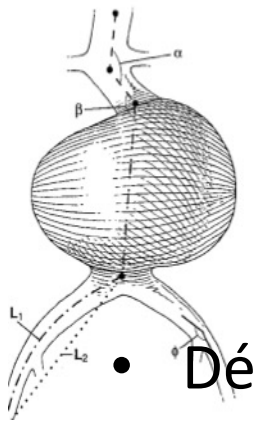
Les anévrismes de l'aorte abdominale

Quel choix thérapeutique pour quel patient en 2023?

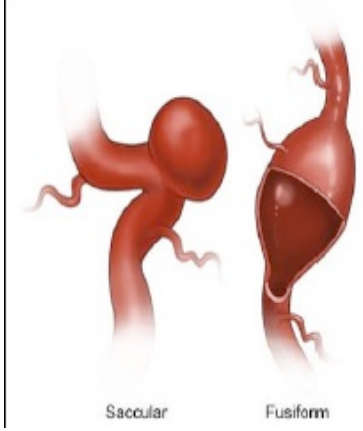
Pr Elixène Jean-Baptiste – Pr Nirvana Sadaghianloo
(CHU de Nice, Service de Chirurgie vasculaire et endovasculaire)

Amicale des Cardiologues de la Côte d'Azur

A.C.C.A.



Anévrismes de l'aorte Abdominale



- Dépistage (unique, ciblé, opportuniste)
  - Hommes de 65 à 75 ans fumeurs chroniques ou anciens <20 ans
  - Hommes de 50 à 75 ans et qui ont des antécédents familiaux d'AAA
    - valable pour les femmes (ESVS)

- Seuil interventionnel
  - Supérieur à 50 mm ou croissance > à 10 mm/an (H)
  - Femme: 45 mm
  - AAA sacciforme

Eur J Vasc Endovasc Surg (2019) 57, 8—93

Editor's Choice — European Society for Vascular Surgery (ESVS) 2019 Clinical Practice Guidelines on the Management of Abdominal Aorto-iliac Artery Aneurysms

Recommendation 22	Class	Level	References
In men, the threshold for considering elective abdominal aortic aneurysm repair is recommended to be ≥5.5 cm diameter.	I	A	[204]

Recommendation 23	Class	Level	References
In women with acceptable surgical risk the threshold for considering elective abdominal aortic aneurysm repair may be considered to be ≥5.0 cm diameter.	IIb	C	[242,578,668, 685,708]

Recommendation 24	Class	Level	References
When rapid abdominal aortic aneurysm growth is observed (≥1 cm/year), fast track referral to a vascular surgeon with additional imaging should be considered.	IIa	C	[369,626]

Recommendation 25	Class	Level	References
Emergency referral to a vascular surgeon of patients with symptomatic abdominal aortic aneurysm is recommended.	I	C	[640,681]

Threshold for elective repair

Systematic review and meta-analysis of the growth and rupture rates of small abdominal aortic aneurysms: implications for surveillance intervals and their cost-effectiveness

Health Technology Assessment, No. 17.41

SG Thompson, LC Brown, MJ Sweeting, MJ Bown, LG Kim, MJ Glover, MJ Buxton, JT Powell; the RESCAN collaborators.

Author Information and Affiliations

Southampton (UK): NIHR Journals Library; 2013 Sep.

Suggest threshold for surgery of 4.5 cm AAA is appropriate in women

- Risque de rupture: 4 fois plus élevé chez Femme VS Homme
- RESCAN metaanalysis
  - Taux de rupture AAA 4.5 cm (femme) = AAA 5.5cm (homme)

Threshold for elective repair

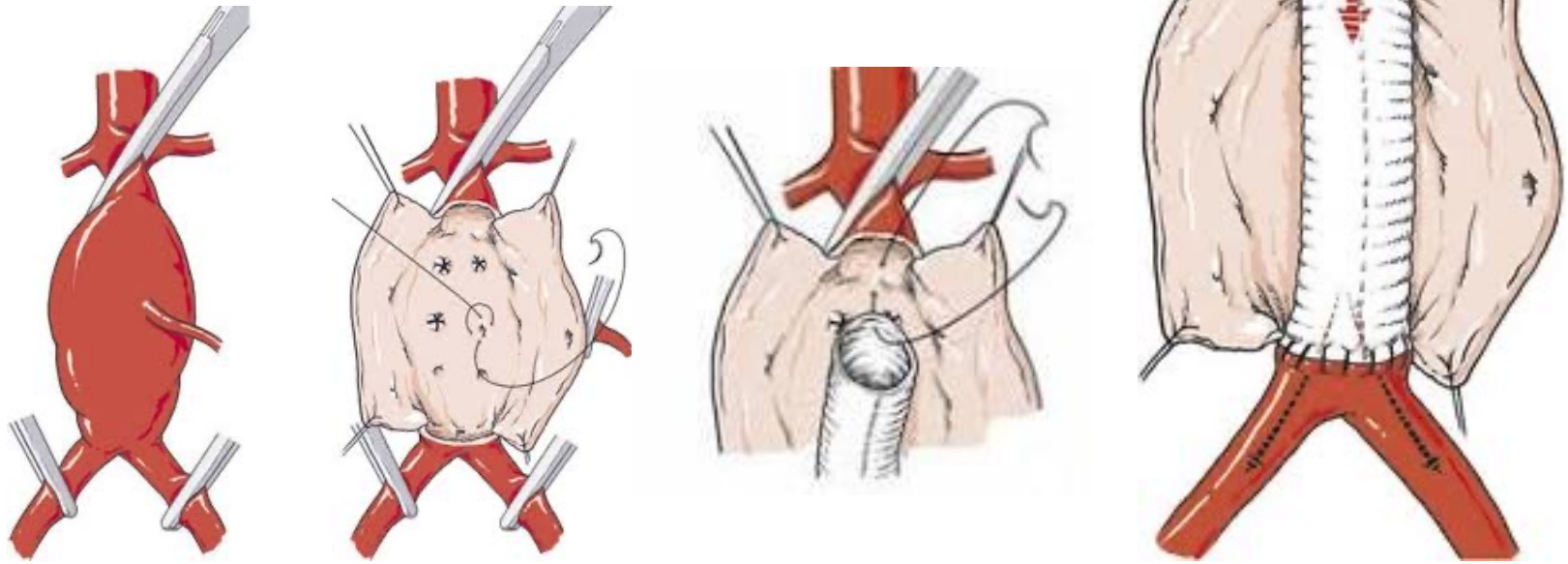
- A US registry based analysis showed a
  - significantly lower population aneurysm related mortality in the USA VS. UK, where
    - US: more than 40% of repairs were performed on small AAAs < 5.5 cm,
    - UK: Small AAA repair rate was less than 10%
- Etude française ACE: 0.7% mortalité à 30 jours (OR)

Traitement médical:

- Arrêt du tabac +++
- Correction d'une hypertension artérielle
  - Cible générale 120-129 / 70-79 mmHg (ESH 2023).
- Correction d'une hypercholestérolémie
- Correction d'un surpoids ou obésité
- Exercice physique régulier
- Dépistage annuel ou contrôle d'un diabète
- Surveillance spécialisée régulière par angiologue ou cardiologue

PRINCIPES DU TRAITEMENT:
Traitement conventionnel

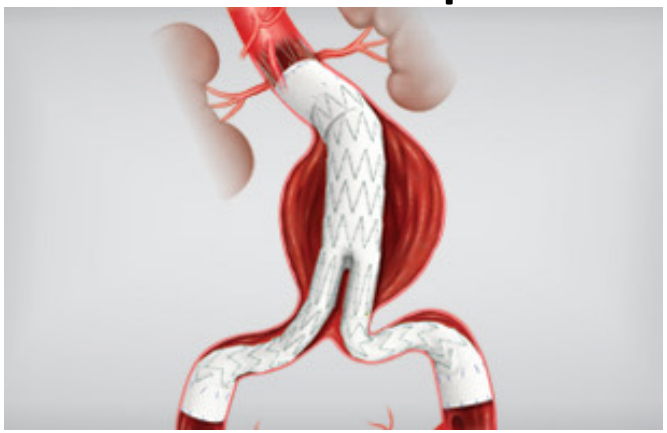
- Mise à plat greffe aortique

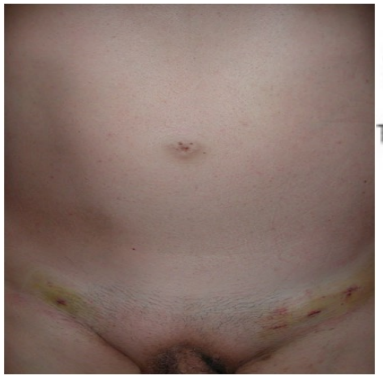


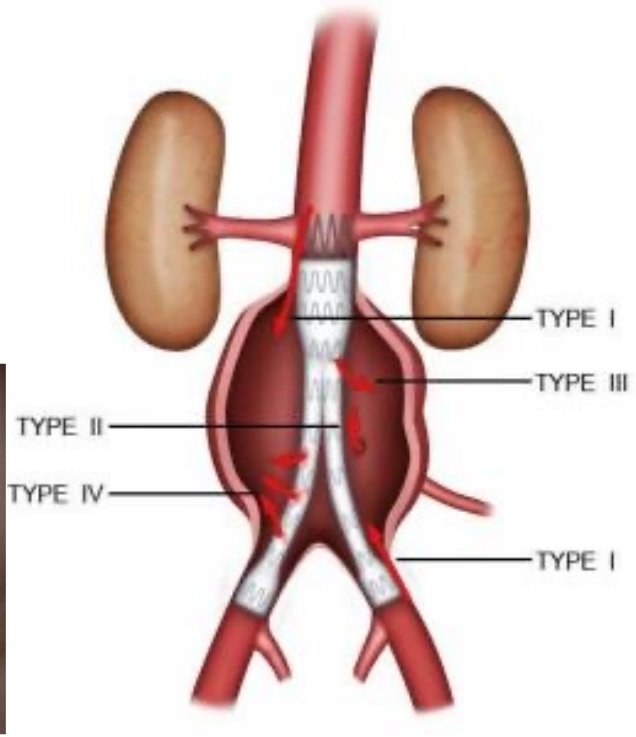
AVANTAGES	INCONVENIENTS
PAS DE SURVEILLANCE SCANNER	MORTALITÉ OPÉRATOIRE: 2- 5% LAPAROTOMIE ou LOMBOTOMIE

PRINCIPES DU TRAITEMENT:
Traitement endovasculaire

- Endoprothèse aortique



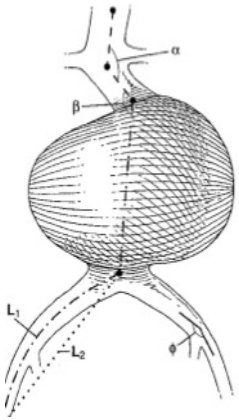


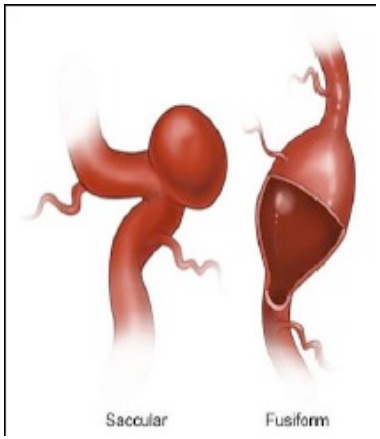


AVANTAGES	INCONVENIENTS
MORTALITÉ OPÉRATOIRE: 0.6 - 1.4%	**ANATOMIE COMPATIBLE** REINTERVENTION **SCANNER ANNUEL À VIE**

Anévrismes de l'aorte

- EVAR:
  - ❑ Remplace progressivement Chirurgie conventionnelle
  - ❑ Actuellement 1 AAA sur 2
  - ❑ Impact positif sur la mortalité de la pathologie anévrismale depuis





