

ORIGINAL ARTICLE

Long-Term Comparison of Endovascular and Open Repair of Abdominal Aortic Aneurysm

Frank A. Lederle, M.D., Julie A. Freischlag, M.D., Tassos C. Kyriakides, Ph.D., Jon S. Matsumura, M.D., Frank T. Padberg, Jr., M.D., Ted R. Kohler, M.D., Panagiotis Kougias, M.D., Jessie M. Jean-Claude, M.D., Dolores F. Cikrit, M.D., and Kathleen M. Swanson, M.S., R.Ph., for the OVER Veterans Affairs Cooperative Study Group*

ABSTRACT

BACKGROUND

Whether elective endovascular repair of abdominal aortic aneurysm reduces long-term morbidity and mortality, as compared with traditional open repair, remains uncertain.

METHODS

We randomly assigned 881 patients with asymptomatic abdominal aortic aneurysms who were candidates for both procedures to either endovascular repair (444) or open repair (437) and followed them for up to 9 years (mean, 5.2). Patients were selected from 42 Veterans Affairs medical centers and were 49 years of age or older at the time of registration.

RESULTS

More than 95% of the patients underwent the assigned repair. For the primary outcome of all-cause mortality, 146 deaths occurred in each group (hazard ratio with endovascular repair versus open repair, 0.97; 95% confidence interval [CI], 0.77 to 1.22; $P=0.81$). The previously reported reduction in perioperative mortality with endovascular repair was sustained at 2 years (hazard ratio, 0.63; 95% CI, 0.40 to 0.98; $P=0.04$) and at 3 years (hazard ratio, 0.72; 95% CI, 0.51 to 1.00; $P=0.05$) but not thereafter. There were 10 aneurysm-related deaths in the endovascular-repair group (2.3%) versus 16 in the open-repair group (3.7%) ($P=0.22$). Six aneurysm ruptures were confirmed in the endovascular-repair group versus none in the open-repair group ($P=0.03$). A significant interaction was observed between age and type of treatment ($P=0.006$); survival was increased among patients under 70 years of age in the endovascular-repair group but tended to be better among those 70 years of age or older in the open-repair group.

CONCLUSIONS

Endovascular repair and open repair resulted in similar long-term survival. The perioperative survival advantage with endovascular repair was sustained for several years, but rupture after repair remained a concern. Endovascular repair led to increased long-term survival among younger patients but not among older patients, for whom a greater benefit from the endovascular approach had been expected. (Funded by the Department of Veterans Affairs Office of Research and Development; OVER ClinicalTrials.gov number, NCT00094575.)

From the Veterans Affairs Medical Centers in Minneapolis (F.A.L.), Baltimore (J.A.F.), West Haven, CT (T.C.K.), Madison, WI (J.S.M.), East Orange, NJ (F.T.P.), Seattle (T.R.K.), Houston (P.K.), Cleveland (J.M.J.-C.), Indianapolis (D.F.C.), and Albuquerque, NM (K.M.S.). Address reprint requests to Dr. Lederle at the Department of Medicine (III-0), Veterans Affairs Medical Center, 1 Veterans Dr., Minneapolis, MN 55417, or at frank.lederle@va.gov.

*The members of the Open versus Endovascular Repair Trial (OVER) study group are listed in the Supplementary Appendix, available at NEJM.org.

