

Endovascular repair of AAA(EVAR): counterbalancing the benefits with the costs

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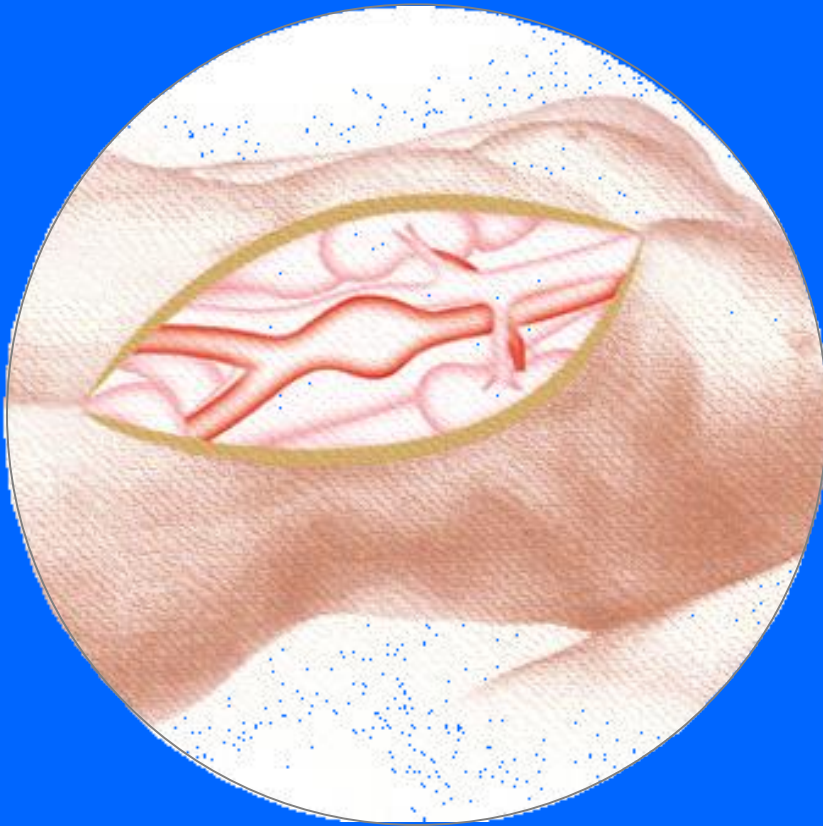
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2 Treatment options