ETAT DES LIEUX OPTIMISTE…

Résultats des EPRC

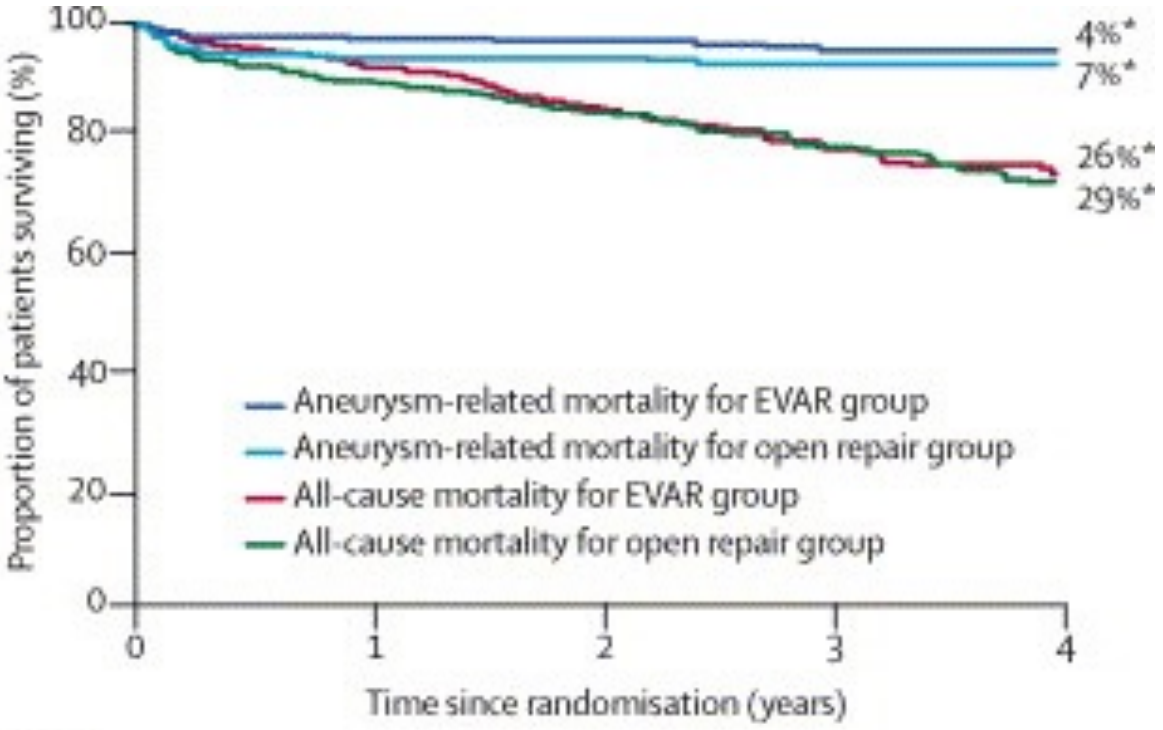
30 day mortality: patients fit for surgery

	EVAR	Open repair
EVAR 1* (n = 1082)	1,7 %	4,8 %
DREAM** (n= 345)	1,2 %	4,6 %

•* Lancet 2004 ** N Engl J Med, 2004

Résultats des EPRC

Survie des patients

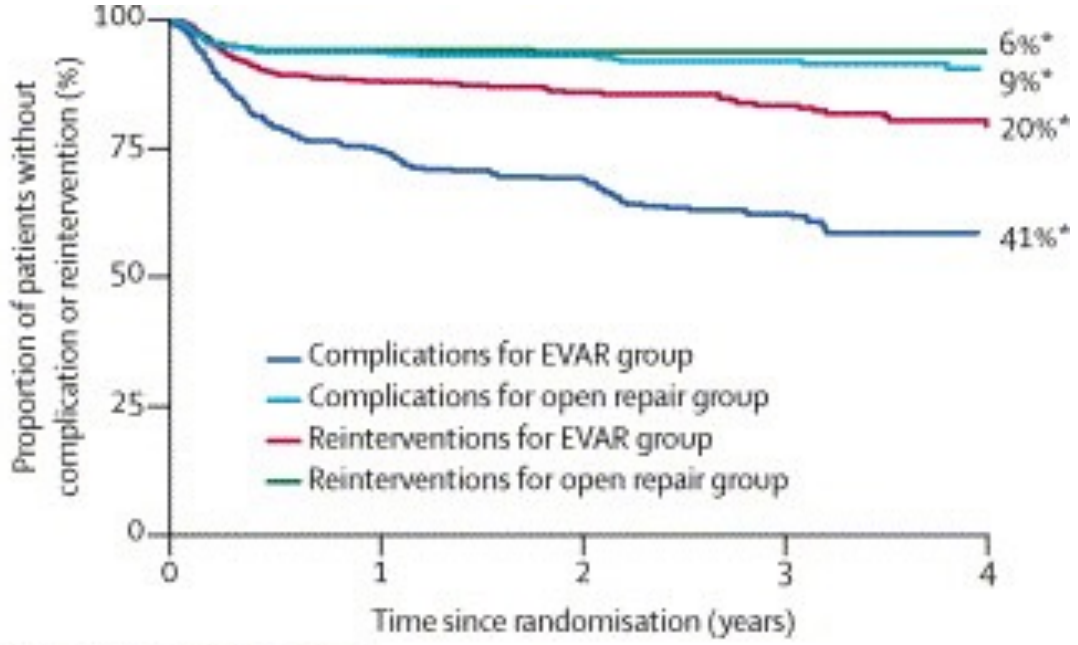


Number at risk					
Open repair	539	484	314	195	88
EVAR	543	503	316	187	94

- * Evar trial 1 participants. Lancet 2005

Résultats des EPRC

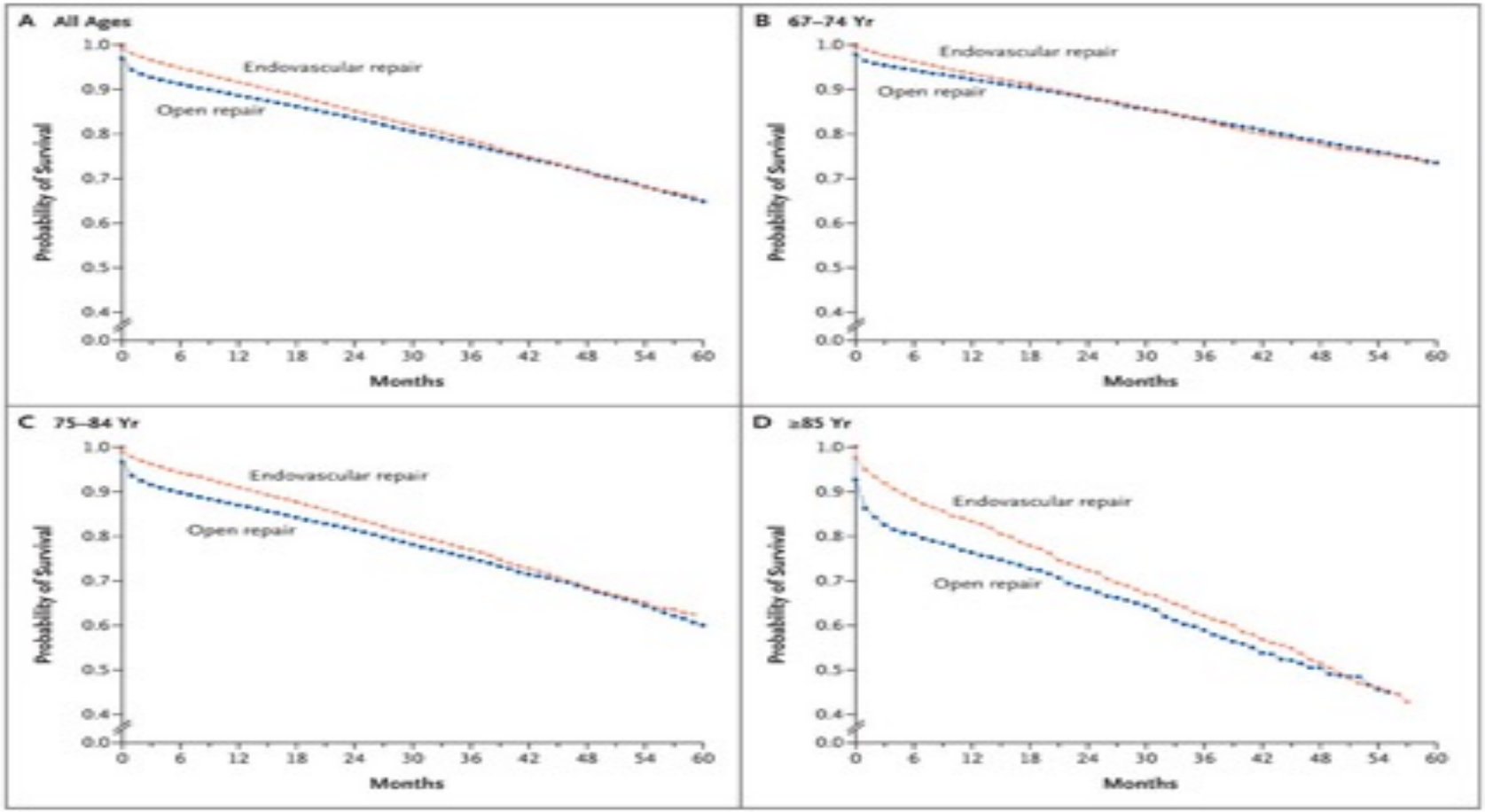
Complications et procédures secondaires



Number at risk for complications					
Open repair	539	466	301	182	82
EVAR	543	386	235	134	67
Number at risk for reinterventions					
No intervention	539	468	304	189	88
EVAR	543	450	278	168	80

- * Evar trial 1 participants. Lancet 2005

45660 matched patients



Schermerhorn et al. N Engl J Med, 2008.

Schermerhorn et al. N Engl J Med, 2008.