N Engl J Med 2012;367:1988-97.
DOI: 10.1056/NEJMoa1207481
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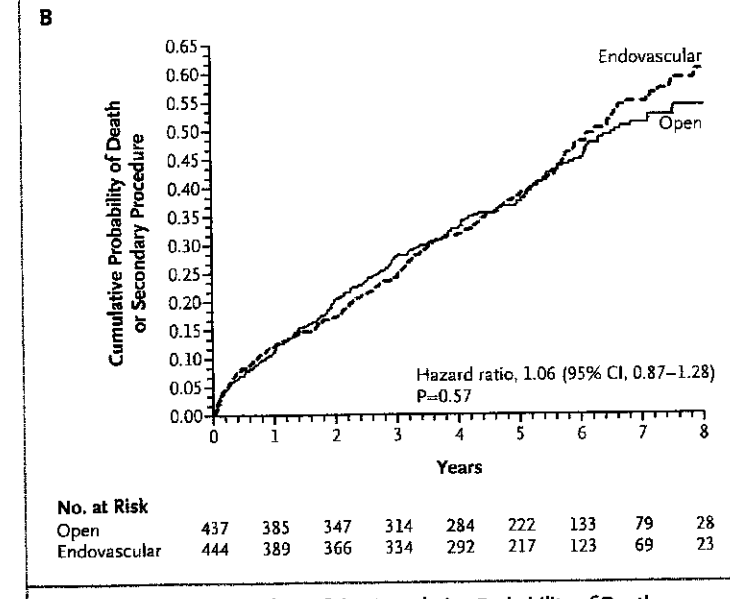
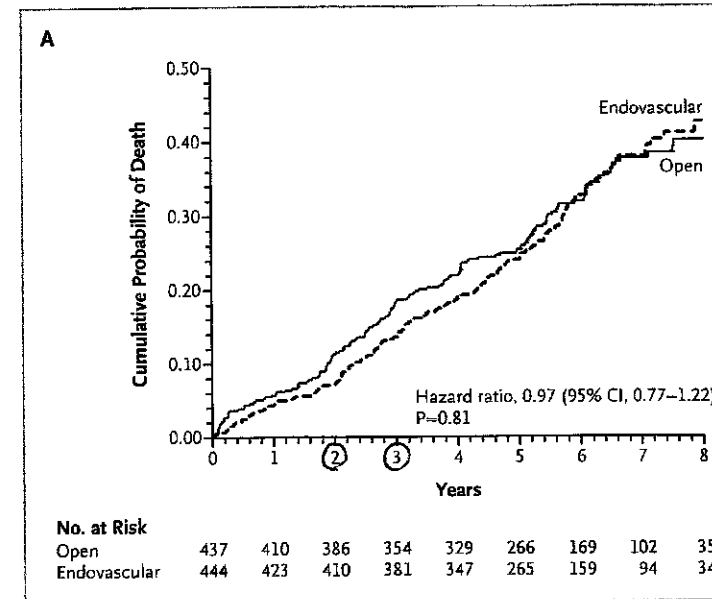


Figure 1. Kaplan-Meier Plots of the Cumulative Probability of Death or a Secondary Therapeutic Procedure, According to Type of Aneurysm Repair. Panel A shows the cumulative probability of death from the time of randomization among patients with an abdominal aortic aneurysm who underwent endovascular repair as compared with those who underwent open repair. Panel B shows the cumulative probability of death or a secondary therapeutic procedure.

Table 2. Clinical Outcomes in the Two Treatment Groups.

Outcome	Endovascular Repair (N=444)	Open Repair (N=437)	P Value
All deaths — no. of patients (%)	146 (32.9)	146 (33.4)	0.81
Cause of death — no. of patients (%)			
○ Aneurysm-related cause	10 (2.3)	16 (3.7)	0.22
○ During hospitalization or within 30 days after repair	2 (0.5)	13 (3.0)	0.004
Cardiovascular cause not related to aneurysm	39 (8.8)	29 (6.6)	0.23
Cancer	39 (8.8)	48 (11.0)	0.27
Pneumonia or other infection	15 (3.4)	12 (2.8)	0.59
Chronic obstructive lung disease	5 (1.1)	13 (3.0)	0.05
Accident, homicide, or suicide	10 (2.3)	4 (0.9)	0.18
Other cause	15 (3.4)	9 (2.1)	0.23
Unknown cause	13 (2.9)	15 (3.4)	0.67
○ Aneurysm rupture	6 (1.4)	0	0.03
New or worsened claudication — no. of patients (%)	23 (5.2)	15 (3.4)	0.20
○ Secondary therapeutic procedures			
No. of patients (%)	98 (22.1)	78 (17.8)	0.12
No. of procedures	148	105	0.26
Hospitalizations after repair			
○ Total no. of hospitalizations	954	1040	0.08
Total no. of patients with one or more hospitalizations (%)	325 (73.2)	314 (71.9)	0.66
Hospitalizations related to aneurysm			
No. of hospitalizations	171	117	0.12
No. of patients (%)	95 (21.4)	78 (17.8)	0.19