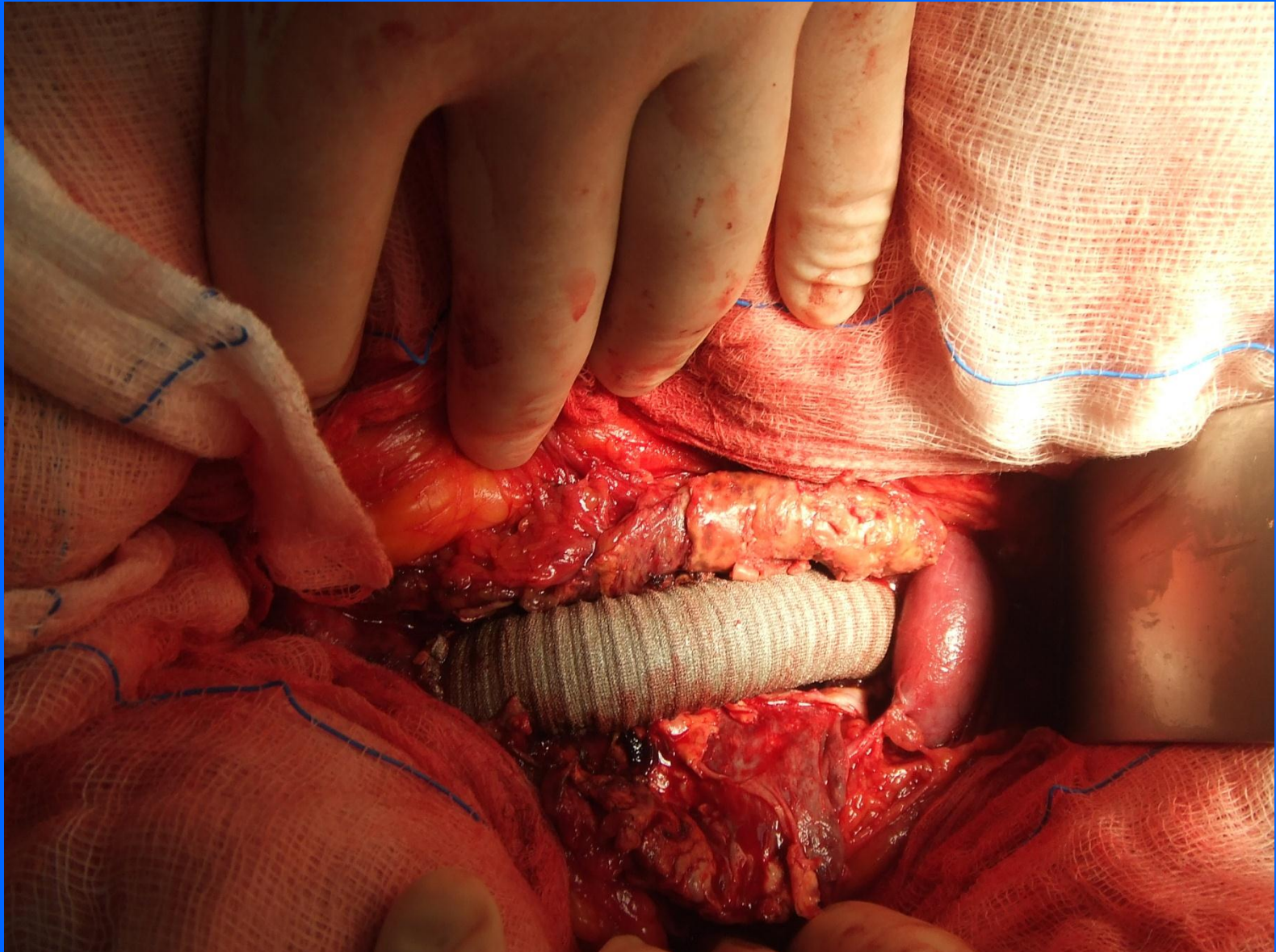


Open Surgery