Table 3. Postoperative Outcomes after Endovascular Repair or Open Repair.*

Outcome	Year 1		Year 2		Year 3		Year 4		P Value
	Endovascular Repair	Open Repair	Endovascular Repair	Open Repair	Endovascular Repair	Open Repair	Endovascular Repair	Open Repair	
	percent of patients								
Rupture	0.3	0.2	0.7	0.3	1.3	0.4	1.8	0.5	<0.001
Any aneurysm-related reintervention	2.7	0.5	4.8	0.8	7.0	1.2	9.0	1.7	<0.001
Major reintervention	0.4	0.2	0.7	0.3	1.2	0.3	1.6	0.6	<0.001
Conversion to open repair	0.1		0.2		0.3		0.4		
Open aneurysm repair	0.3	0.1	0.5	0.1	0.9	0.2	1.1	0.4	<0.001
Repeat aneurysm repair or aortobifemoral bypass	0.1	0.1	0.4	0.1	0.7	0.1	0.9	0.2	<0.001
Axillofemoral or axillobifemoral bypass	0.1	0.1	0.2	0.1	0.2	0.1	0.2	0.3	0.40
Repair of infected graft or graft–enteric fistula	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.13
Minor reintervention	2.4	0.4	4.2	0.6	6.1	0.9	7.8	1.3	<0.001
Endovascular	1.9	0.2	3.5	0.3	5.2	0.5	6.7	0.6	<0.001
Repeat endovascular aneurysm repair	0.2	0.04	0.4	0.1	0.8	0.1	1.2	0.1	<0.001
Embolization	0.7	0.04	1.3	0.1	2.0	0.2	2.3	0.2	<0.001
Angioplasty (aortic or iliac)	0.6	0.1	0.8	0.2	1.0	0.3	1.1	0.3	<0.001
Extension cuff	0.8	0.03	1.6	0.04	2.7	0.04	3.8	0.1	<0.001
Open	0.6	0.2	0.9	0.3	1.1	0.5	1.2	0.7	<0.001
Thrombectomy	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.61
Femoral–femoral bypass	0.5	0.1	0.7	0.2	0.9	0.2	0.9	0.3	<0.001

* Data are hierarchical within indented subheadings (e.g., a given patient may have undergone and been counted for both embolization and extension cuff but would have been counted only once for endovascular reintervention; similarly, a patient may have been counted for both minor and major reinterventions but would have been counted only once for the overall category of aneurysm-related reintervention). P values were obtained with the use of log-rank analysis of Kaplan–Meier curves.

Table 4. Laparotomy-Related Outcomes after Endovascular Repair or Open Repair.*

Outcome	Year 1		Year 2		Year 3		Year 4		P Value
	Endovascular Repair	Open Repair	Endovascular Repair	Open Repair	Endovascular Repair	Open Repair	Endovascular Repair	Open Repair	
	percent of patients								
Laparotomy-related reintervention	1.4	3.4	2.4	6.3	3.5	8.1	4.1	9.7	<0.001
Repair of an abdominal-wall hernia	0.3	1.9	0.6	4.0	0.9	5.1	1.1	5.8	<0.001
Lysis of adhesions without bowel resection	0.2	0.6	0.3	0.9	0.4	1.1	0.5	1.5	<0.001
Bowel resection	1.0	1.1	1.7	1.9	2.5	2.7	3.0	3.4	0.02
Large bowel	0.8	0.9	1.4	1.4	2.1	2.0	2.5	2.6	0.57
Small bowel	0.2	0.3	0.3	0.6	0.5	0.9	0.7	1.1	<0.001
Laparotomy-related hospitalization without bowel resection or lysis of adhesions	2.2	4.9	4.4	8.8	6.4	11.7	8.1	14.2	<0.001

* Data are hierarchical within indented subheadings (e.g., a given patient may have had both repair of an abdominal-wall hernia and lysis of adhesions but would have been counted only once for laparotomy-related reintervention). P values were obtained with the use of log-rank analysis of Kaplan–Meier curves.

Schermerhorn et al. N Engl J Med, 2008.

Endovascular versus open repair of abdominal aortic aneurysm in 15-years' follow-up of the UK endovascular aneurysm repair trial 1 (EVAR trial 1): a randomised controlled trial

*Rajesh Patel, Michael J Sweeting, Janet T Powell, Roger M Greenhalgh, for the EVAR trial investigators**

Lancet 2016; 388: 2366–74

	Endovascular repair (N=626)		Open repair (N=626)		Hazard ratio (95% CI)		p value†
	n/N (%)	Rate per 100 person-years	n/N (%)	Rate per 100 person-years	Unadjusted	Adjusted*	
Total mortality							
All patients	466/626 (74%)	9·3	444/626 (71%)	8·9	1·05 (0·92–1·19)	1·11 (0·97–1·27)	0·14
0–6 months	26/626 (4%)	8·5	45/626 (7%)	15·0	0·57 (0·35–0·92)	0·61 (0·37–1·02)	0·06
>6 months to 4 years	126/600 (21%)	6·7	116/581 (20%)	6·3	1·07 (0·83–1·38)	1·13 (0·87–1·47)	0·35
>4–8 years	135/474 (28%)	8·3	129/464 (28%)	8·0	1·03 (0·81–1·31)	1·07 (0·83–1·37)	0·62
>8 years	179/339 (53%)	14·9	154/333 (46%)	12·7	1·18 (0·95–1·47)	1·25 (1·00–1·56)	0·048
Aneurysm-related mortality							
All patients	56/626 (9%)	1·1	45/626 (7%)	0·9	1·24 (0·84–1·83)	1·31 (0·86–1·99)	0·21
0–6 months	14/626 (2%)	4·6	30/626 (5%)	10·0	0·46 (0·24–0·87)	0·47 (0·23–0·93)	0·031
>6 months to 4 years	12/599 (2%)	0·6	8/581(1%)	0·4	1·48 (0·60–3·62)	1·46 (0·56–3·83)	0·44
>4–8 years	14/474 (3%)	0·9	4/464 (1%)	0·2	3·46 (1·14–10·52)	3·11 (0·99–9·72)	0·05
>8 years	16/339 (5%)	1·3	3/333 (1%)	0·2	5·50 (1·60–18·89)	5·82 (1·64–20·65)	0·0064

*Hazard ratios adjusted for age, sex, maximum aneurysm diameter, forced expiratory volume in 1 s, log creatinine, statin use, body-mass index, smoking status, systolic blood pressure and total cholesterol; 77 individuals excluded due to missing data. †p value adjusted for covariates.

Table 1: Deaths from any cause and aneurysm-related causes, according to time since randomisation in the intention-to-treat population

Systematic review

Meta-analysis of individual-patient data from EVAR-1, DREAM, OVER and ACE trials comparing outcomes of endovascular or open repair for abdominal aortic aneurysm over 5 years

J. T. Powell[1], M. J. Sweeting[2], P. Ulug[1], J. D. Blankensteijn[3], F. A. Lederle[4], J.-P. Becquemin[5] and R. M. Greenhalgh[1], on behalf of the EVAR-1, DREAM, OVER and ACE Trialists

[1]Vascular Surgery Research Group, Imperial College London, London, and [2]Department of Public Health and Primary Care, University of Cambridge, Cambridge, UK, [3]Department of Surgery, VU Medical Centre, Amsterdam, The Netherlands, [4]Department of Medicine, VA Medical Centre, Minneapolis, Minnesota, USA, and [5]Vascular Institute of Paris East, Hôpital Privé Paul d'Egine, Champigny, Université, Paris-Est Créteil, Créteil, France

Correspondence to: Professor R. M. Greenhalgh, Vascular Surgery Research Group, Imperial College London, London W6 8RP, UK (e-mail: r.greenhalgh@imperial.ac.uk)

Background: The erosion of the early mortality advantage of elective endovascular aneurysm repair (EVAR) compared with open repair of abdominal aortic aneurysm remains without a satisfactory explanation.

Methods: An individual-patient data meta-analysis of four multicentre randomized trials of EVAR *versus* open repair was conducted to a prespecified analysis plan, reporting on mortality, aneurysm-related mortality and reintervention.

Results: The analysis included 2783 patients, with 14 245 person-years of follow-up (median 5·5 years). Early (0–6 months after randomization) mortality was lower in the EVAR groups (46 of 1393 *versus* 73 of 1390 deaths; pooled hazard ratio 0·61, 95 per cent c.i. 0·42 to 0·89; $P = 0·010$), primarily because 30-day operative mortality was lower in the EVAR groups (16 deaths *versus* 40 for open repair; pooled odds ratio 0·40, 95 per cent c.i. 0·22 to 0·74). Later (within 3 years) the survival curves converged, remaining converged to 8 years. Beyond 3 years, aneurysm-related mortality was significantly higher in the EVAR groups (19 deaths *versus* 3 for open repair; pooled hazard ratio 5·16, 1·49 to 17·89; $P = 0·010$). Patients with moderate renal dysfunction or previous coronary artery disease had no early survival advantage under EVAR. Those with peripheral artery disease had lower mortality under open repair (39 deaths *versus* 62 for EVAR; $P = 0·022$) in the period from 6 months to 4 years after randomization.

Conclusion: The early survival advantage in the EVAR group, and its subsequent erosion, were confirmed. Over 5 years, patients of marginal fitness had no early survival advantage from EVAR compared with open repair. Aneurysm-related mortality and patients with low ankle : brachial pressure index contributed to the erosion of the early survival advantage for the EVAR group. Trial registration numbers: EVAR-1, ISRCTN55703451; DREAM (Dutch Randomized Endovascular Aneurysm Management), NCT00421330; ACE (Anévrysme de l'aorte abdominale, Chirurgie *versus* Endoprothèse), NCT00224718; OVER (Open *Versus* Endovascular Repair Trial for Abdominal Aortic Aneurysms), NCT00094575.

Presented to the Charing Cross International Symposium, London, UK, April 2016

Paper accepted 26 September 2016

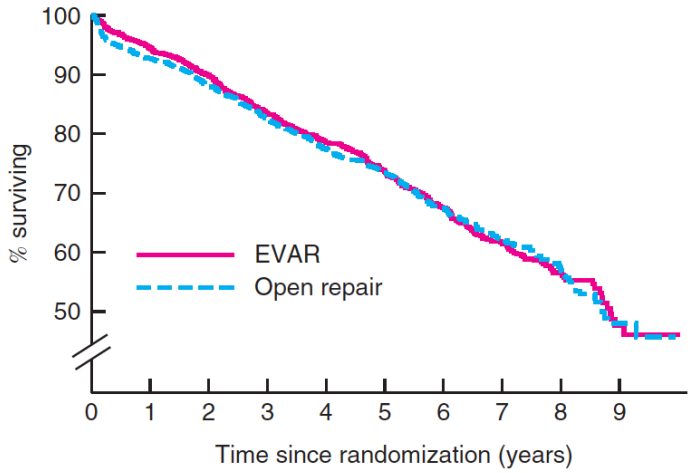
Published online in Wiley Online Library (www.bjs.co.uk). **DOI:** 10.1002/bjs.10430

Introduction

Open repair of abdominal aortic aneurysm (AAA) was first introduced by Dubost in 1951[1]. In the 1990s, the less invasive endovascular aneurysm repair (EVAR) was introduced; EVAR-1[2], the first multicentre randomized the UK. This was soon followed by the DREAM[3] and ACE[4] multicentre trials in Europe, and the OVER trial[5] in the USA.

