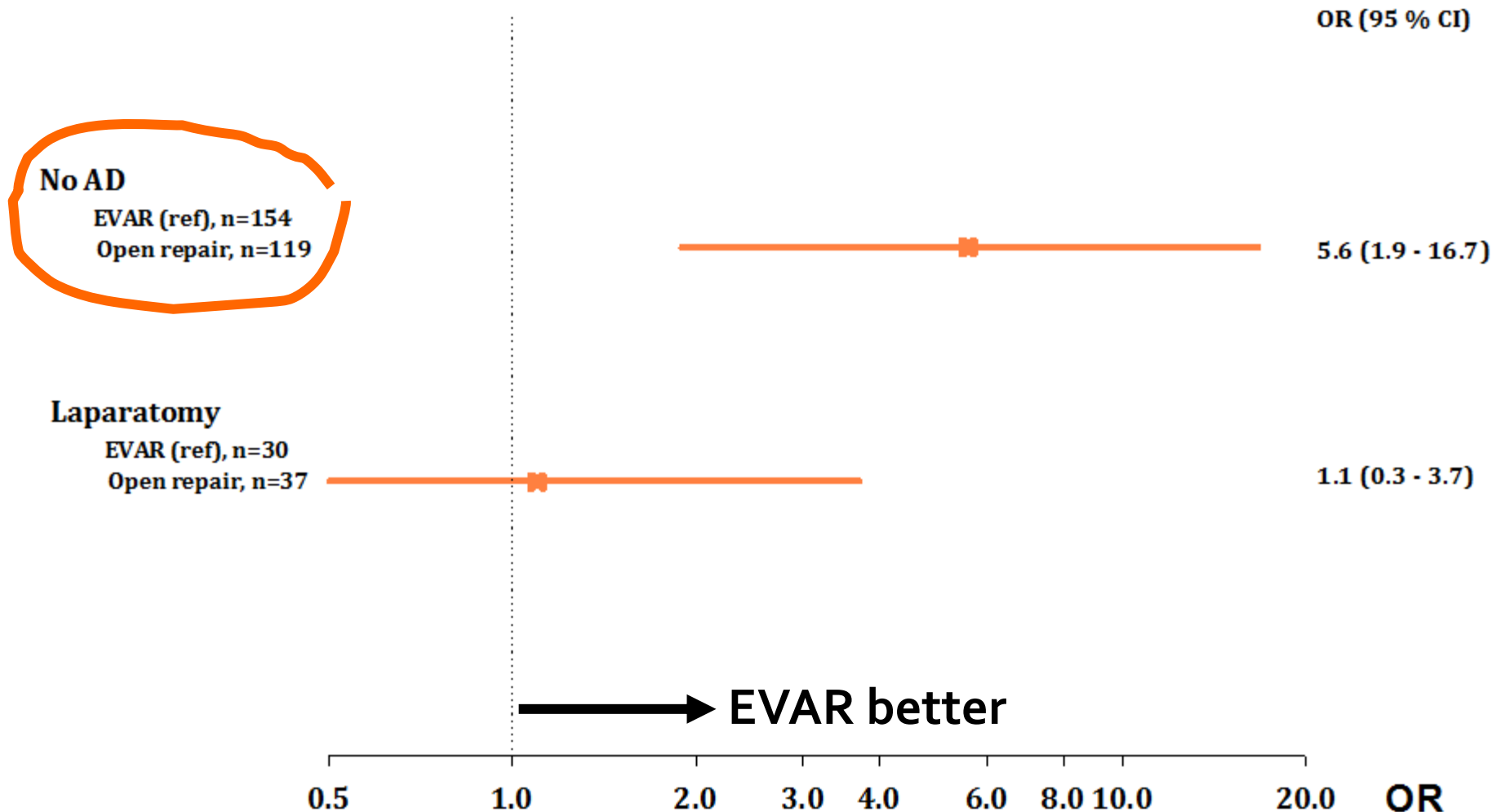
EVAR 30-day mortality over time periods



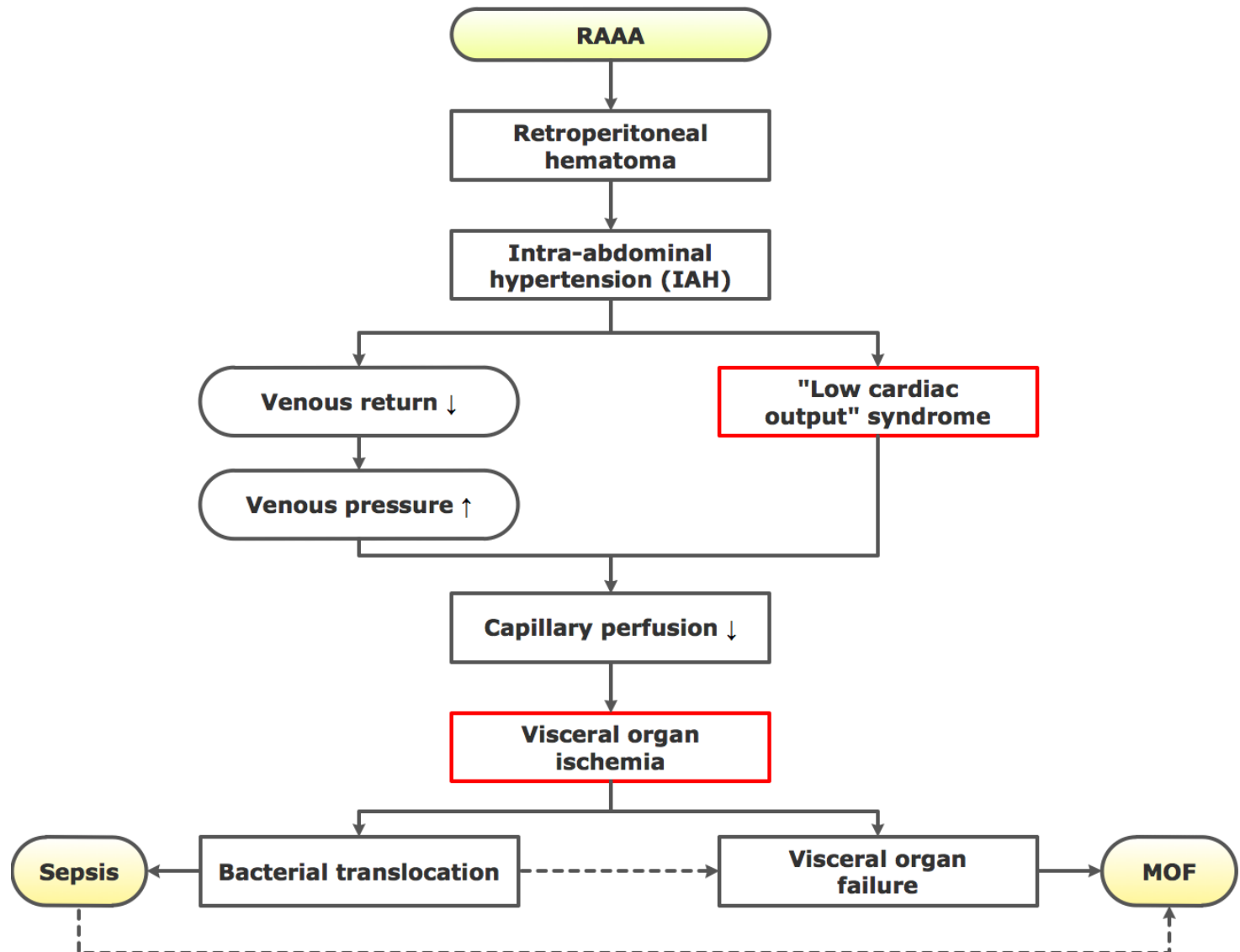
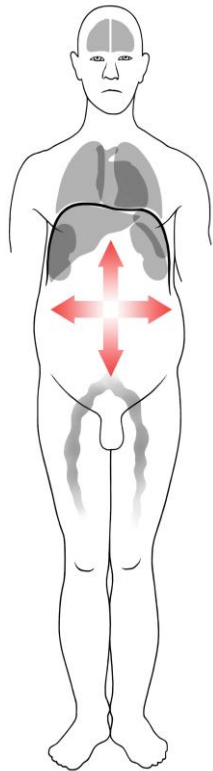
Adjusted odds ratios (OR) with 95 % confidence intervals for 30 days mortality between Open repair and EVAR and other potential markers for mortality



Adjusted odds ratios (OR) with 95 % confidence intervals for 30 days mortality between Open repair and EVAR



Abdominal Compartment Syndrome (ACS)



ACS is frequent & a serial killer!