Endovascular Stent Grafting

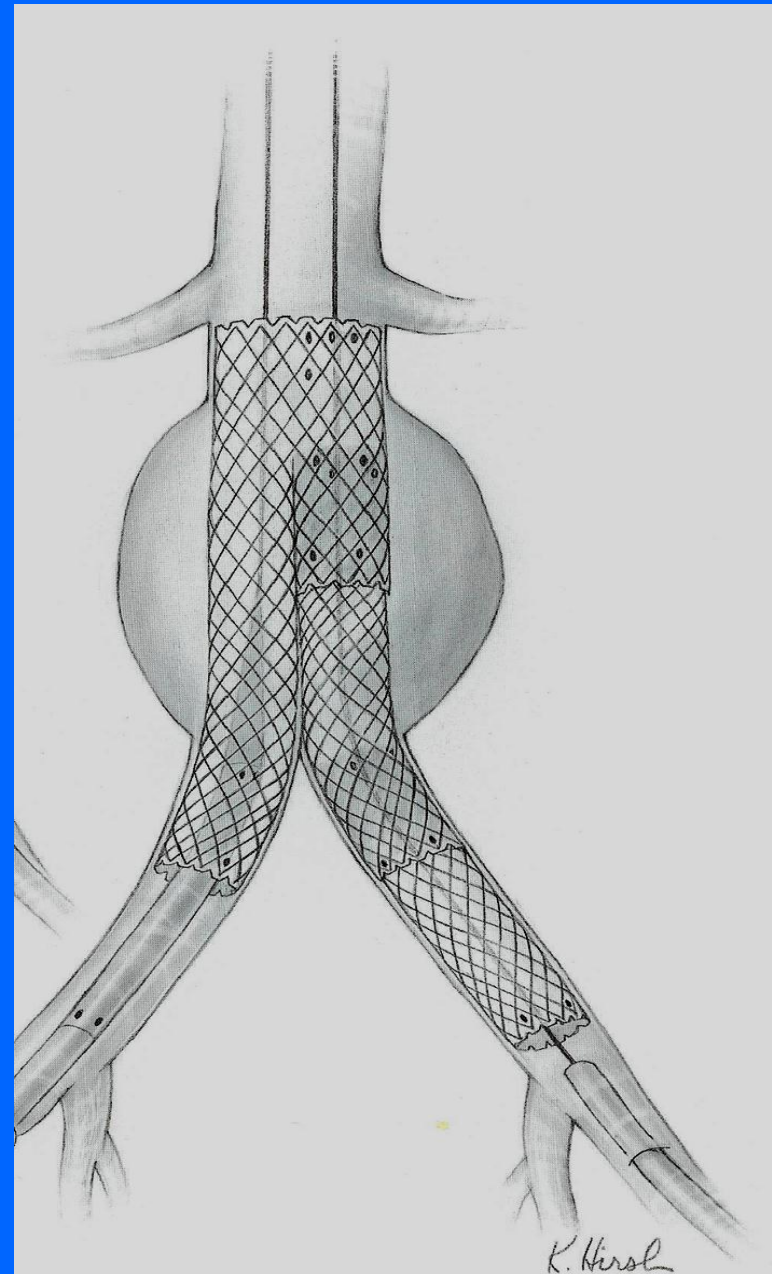