Each of the randomized trials of EVAR *versus* open repair recruited patients (suitable for either open or endovas-

❑ **No difference in total mortality**



No. at risk

EVAR	1393	1313	1228	1114	988	832	556	309	137
Open repair	1390	1279	1200	1088	959	836	564	327	147

Fig. 1 Kaplan–Meier survival curves for overall total mortality, by randomized group, for all 2783 patients in the four trials combined. EVAR, endovascular aneurysm repair

- ❑ **Between 0 and 6 months, mortality was lower for the EVAR group**
- ❑ **After this, the early advantage for the EVAR group was lost and the hazard ratios moved (non-significantly) in the direction of open repair.**
- ❑ **By 5 years, the estimated survival rate was 73·6% (95% CI:. 71·1 to 75·9) in both groups**

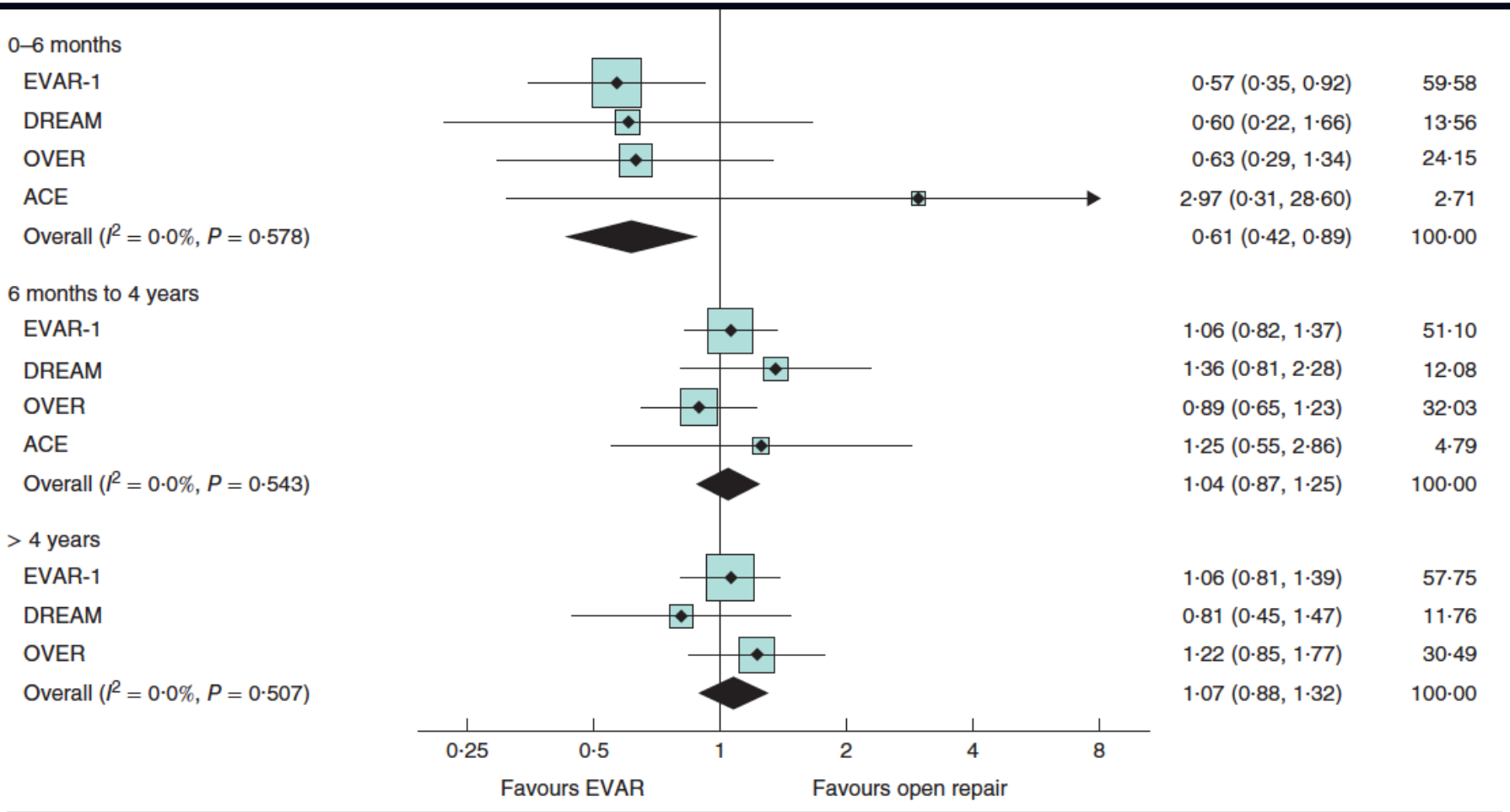


Fig. 2 Unadjusted hazard ratios, with 95 per cent confidence intervals, for total mortality overall and at 0–6 months, 6 months to 4 years and more than 4 years since randomization. EVAR, endovascular aneurysm repair

UK National Institute for Health and Care Excellence (NICE)

EVARXIT Manqué: EVAR of unruptured aneurysms should not be offered—even in patients for whom OSR was contraindicated

- Draft guidelines on the diagnosis and management of abdominal aortic aneurysms in May, 2018

- Volte-face: the final NICE guideline, published on March 19, 2020, after multiple delays and global outcry→**EVAR can be considered for individuals in whom OSR is contraindicated.**

PLAUSIBLE REASONS

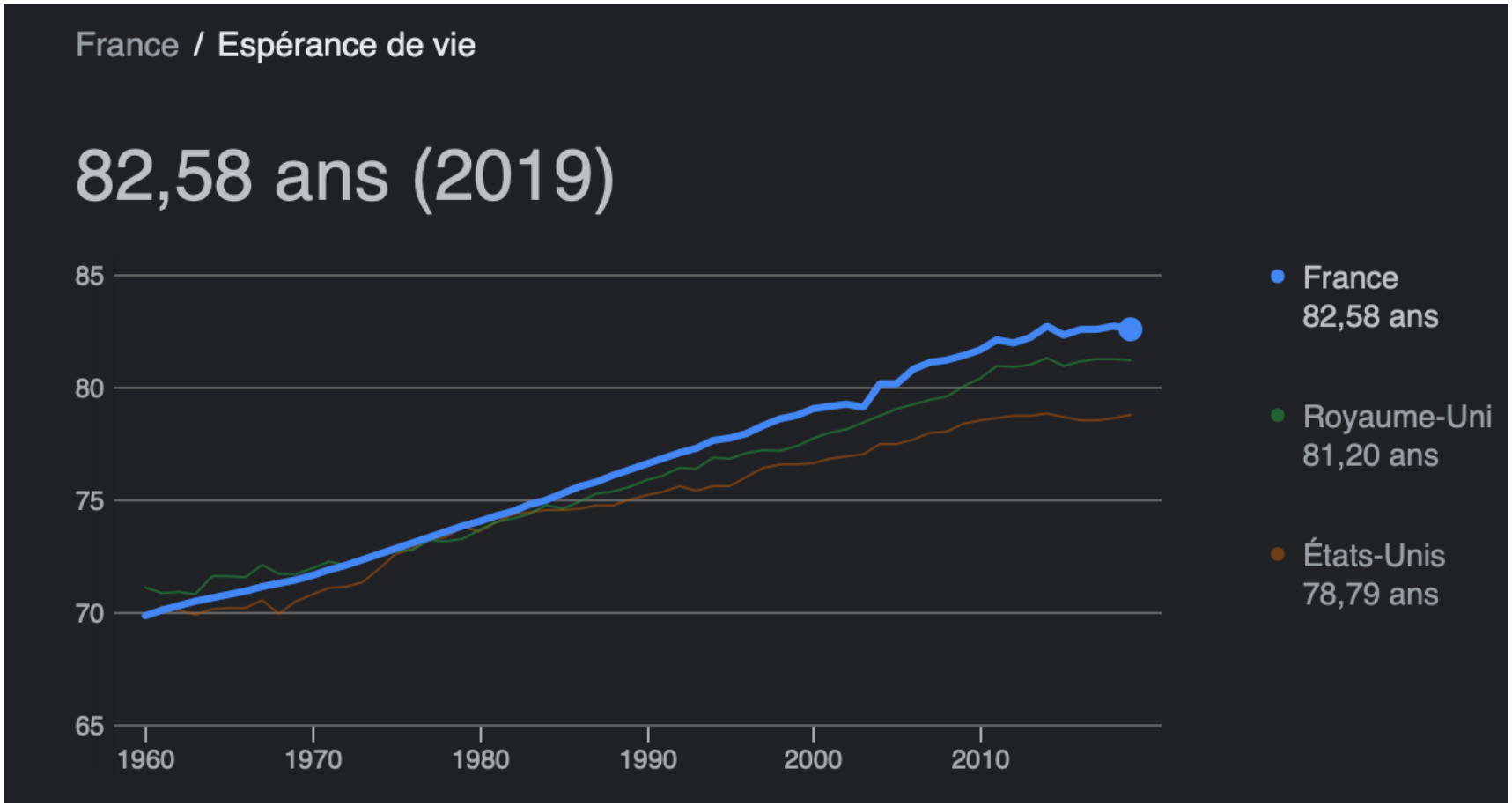
- The perioperative deaths after open repair most likely occurred in the frailest patients
- The curves converged as later deaths occurred in the frailest patients in the endovascular-repair groups

Table 1 Baseline and postrandomization characteristics of patients in the four trials

	EVAR-1 (n =1252)	DREAM (n = 351)	OVER (n = 881)	ACE (n = 299)
Baseline variables				
Age (years)*	74(6)	70(7)	70(8)	69(7)
Men	1135 (90·7)	322 (91·7)	876 (99·4)	296 (99·0)
BMI (kg/m^2)*	26·5(4·5)	26·7(4·7)	28·6(5·4)	27·2(3·5)
Smoking status§				
Current smoker	270 (21·6)	130 (37·0)	363 (41·2)	72 (24·1)
Ex-smoker	863 (68·9)	78 (22·2)	481 (54·6)	75 (25·1)
Diabetes	128 (10·2)	35 (10·0)	200 (22·7)	49 (16·4)
Previous angina/MI	492 (39·3)	153 (43·6)	268 (30·4)	115 (38·5)
ABPI*¶	1·0(0·2)	1·0(0·2)	1·0(0·2)	n.a.
Creatinine (μmol/l)†	102 (90–119)	95 (84–109)	97 (80–110)	93 (82–110)
EQ-5D™ score*	0·82(0·12)	0·84(0·11)	0·85(0·09)	n.a.
AAA diameter (cm)*	6·5(0·9)	6·0(0·9)	5·7(0·9)	5·6(0·7)
AAA neck length (cm)*	2·8(1·2)	2·5(1·2)	2·6(1·2)	2·8(1·0)
AAA neck diameter (cm)*	2·35(0·30)	2·39(0·33)	2·26(0·35)	2·36(0·33)
Postrandomization parameters				
Time from randomization to repair (days)†#	40 (1–576)	39 (3–209)	17 (0–290)	27 (1–203)
Commenced repair in compliance with randomization	1165 (93·1)	339 (96·6)	853 (96·8)	277 (92·6)
Follow-up for mortality (years)†	6·0 (3·9–7·3)	6·0 (5·0–6·8)	5·4 (4·1–6·8)	3·1 (2·1–3·4)
30-day operative mortality				
EVAR	11 of 614 (1·8)	2 of 170 (1·2)	1 of 439 (0·2)	2 of 150 (1·3)
Open repair	26 of 602 (4·3)	5 of 173 (2·9)	8 of 429 (1·9)	1 of 147 (0·7)
Reintervention rate‡				
EVAR	174 of 3381 (5·1)	77 of 906 (8·5)	155 of 2334 (6·6)	32 of 419 (7·6)
Open repair	64 of 3309 (1·9)	41 of 932 (4·4)	104 of 2276 (4·6)	10 of 408 (2·5)