| Author | Year | Treatment | n= | ACS (%) | 30-day mortality | |
|---------------|------|------------|----------|---------|-------------------|------------|
| | | | | | ACS - | ACS + |
| Starnes | 2009 | OR EVAR | 24 27 | 25 7 | 44% 16% | 83% 50% |
| Mayer | 2009 | EVAR | 102 | 22 | 9% | 26% |
| Mehta | 2005 | EVAR | 30 | 20 | 13% | 57% |
| Papavassiliou | 2003 | OR | 22 | 27 | 25% | 100% |
| Foy | 2003 | OR | 21 | 20 | | 5x |
| Rasmussen | 2002 | OR | 135 | 33 | 9% | 56% |
| Oehlschlager | 1997 | OR | 38 | 21 | 50% | 73% |
| Fietsam | 1989 | OR | 100 | 4 | First description | |

Aortic emergency

Shock room

ICU

CT

25%

Proof of feasibility

Anaesthetic workup

Shock room

Redo EVAR

Trauma surgery

Procedure

EVAR

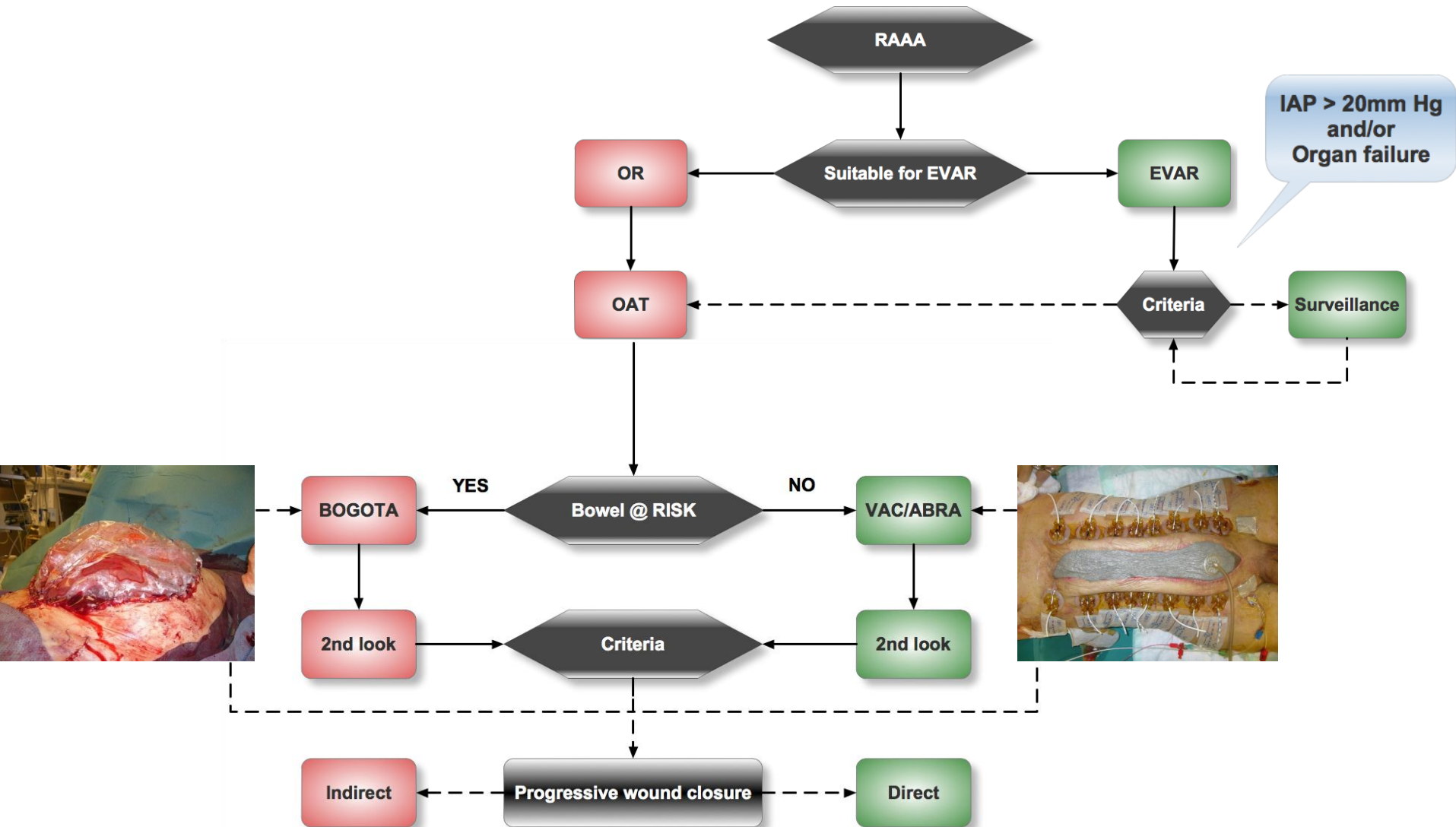
OR

Angio Suite/OT

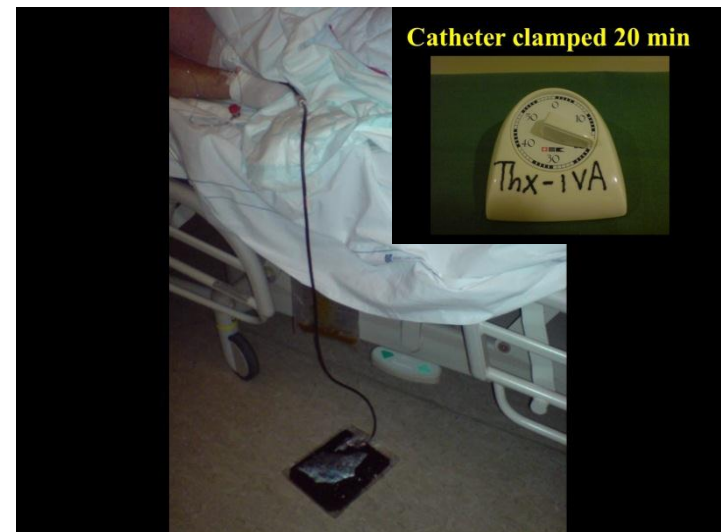
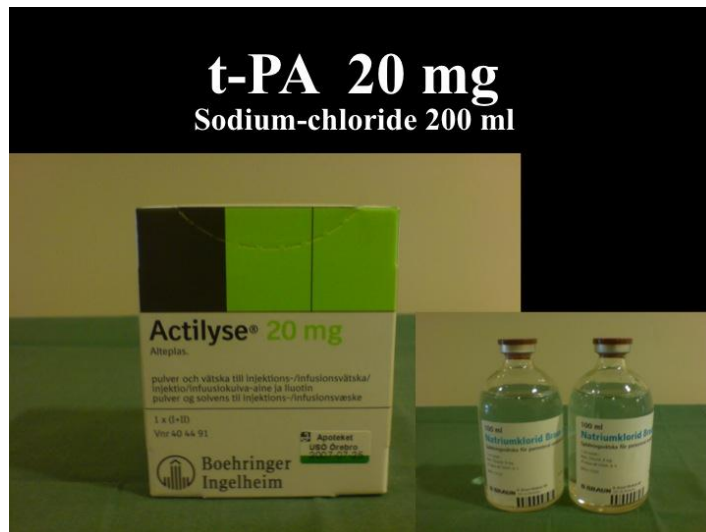
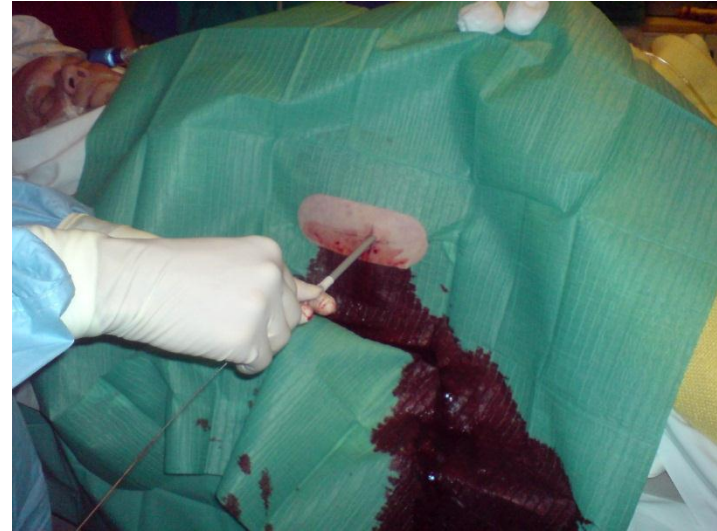
OT



UHZ algorithm for ACS



OB sub-algorithm for ACS



CONCLUSION

REVAR

allows Tx of „all“ pats

- „Unfit for surgery“? NO!
- Results at least equal
- Exceptions: refusal, severe dementia, „dead“

significantly better in

- Aged patients
- Free ruptures
- Patients w/o abdominal decompression

ENDO



Thank you for your attention!



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