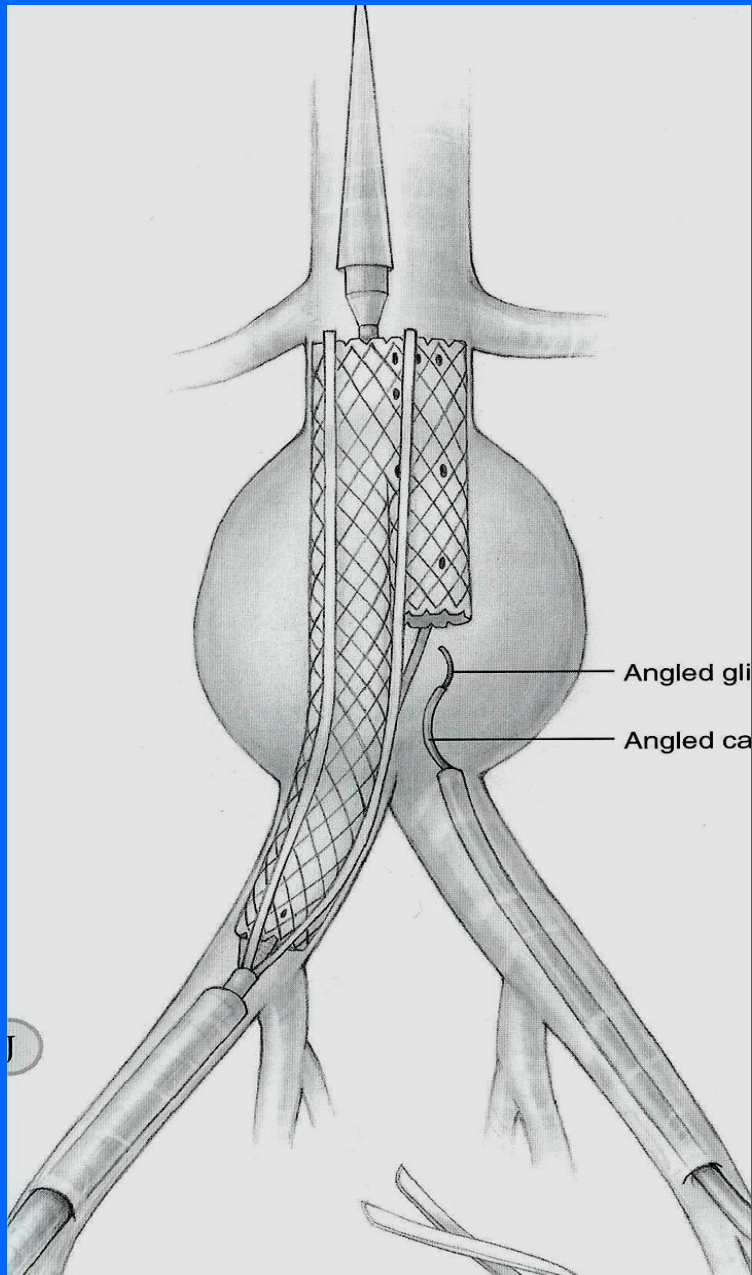
Open repair