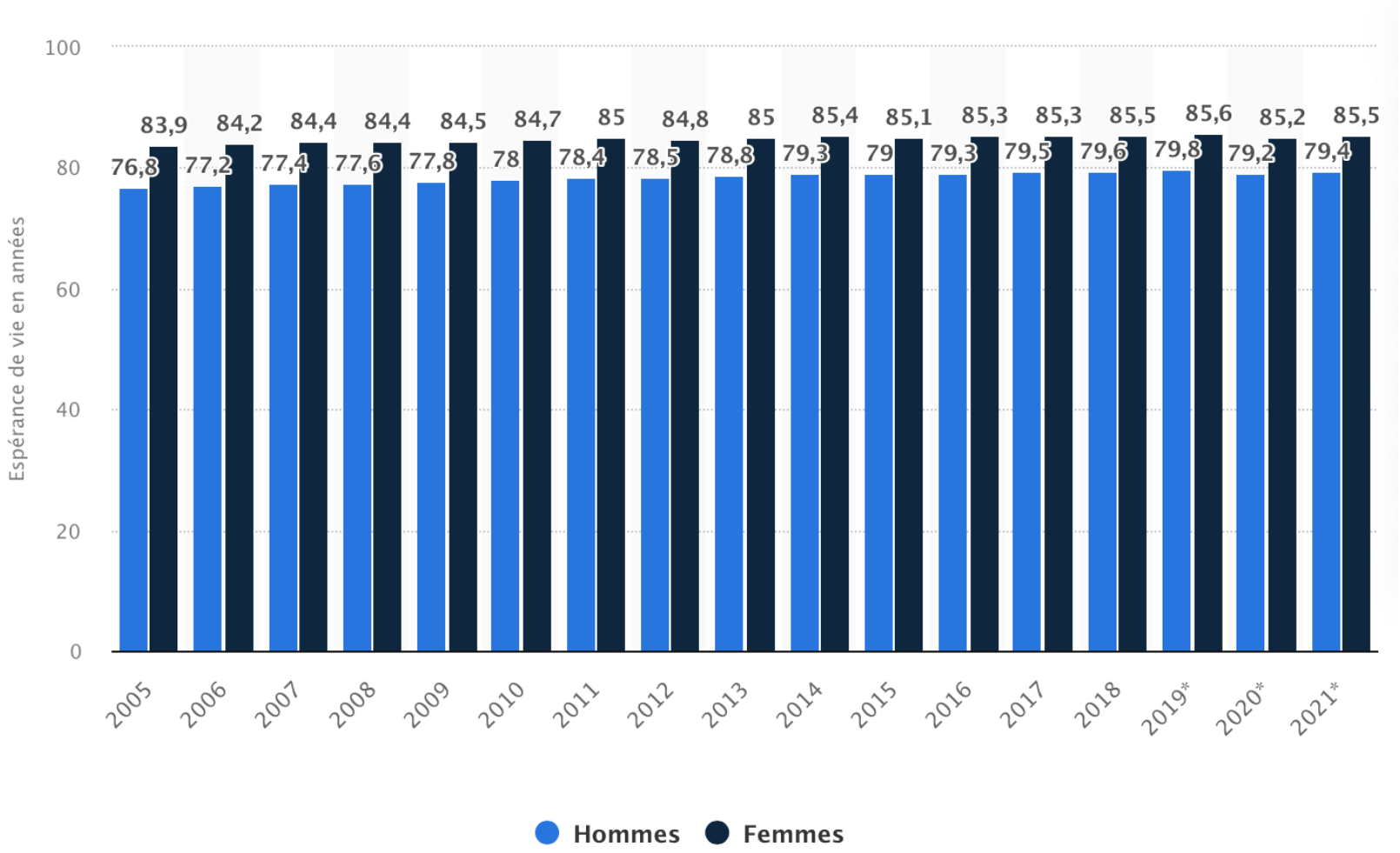

TOULON
SŒUR ANDRÉ FÊTE
SES 118 ANS

Espérance de vie en France, UK & USA



Source: Banque mondiale

Espérance de vie en France métropolitaine par sexe 2005-2021



Hazard ratios for aneurysm-related mortality by time since operation for those who underwent surgery

	EVAR-1 (*n* = 1216)	DREAM (*n* = 343)	OVER (*n* = 868)	ACE (*n* = 297)	Pooled (*n* = 2724)
Proportion of patients who died*					
All patients					
EVAR	31 of 614 (0·9)	6 of 170 (0·7)	9 of 439 (0·4)	7 of 150 (1·7)	53 of 1373 (0·8)
Open repair	32 of 602 (1·0)	10 of 173 (1·1)	13 of 429 (0·6)	1 of 147 (0·3)	56 of 1351 (0·8)
Time since operation					
0–30 days					
EVAR	11 of 614 (22·0)	2 of 170 (14·3)	1 of 439 (2·8)	2 of 150 (16·4)	16 of 1373 (14·2)
Open repair	26 of 602 (53·7)	5 of 173 (35·5)	8 of 429 (22·9)	1 of 147 (8·3)	40 of 1351 (36·5)
31 days to 3 years					
EVAR	7 of 603 (0·4)	2 of 168 (0·4)	5 of 438 (0·4)	4 of 148 (1·1)	18 of 1357 (0·5)
Open repair	4 of 576 (0·3)	5 of 168 (1·1)	4 of 421 (0·3)	0 of 146 (0)	13 of 1311 (0·4)
> 3 years					
EVAR	13 of 498 (0·8)	2 of 140 (0·5)	3 of 380 (0·3)	1 of 78 (2·3)	19 of 1096 (0·6)
Open repair	2 of 484 (0·1)	0 of 146 (0)	1 of 352 (0·1)	0 of 72 (0)	3 of 1054 (0·1)
Unadjusted hazard ratio*					
All patients	0·94	0·61	0·68	6·86	0·89

- **strong relative advantage for the EVAR group in the first 30 days;**
- **between 30 days and 3 years there was no difference between the groups,**
- **but after 3 years there was a significant relative advantage for the open repair group, with three aneurysm-related deaths versus 19 in the EVAR groups (hazard ratio 5·16, 1·49 to 17·89; P =0·010)**

Systematic review

Meta-analysis of individual-patient data from EVAR-1, DREAM, OVER and ACE trials comparing outcomes of endovascular or open repair for abdominal aortic aneurysm over 5 years

J. T. Powell[1], M. J. Sweeting[2], P. Ulug[1], J. D. Blankensteijn[3], F. A. Lederle[4], J.-P. Becquemin[5] and R. M. Greenhalgh[1], on behalf of the EVAR-1, DREAM, OVER and ACE Trialists

[1]Vascular Surgery Research Group, Imperial College London, London, and [2]Department of Public Health and Primary Care, University of Cambridge, Cambridge, UK, [3]Department of Surgery, VU Medical Centre, Amsterdam, The Netherlands, [4]Department of Medicine, VA Medical Centre, Minneapolis, Minnesota, USA, and [5]Vascular Institute of Paris East, Hôpital Privé Paul d'Egine, Champigny, Université, Paris-Est Créteil, Créteil, France

Correspondence to: Professor R. M. Greenhalgh, Vascular Surgery Research Group, Imperial College London, London W6 8RP, UK (e-mail: r.greenhalgh@imperial.ac.uk)

Background: The erosion of the early mortality advantage of elective endovascular aneurysm repair (EVAR) compared with open repair of abdominal aortic aneurysm remains without a satisfactory explanation.

Methods: An individual-patient data meta-analysis of four multicentre randomized trials of EVAR *versus* open repair was conducted to a prespecified analysis plan, reporting on mortality, aneurysm-related mortality and reintervention.

Results: The analysis included 2783 patients, with 14 245 person-years of follow-up (median 5·5 years). Early (0–6 months after randomization) mortality was lower in the EVAR groups (46 of 1393 *versus* 73 of 1390 deaths; pooled hazard ratio 0·61, 95 per cent c.i. 0·42 to 0·89; $P = 0·010$), primarily because 30-day operative mortality was lower in the EVAR groups (16 deaths *versus* 40 for open repair; pooled odds ratio 0·40, 95 per cent c.i. 0·22 to 0·74). Later (within 3 years) the survival curves converged, remaining converged to 8 years. Beyond 3 years, aneurysm-related mortality was significantly higher in the EVAR groups (19 deaths *versus* 3 for open repair; pooled hazard ratio 5·16, 1·49 to 17·89; $P = 0·010$). Patients with moderate renal dysfunction or previous coronary artery disease had no early survival advantage under EVAR. Those with peripheral artery disease had lower mortality under open repair (39 deaths *versus* 62 for EVAR; $P = 0·022$) in the period from 6 months to 4 years after randomization.

Conclusion: The early survival advantage in the EVAR group, and its subsequent erosion, were confirmed. Over 5 years, patients of marginal fitness had no early survival advantage from EVAR compared with open repair. Aneurysm-related mortality and patients with low ankle : brachial pressure index contributed to the erosion of the early survival advantage for the EVAR group. Trial registration numbers: EVAR-1, ISRCTN55703451; DREAM (Dutch Randomized Endovascular Aneurysm Management), NCT00421330; ACE (Anévrysme de l'aorte abdominale, Chirurgie *versus* Endoprothèse), NCT00224718; OVER (Open *Versus* Endovascular Repair Trial for Abdominal Aortic Aneurysms), NCT00094575.

Presented to the Charing Cross International Symposium, London, UK, April 2016

Paper accepted 26 September 2016

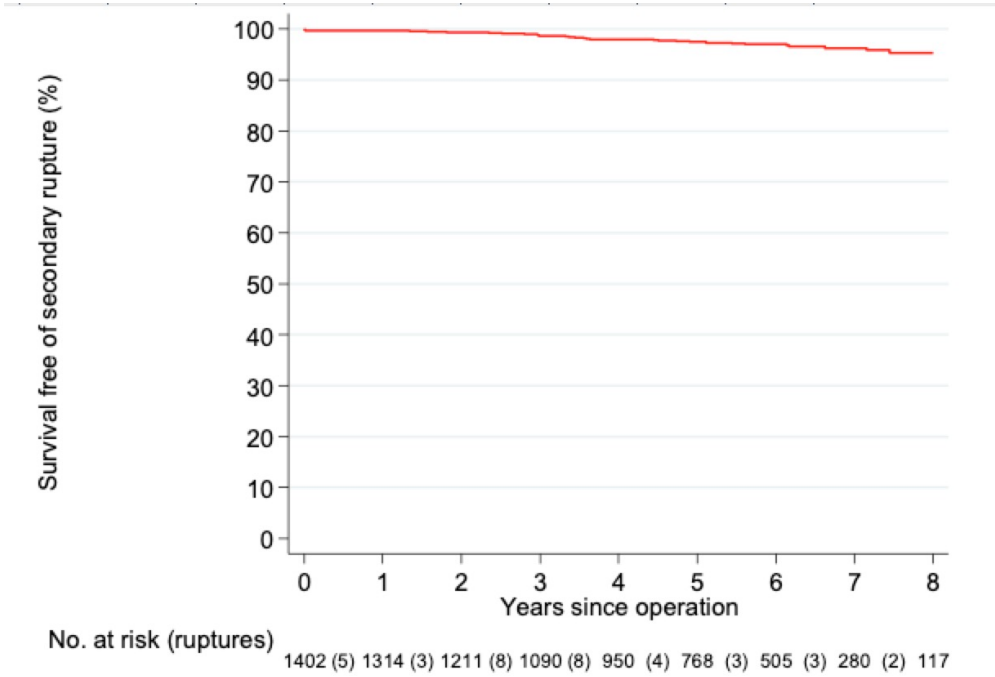
Published online in Wiley Online Library (www.bjs.co.uk). **DOI:** 10.1002/bjs.10430

Introduction

Open repair of abdominal aortic aneurysm (AAA) was first introduced by Dubost in 1951[1]. In the 1990s, the less invasive endovascular aneurysm repair (EVAR) was introduced; EVAR-1[2], the first multicentre randomized the UK. This was soon followed by the DREAM[3] and ACE[4] multicentre trials in Europe, and the OVER trial[5] in the USA.