EVAR



EVAR

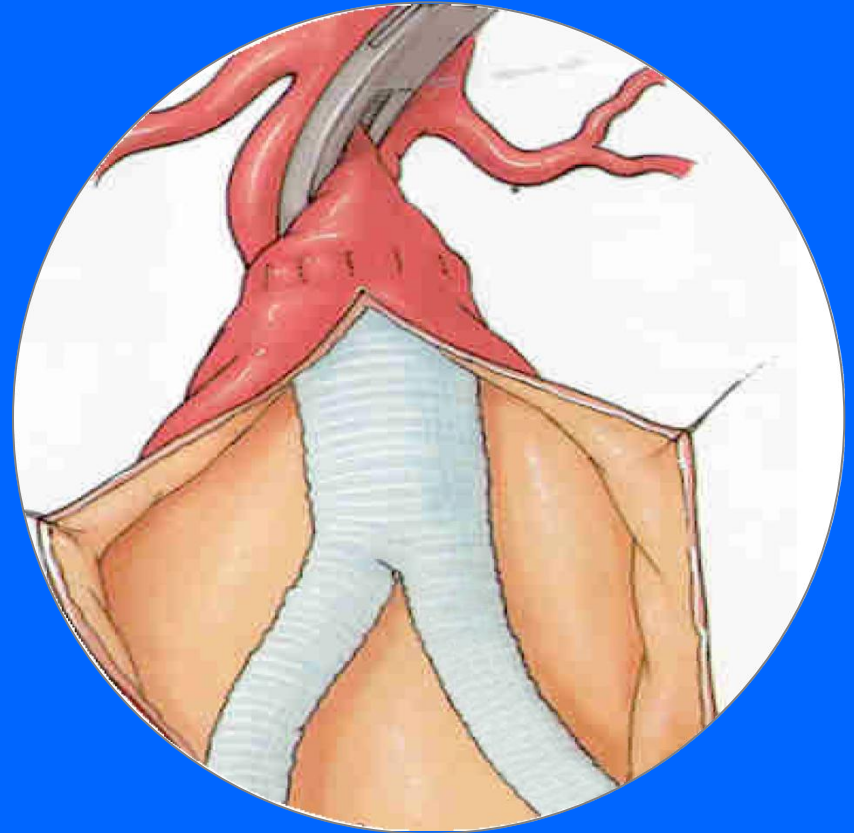


EVAR



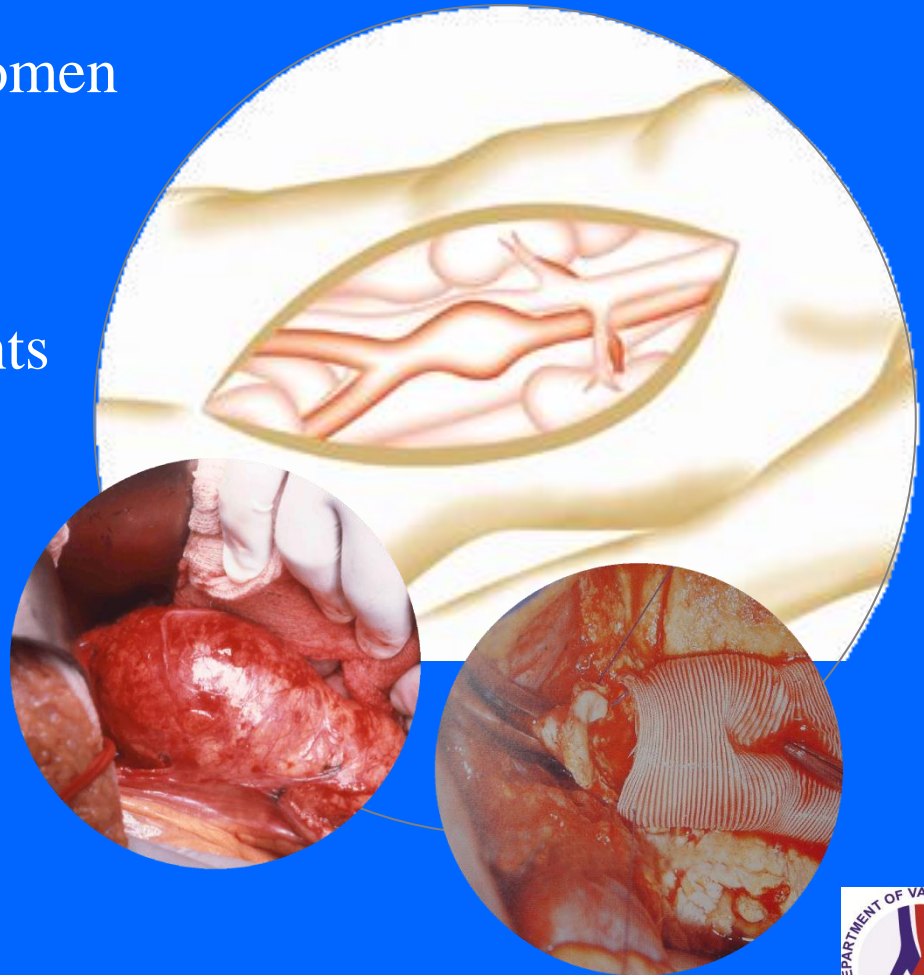
Open surgical repair: advantages

- Aneurysm opened, graft sewn in, aorta wrapped and closed around graft
- Established procedure (with more than 40 years of clinical experience)
- Excludes aneurysm and prevents sac growth
- Proven, long-term results



Open surgical repair: drawbacks

- Significant incision in the abdomen
- 30–90 minute cross-clamp
- Up to 4-hour procedure
- Contraindicated in some patients
- 1–2 days intensive care
7–14 days hospitalization
4–6 weeks recovery time