Each of the randomized trials of EVAR *versus* open repair recruited patients (suitable for either open or endovas-

❑ **Late aneurysm ruptures had mostly jeopardized EVAR outcomes long term.**



PLAUSIBLE REASONS

- If we considered the randomised trials included in the NICE assessment
- They were outdated (inclusion avant 2004)
- Earlier-generation devices were used, which might have poorer long-term outcomes,
- Loose follow-up protocol

Systematic review

Meta-analysis of individ
OVER and ACE trials co
open repair for abdomin

J. T. Powell[1], M. J. Sweeting[2], P. Ulug
R. M. Greenhalgh[1], on behalf of the E

[1]Vascular Surgery Research Group, Imperial College Lon
Cambridge, UK, [3]Department of Surgery, VU Medical C
Minneapolis, Minnesota, USA, and [5]Vascular Institute of
France
Correspondence to: Professor R. M. Greenhalgh, Vascular S
(e-mail: r.greenhalgh@imperial.ac.uk)

Background: The erosion of the early
(EVAR) compared with open repair o
explanation.
Methods: An individual-patient data met
open repair was conducted to a prespe
mortality and reintervention.
Results: The analysis included 2783 pat
Early (0–6 months after randomization)
1390 deaths; pooled hazard ratio 0·61, 95
operative mortality was lower in the EV
ratio 0·40, 95 per cent c.i. 0·22 to 0·74).
converged to 8 years. Beyond 3 years, an
groups (19 deaths *versus* 3 for open repa
with moderate renal dysfunction or previo
EVAR. Those with peripheral artery dise

❑ Late aneur
mostly jeop
outcomes l

❑ Need for re
surveillanc

Introduction

Open repair of abdominal aortic aneurysm
first introduced by Dubost in 1951[1]. In th
less invasive endovascular aneurysm repair
introduced; EVAR-1[2], the first multicentre

Multicenter Study › Ann Sur

Rate and predictal
endovascular and
repair: data from

Thomas R Wyss [1], Louise C Brow

Affiliations

PMID: 210

Abstrac

Objective
repair (EVA

Backgrou
complicati

Methods: By July 2009, a total o
United Kingdom EVAR trials 1 and
and rupture. The incidence of rup
complications in a Cox regressior

Results: There were no ruptures
during a mean follow-up of 4·8 ye

❑ Half of the survivors wer
undergoing annual imagi
follow-up at 6 years after
randomization

❑ This had declined to 10%
years in the EVAR-1 trial
reported the longer follo
data

Original article

Predicting risk of rupture and rup
reinterventions following endova
aneurysm repair

I. Grootes[1], J. K. Barrett[1,2], P. Ulug[3], F. Rohlffs[3],
R. M. Greenhalgh[3] and M. J. Sweeting[1,4]

[1]Department of Public Health and Primary Care and [2]Medical Research Cou
Surgery Research Group, Imperial College London, Charing Cross Hospital,
Leicester, UK, and [5]Department of Vascular Surgery, University of Helsinki a
Correspondence to: Ms I. Grootes, Department of Public Health and Primary C
Cambridge CN1 8RN, UK (e-mail: ig345@medschl.cam.ac.uk)

Background: Clinical and imaging surveillance practices fo

Published online in Wiley Online Library (www.bjs.co.uk). DOI:

Introduction

Endovascular aneurysm repair (EVAR) has become the primary choice of repair for many patients with an intact abdominal aortic aneurysm (AAA)[1] and is a less invasive alternative to traditional open repair of AAA. Evidence from RCTs of EVAR *versus* open repair has shown that EVAR has an early mortality benefit; however, this survival benefit is eroded within a few years after operation[2–5], with significantly higher AAA-related mortality and rates

Endovascular versus open repair of abdominal aortic aneurysm in 15-years' follow-up of the UK endovascular aneurysm repair trial 1 (EVAR trial 1): a randomised controlled trial

*Rajesh Patel, Michael J Sweeting, Janet T Powell, Roger M Greenhalgh, for the EVAR trial investigators**

Lancet 2016; 388: 2366–74
Published Online October 12, 2016 http://dx.doi.org/10.1016/S0140-6736(16)31135-7
See Comment page 2326

*The EVAR trial investigators are listed in the appendix
Vascular Surgery Research Group, Imperial College London, London, UK (R Patel PhD, Prof J T Powell MD, Prof R M Greenhalgh MD); **and Cardiovascular Epidemiology Unit, Department of Public Health and Primary Care, University of Cambridge, Cambridge, UK** (M J Sweeting PhD)
Correspondence to: Prof Roger M Greenhalgh, Vascular Surgery Research Group, Imperial College London, London W6 8RP, UK
r.greenhalgh@imperial.ac.uk

See Online for appendix

Summary

Background Short-term survival benefits of endovascular aneurysm repair (EVAR) versus open repair of intact abdominal aortic aneurysms have been shown in randomised trials, but this early survival benefit is lost after a few years. We investigated whether EVAR had a long-term survival benefit compared with open repair.

Methods We used data from the EVAR randomised controlled trial (EVAR trial 1), which enrolled 1252 patients from 37 centres in the UK between Sept 1, 1999, and Aug 31, 2004. Patients had to be aged 60 years or older, have aneurysms of at least 5·5 cm in diameter, and deemed suitable and fit for either EVAR or open repair. Eligible patients were randomly assigned (1:1) using computer-generated sequences of randomly permuted blocks stratified by centre to receive either EVAR (n=626) or open repair (n=626). Patients and treating clinicians were aware of group assignments, no masking was used. The primary analysis compared total and aneurysm-related deaths in groups until mid-2015 in the intention-to-treat population. This trial is registered at ISRCTN (ISRCTN55703451).

Findings We recruited 1252 patients between Sept 1, 1999, and Aug 31, 2004. 25 patients (four for mortality outcome) were lost to follow-up by June 30, 2015. Over a mean of 12·7 years (SD 1·5; maximum 15·8 years) of follow-up, we recorded 9·3 deaths per 100 person-years in the EVAR group and 8·9 deaths per 100 person-years in the open-repair group (adjusted hazard ratio [HR] 1·11, 95% CI 0·97–1·27, p=0·14). At 0–6 months after randomisation, patients in the EVAR group had a lower mortality (adjusted HR 0·61, 95% CI 0·37–1·02 for total mortality; and 0·47, 0·23–0·93 for aneurysm-related mortality, p=0·031), but beyond 8 years of follow-up open-repair had a significantly lower mortality (adjusted HR 1·25, 95% CI 1·00–1·56, p=0·048 for total mortality; and 5·82, 1·64–20·65, p=0·0064 for aneurysm-related mortality). The increased aneurysm-related mortality in the EVAR group after 8 years was mainly attributable to secondary aneurysm sac rupture (13 deaths [7%] in EVAR *vs* two [1%] in open repair), with increased cancer mortality also observed in the EVAR group.

Interpretation EVAR has an early survival benefit but an inferior late survival compared with open repair, which needs to be addressed by lifelong surveillance of EVAR and re-intervention if necessary.

❑ Most notably, many of these patients underwent long-term follow-up with only DUS due to concerns regarding radiation exposure

lost (catch-up of mortality) in these randomised controlled trials after 2 years (in the UK Endovascular Aneurysm Repair trial 1 [EVAR trial 1]),[6] 1–2 years

Queensland, Australia, reported no differences in 5-year, 10-year, and 15-year survival between open repair (n=982; median follow-up 6·5 years) and EVAR (n=358; median

Is it adequate to follow-up patients after EVAR based mainly or exclusively on DUS?

ORIGINAL ARTICLE

Computed Tomography-Aortography Versus Color-Duplex Ultrasound for Surveillance of Endovascular Abdominal Aortic Aneurysm Repair

A Prospective Multicenter Diagnostic-Accuracy Study (the ESSEA Trial)

Elixène Jean-Baptiste ✉, Patrick Feugier, Coralie Cruzel, Gabrielle Sarlon-Bartoli, Thierry Reix, Eric Steinmetz, Xavier Chaufour, Bertrand Chavent, Lucie Salomon du Mont, Meghann Ejargue, Blandine Maurel, Rafaelle Spear, Dominique Midy, Fabien Thaveau

- ❑ **Long-term imaging follow-up is not only being performed insufficiently after EVAR, but might be also wrongly conducted when based mainly or exclusively on DUS.**
- ❑ **This could account for some unexpected aneurysm-related deaths reported mid- or long-term in the previous prospective trials**

Circulation: Cardiovascular Imaging

ELECTIVE AAA REPAIR

- Vascular anatomy assessment
- Operative risk assessment and optimisation (physiological reserves and fitness for surgery)
- Life expectancy
- Patient preferences (needs, expectations, sexual function, lifelong surveillance…)

Operative risk assessment

- Open aortic repair as a high risk intervention (risk of cardiovascular death or MI ≥ 5% within 30 days)

- EVAR is graded as an intermediate risk intervention
  - (cardiac risk between 1% and 5%)

Guidelines and Scientific Documents

ESC
European Society of Cardiology

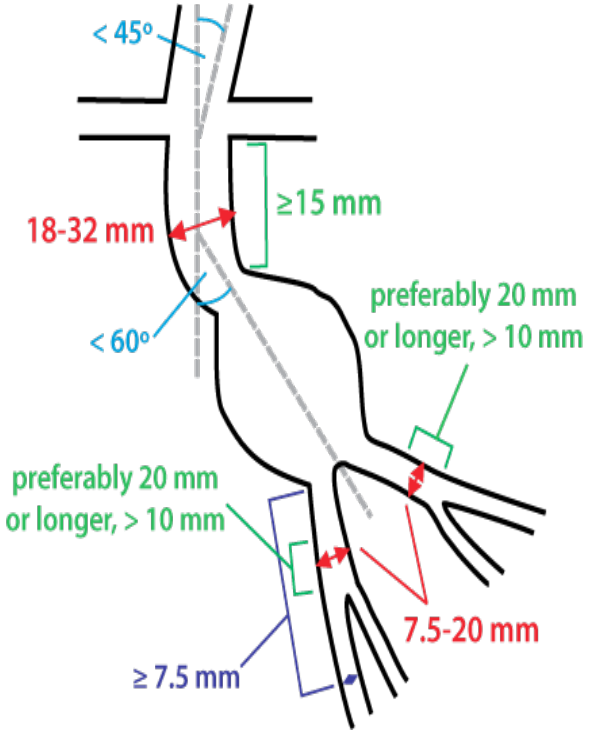
Early recovery after surgery (ERAS) after open AAA repair (RAAC).

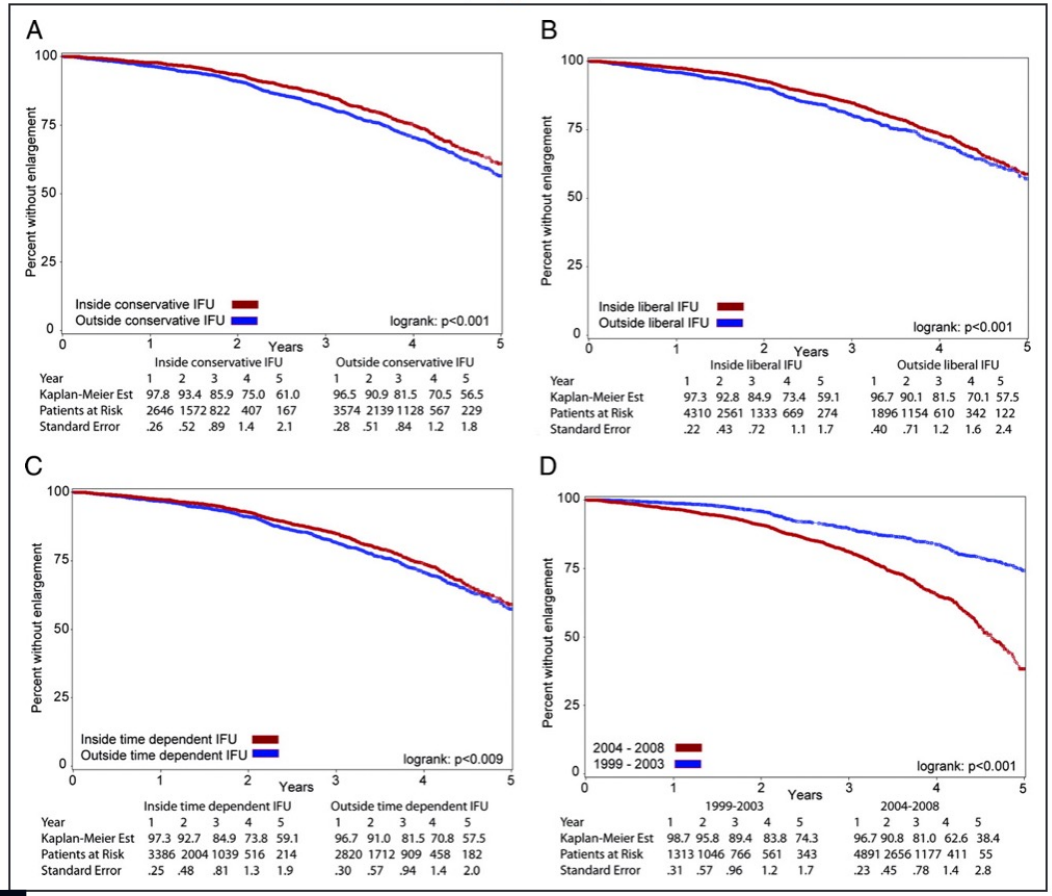
- Parcours de soin intégré multidisciplinaire
- Counselling préopératoire complet (préparation mentale)
- Anesthésie épidurale péri-opératoire
- Abords chirurgicaux mini-invasifs
- Analgésie optimale (limiter les effets secondaires des opiacés)
- Mobilisation précoce
- Reprise précoce de l'alimentation orale
- Eviter ou ablation précoce SNG, Drains, Foley cathéter

Predictors of Abdominal Aortic Aneurysm Sac Enlargement After Endovascular Repair

Andres Schanzer ✉, Roy K. Greenberg, Nathanael Hevelone, William P. Robinson, Mohammad H. Eslami, Robert J. Goldberg and Louis Messina

Originally published 10 Apr 2011 | https://doi.org/10.1161/CIRCULATIONAHA.110.014902 | Circulation. 2011;123:2848–2855





June 21, 2011
Vol 123, Issue 24

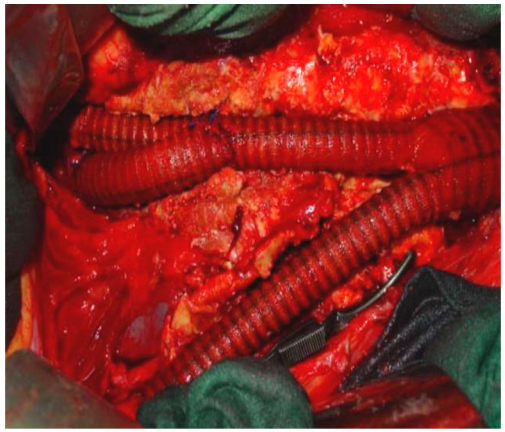
Acquis ✓

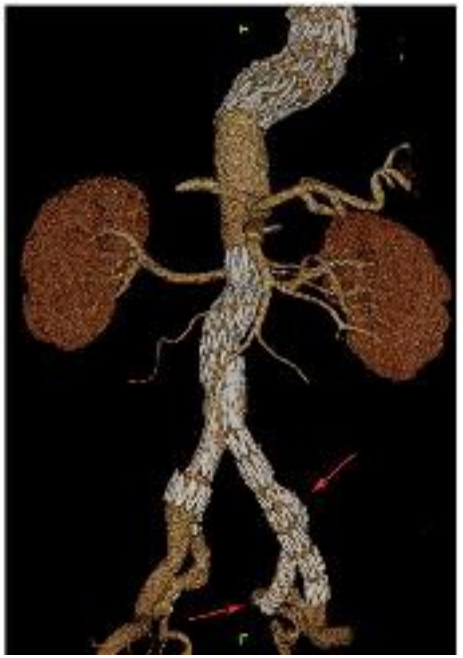
❑ Respect des IFU

Vascular anatomy assessment.

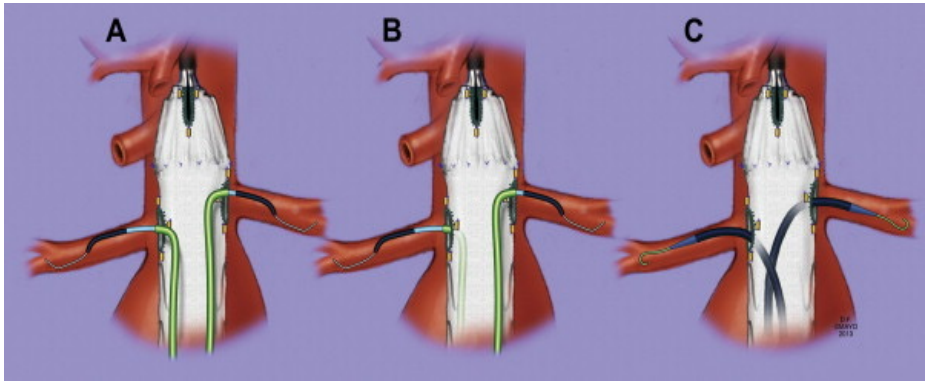
PRÉSERVATION DE LA CIRCULATION PELVIENNE

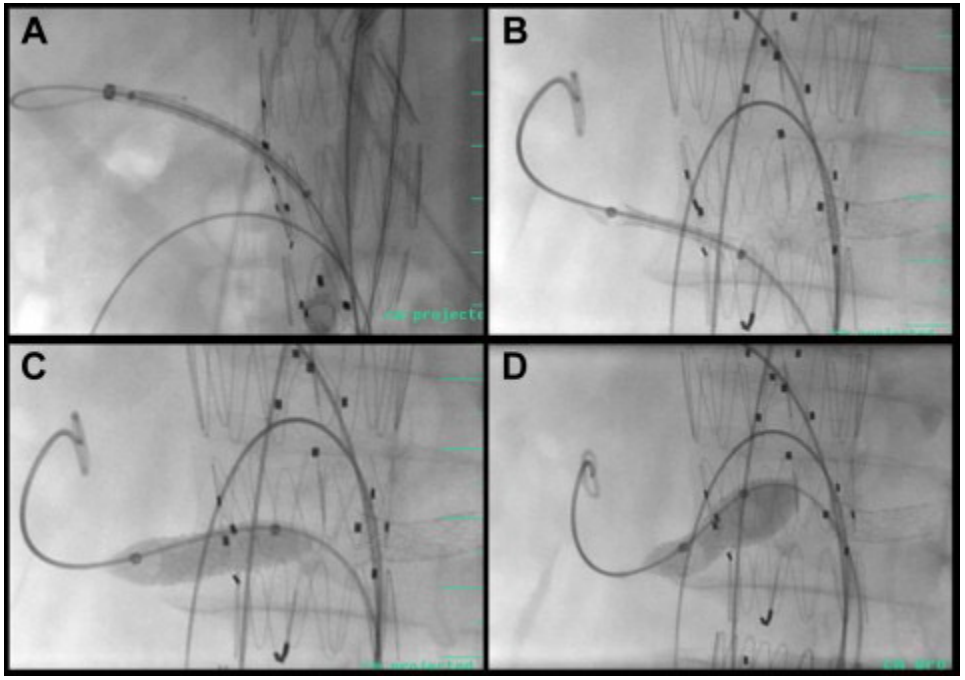
- INTÉRÊTS:
  - ❑ **Dysfonctionnement sexuel post-opérat**
  - ❑ **Claudication fessière**
  - ❑ **Ischémie colique**
  - ❑ **Ischémie médullaire (paraplégie, paraparésie)**