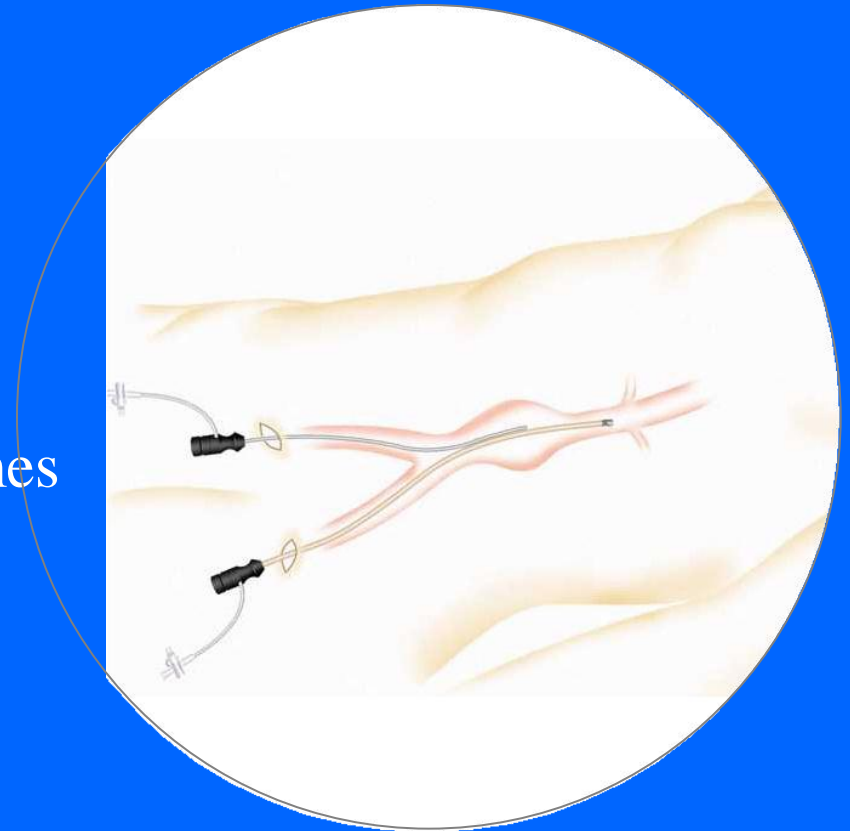
Open surgical repair: drawbacks

- Many patients considered “unfit” :
 - High anesthesia risk
 - Significant cardiac co-morbidities
 - Previous abdominal surgery/hostile abdomen
- Difficult recovery for patient:
 - Risks losing independence
 - Risk of impotence



Endovascular stent grafting: advantages

- **Benefits**
 - Minimally invasive
 - Reduced risk of death
 - Faster recovery
 - Improved functional outcomes



Endovascular stent grafting: drawbacks

- **Drawbacks**

- Complications and re-interventions:
 - Endoleaks
 - Stent graft migration
 - Modular dislocation
- Most complications are benign and treatable by endovascular techniques.
- New stent graft generations are associated with fewer complications.

EVAR is gradually replacing OR as the method of choice

2001-2006 covering >37 million beneficiaries in the Medicare

- ✓ OR procedures from 31,965 went to 15,665 (-51%)
- ✓ EVAR from 11,028 went to 28,937 (+162%)

Levin et al. J Am Coll Radiol 2009;6:506-509

Peri-operative mortality

EVAR 0.5% - OR 3.0% p=.004

Mortality at 2 years

EVAR 7.0% - OR 9.8% p=.13

Lederle et al. JAMA 2009;302:1535-42

Cost-effectiveness of EVAR as compared to OR

EVAR is associated with considerably higher costs compared to OR.

Jonk et al. Int J Technol Assess Health Care 2007;23:205

Prinssen et al. J Vasc Surg 2007;46:883-890

“for patients medically fit for OR, mid-term costs are greater for EVAR, with no difference in overall survival or quality of life”

“for patients medically unfit for OR, EVAR costs more than no intervention with no difference in survival”

Jonk et al. Int J Technol Assess Health Care 2007;23:205

“routine use of EVAR in patients also eligible for OR..... provides only a marginal overall survival benefit, and is associated with a substantial, if not prohibitive, increase in costs”

Prinssen et al. J Vasc Surg 2007;46:883-890



What are the reasons that result in increased cost of EVAR?

Noll RE Jr et al. J Vasc Surg 2007 Jul;46(1):9-15

Long-term postplacement cost after endovascular aneurysm repair.

- ✓ During a 5-year period, the postplacement cost of EVAR increases the global cost by 44%.
- ✓ The subgroups of patients with endoleaks and those requiring secondary procedures generate a disproportionate share of postplacement costs.

Hayter CL et al. J Vasc Surg 2005;42:912-8.

Follow-up costs increase the cost disparity between endovascular and open abdominal aortic aneurysm repair.

- ✓ EVAR results in significantly greater hospital costs compared with OR, despite reduced hospital and intensive care unit stays.
- ✓ The inclusion of follow-up costs further increases the cost disparity between EVAR and OR. Because EVAR requires lifelong surveillance and has a high rate of reintervention, follow-up costs must be included in any cost comparison of EVAR and OR.
- ✓ The economic cost, as well as the efficacy, of new technologies such as EVAR must be addressed before their widespread use is advocated.

Do we have predictors of poorer outcome that certainly increase the cost of EVAR?

Br J Surg. 2010 Aug;97(8):1207-17.

Use of baseline factors to predict complications and reinterventions after endovascular repair of abdominal aortic aneurysm.

Brown LC, Greenhalgh RM, Powell JT, Thompson SG; EVAR Trial Participants.

Graft-related complication and reintervention rates were common after EVAR in patients with **a large aneurysm**.

Younger patients and those with **aneurysms closer to the 5.5-cm threshold for intervention** experienced lower rates.

Br J Surg. 2010 May;97(5):657-63.

Risk of reintervention after endovascular aortic aneurysm repair.

Karthikesalingam A, Holt PJ, Hinchliffe RJ, Nordon IM, Loftus IM, Thompson MM.

Among 553 patients undergoing infrarenal EVAR between 2001 and 2009

✓ Reintervention-free survival rates at 1, 3 and 5 years were 90.1, 85.3 and 81.2 per cent.

The reintervention rate was higher in:

✓ patients who needed an intraoperative adjunct during the index procedure ($P = 0.014$) and

✓ in those who did not have intraoperative computed tomography angiography ($P = 0.024$).

❖ Intraoperative adjuncts were an independent risk factor for future reintervention (hazard ratio 2.62, 95 per cent confidence interval 1.18 to 3.76; $P = 0.012$).

Typical patient follow-up

- Following open surgery:
 - Ultrasound every year for patients treated via open surgery
- Following endovascular stent grafting:
 - Plain X-ray and CT scan at 6 months and then annually for patients treated with an endovascular stent graft

*This is only indicative information.
Follow up protocols and procedures may differ
according to physician's practice.*

Beeman et al. J Vasc Surg 2009;50:1019-24.

Duplex ultrasound imaging alone is sufficient for midterm endovascular aneurysm repair surveillance: a cost analysis study and prospective comparison with computed tomography scan.

- ✓ DU and CT scans were equivalent in determining aneurysm sac diameter after EVAR ($P < .001$).
- ✓ DU and CT were each as likely to falsely suggest an endoleak when none existed and were as likely to miss an endoleak.
- ✓ Cost savings of \$1595 per patient per year were realized by eliminating CT scan surveillance. None of the patients sustained an adverse event such as rupture, graft migration, or limb occlusion as a result of having DU imaging performed as the sole follow-up modality.

CONCLUSION:

Surveillance of EVAR patients can be performed accurately, safely, and cost-effectively with DU as the sole imaging study.



Harrison et al. Eur J Vasc Endovasc Surg.2011;42:187-92
**Surveillance after EVAR based on duplex ultrasound
and abdominal radiography.**

EVAR surveillance based on DUS and AXR is feasible and safe.
No patient presented with rupture or aneurysm-related
complications not identified by modified surveillance.
Mean annual savings were €223.

Do we need to reconsider evidence derived from studies conducted at the early period of EVAR application and on which cost analysis has been made?

Br J Surg. 2012 Sep 28. doi: 10.1002/bjs.8938. [Epub ahead of print]

Aortic rupture and sac expansion after endovascular repair of abdominal aortic aneurysm.

Holt PJ, Karthikesalingam A, Patterson BO, Ghatwary T, Hinchliffe RJ, Loftus IM, Thompson MM.

478 Patients undergoing infrarenal EVAR between 2004 and 2010.

In this series EVAR had a **lower aneurysm-related mortality rate than demonstrated in early controlled trials**, and with **lower sac expansion rates** than reported from image repositories.

Data from earlier studies should be applied to current practice with caution.

Mani K et al. J Endovasc Ther 2008;15:1-11.

Similar cost for elective open and endovascular AAA repair in a population-based setting.

- ✓ No difference was observed in total cost between OR and EVAR (euro 29,786 versus euro 26,382; $p = 0.336$).
- ✓ Preoperative cost was lower for OR compared to EVAR (euro 661 versus euro 1494, $p = 0.002$).
- ✓ OR patients had higher cost of intensive care [36% (euro 8921) of perioperative cost versus 7% (euro 1460), $p = 0.001$], while EVAR had higher implant cost [36% (euro 7468) versus 2% (euro 448), $p < 0.001$].
- ✓ Mean postoperative cost was similar (OR euro 4613 versus EVAR euro 4403, $p = 0.209$; 16% and 17% of total cost, respectively). Postoperative cost after OR was high early on, with lower cost thereafter.

Sultan S, Hynes N. J Endovasc Ther. 2011;18:181-96.
Clinical efficacy and cost per quality-adjusted life years of pararenal endovascular aortic aneurysm repair compared with open surgical repair.