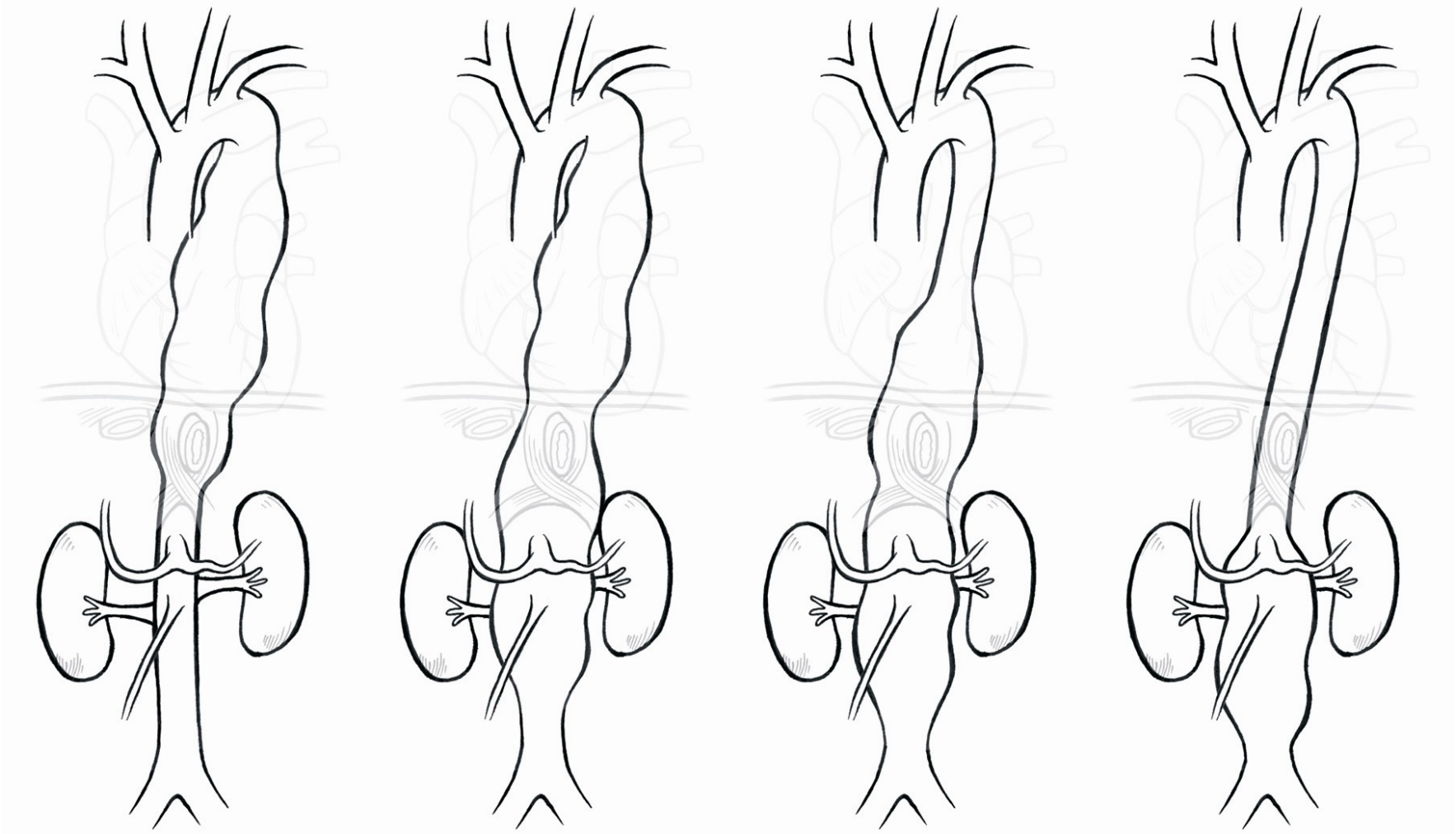


F-EVAR: Principes

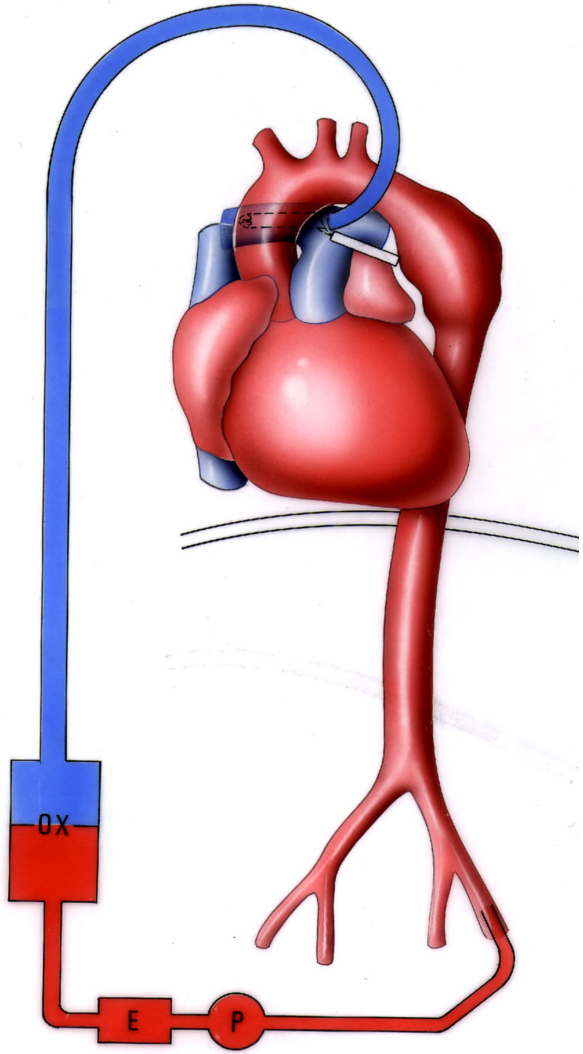


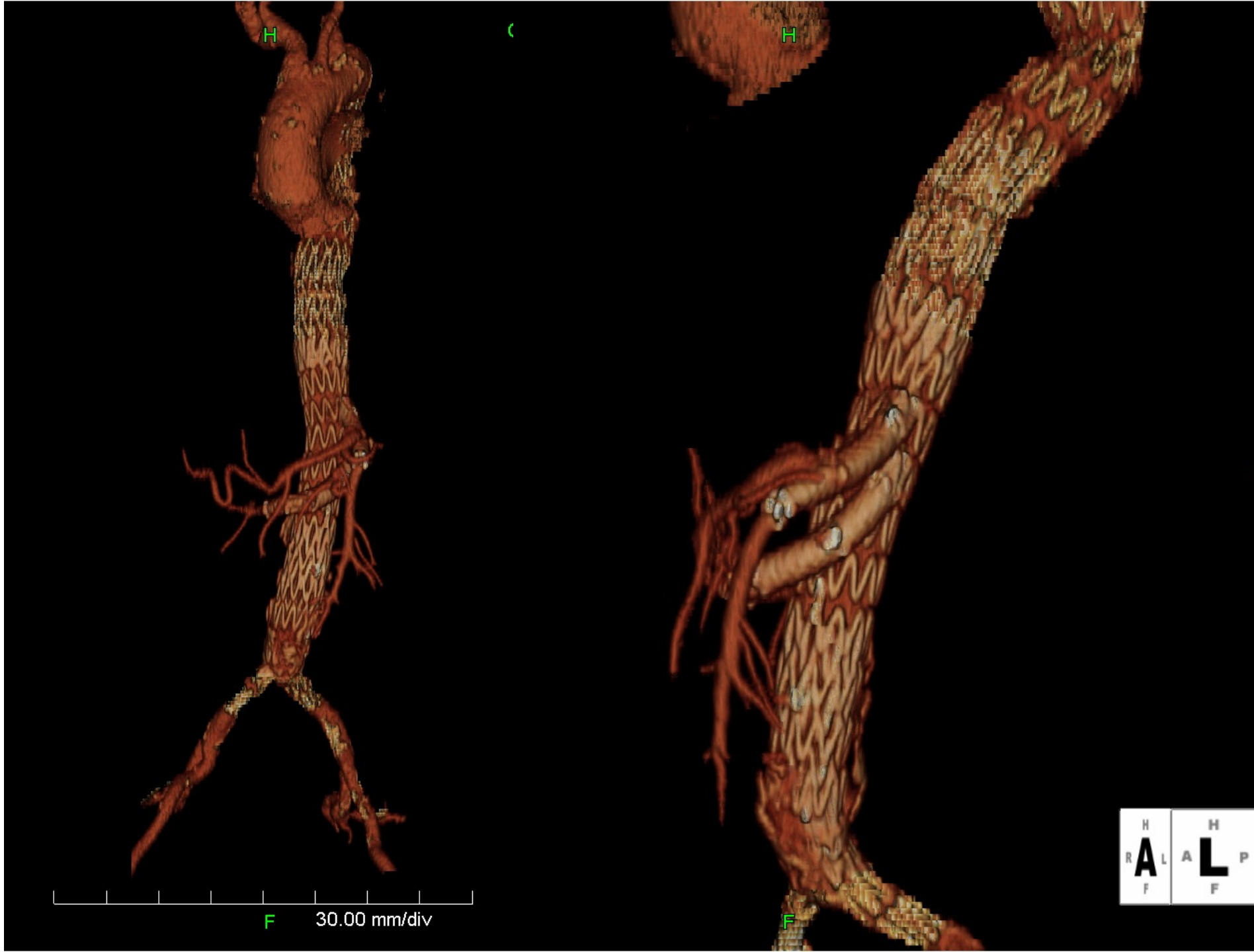


ANÉVRISMES THORACO-ABDOMINAUX
Classification



ATA I; II; III
Traitement Chirurgical Conventionnel




H
H
F
30.00 mm/div
F
H
R
A
L
F
H
A
L
P
F

Eur J Vasc Endovasc Surg (2019) 57, 8—93

Editor's Choice — European Society for Vascular Surgery (ESVS) 2019 Clinical Practice Guidelines on the Management of Abdominal Aorto-iliac Artery Aneurysms

Recommendation 60

In most patients with suitable anatomy and reasonable life expectancy, endovascular abdominal aortic aneurysm repair should be considered as the preferred treatment modality

Class	Level	References
IIa	B	[7,22,341,293,352,52,53,359, 23,357,343,28,345,11,361,29, 344,30,342,360,350,203, 204,351]

Recommendation 61

In patients with long life expectancy, open abdominal aortic aneurysm repair should be considered as the preferred treatment modality

Class	Level	References
IIa	B	[21,22,341,23,343,28,345, 29,344,30,342]

Recommendation 62

In patients with limited life expectancy, elective abdominal aortic aneurysm repair is not recommended

Class	Level	References
III	B	[52,53,203,204]

Nearly all the evidence suggests a significant short-term survival benefit for EVAR over OSR, with a similar long-term outcome up to 15 years of follow up. Yet, there are indications that an increased rate of complications may occur after 8—10 years with earlier generation EVAR devices and uncertain durability of current devices, particular the low profile devices. Thus, although EVAR should be considered the preferred treatment modality in most patients, it is reasonable to suggest an OSR first strategy in younger, fit patients with a long life expectancy >10—15 years. The normal (average) survival after elective AAA repair is about 9 years.[353] Conversely, elective AAA repair is not recommended in patients with limited life expectancy, e.g. in patients with terminal cancer or severe cardiac failure. A pragmatic definition of "limited life expectancy" is less than 2—3 years.

Recommendation 95	Class	Level	References
In patients with juxtarenal abdominal aortic aneurysm, open repair or complex endovascular repair should be considered based on patient status, anatomy, local routines, team experience, and patient preference.	IIa	C	[524,570]

Recommendation 96	Class	Level	References
In complex endovascular repair of juxtarenal abdominal aortic aneurysm, endovascular repair with fenestrated stent grafts should be considered the preferred treatment option when feasible.	IIa	C	[568]

Recommendation 97	Class	Level	References
In complex endovascular repair for juxtarenal abdominal aortic aneurysm, using parallel graft techniques may be considered as an alternative in the emergency setting or when fenestrated stent grafts are not indicated or available, or as a bailout, ideally restricted to $\leq$2 chimneys.	IIb	C	[165]

Recommendation 98	Class	Level	References
In patients with juxtarenal abdominal aortic aneurysm, new techniques/concepts, including endovascular aneurysm seal, endostaples, and in situ laser fenestration, are not recommended as first line treatment, but should be limited to studies approved by research ethics committees, until adequately evaluated.	III	C	[142,224,313, 460,687]

Editor's Choice — European Society for Vascular Surgery (ESVS) 2019 Clinical Practice Guidelines on the Management of Abdominal Aorto-iliac Artery Aneurysms

Recommendation 2	Class	Level	References
It is recommended that centres or networks of collaborating centres treating patients with abdominal aortic aneurysms can offer both endovascular and open aortic surgery at all times.	I	B	[50,70,237,287—289,378,386,541,558,606]

Recommendation 3	Class	Level	References
Abdominal aortic aneurysm repair should only be considered in centres with a minimum yearly caseload of 30 repairs.	IIa	C	[64,278,328,788]

Recommendation 4	Class	Level	References
Abdominal aortic aneurysm repair should not be performed in centres with a yearly caseload <20.	III	B	[124,160,174,277,329,378,435,526,531]

Merci de votre attention

chu de Nice