- ✓ Over a 3-year period, pararenal EVAR costs (including follow-up and reintervention) averaged €20,375 per patient to give a QALY value of 0.90, while mean costs for OSR were €23,928 per patient (0.86 QALY).
- ✓ The incremental cost-effectiveness ratio for pararenal EVAR was €129,586 saved per QALY gained.

Hayes et al. J Endovasc Ther. 2010;17:174-82.
Cost-effectiveness analysis of endovascular versus open surgical repair of acute abdominal aortic aneurysms based on worldwide experience.

- ✓ EVAR dominated OSR in the base case analysis, with a mean cumulative cost/patient of £ 7,422 (\$26,133) for EVAR and £ 8,930 pound (\$28,395) for OSR [- £ 508 (\$2262) difference].
- ✓ The mean quality-adjusted life years (QALYs)/patient was 3.09 for EVAR versus 2.49 for OSR (0.64 difference).
- ✓ EVAR was cost-effective compared with OSR at a threshold value of £20,000 to £30,000 (\$30,000-\$45, 000)/QALY.
- ✓ While the UK's National Institute for Clinical Excellence does not set an absolute limit at which treatments would not be funded, £30,000 (\$45,000) is generally regarded as the upper limit of acceptability. At this level, there is almost a 100% probability that EVAR is a cost-effective treatment for ruptured AAA.

CONCLUSION

EVAR may become cost-effective as compared to OR if:

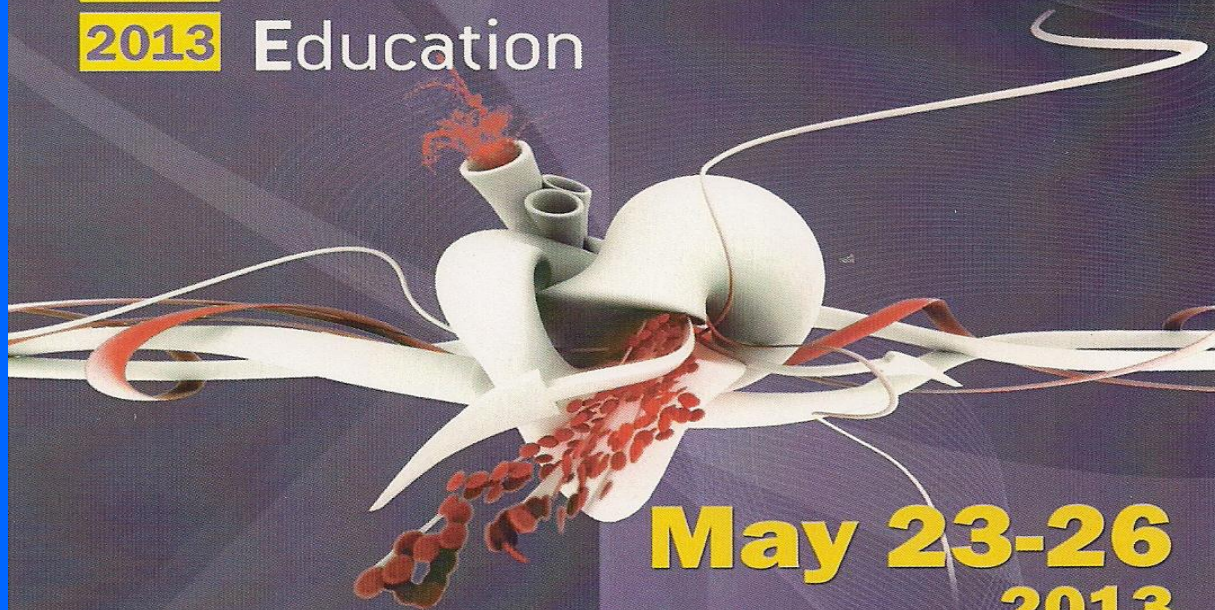
- Efforts are made to minimizing cost based on patient selection and technical and device modifications aiming to reduce endoleaks and the need for secondary procedures
- Post-EVAR surveillance protocol includes ultrasound and abdominal x-ray and avoids CT. This appears to be accurate and safe

Thanks for the attention

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