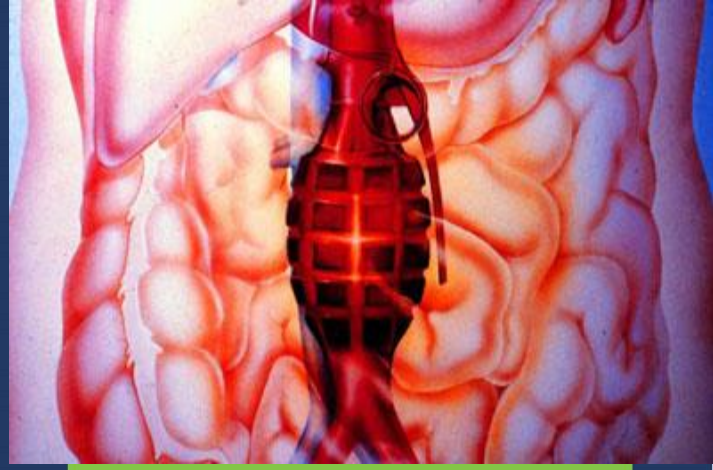
2018 MID-ATLANTIC
CONFERENCE

8th ANNUAL CURRENT CONCEPTS IN
VASCULAR THERAPIES

2018



Richard DeMasi, MD

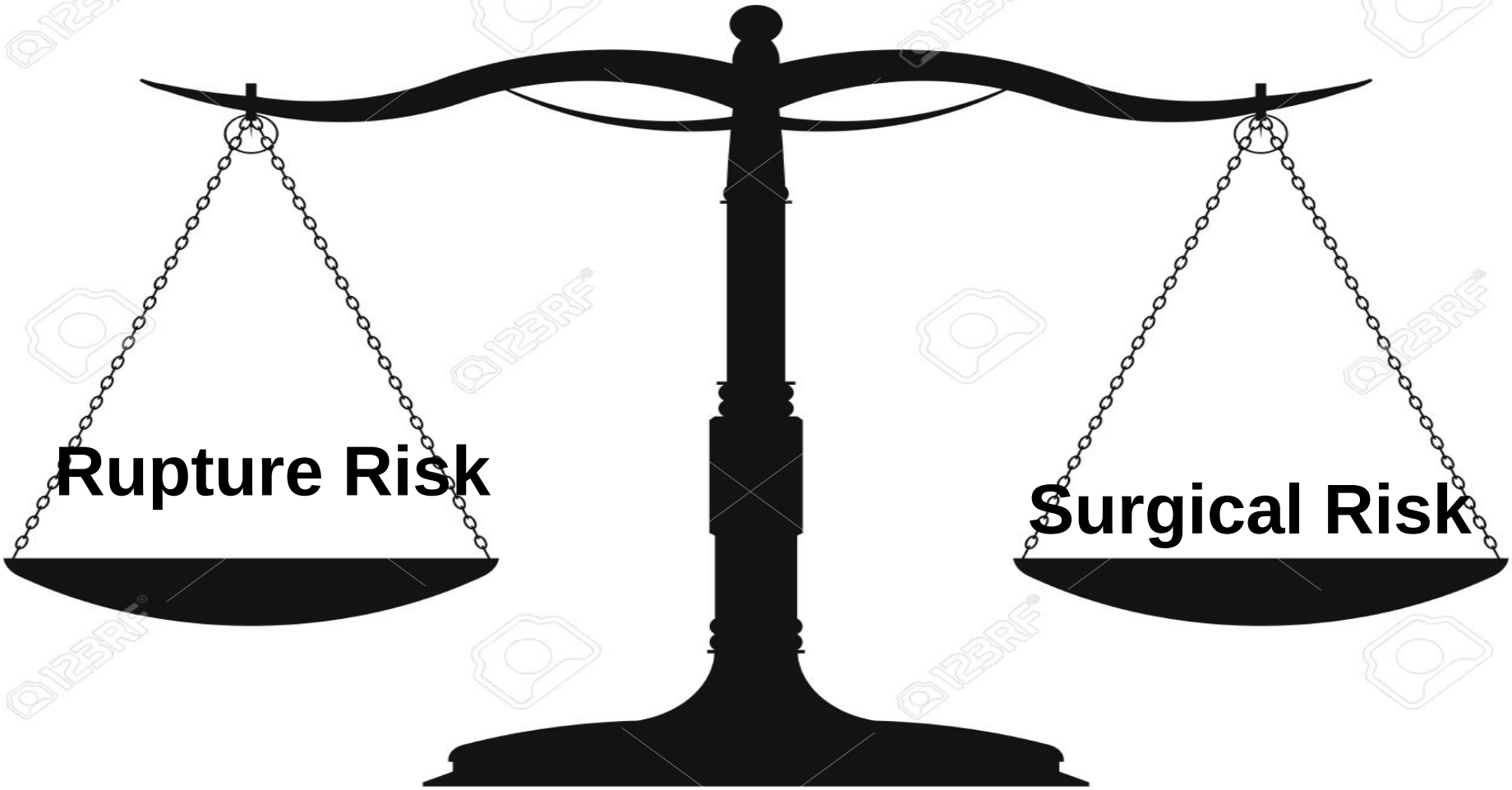
4/28/18

Aneurysm Repair Techniques: An Overview of Indicators for and Types of Repair

About 1 million Americans

190,00 diagnosed per year

50,000 AAA repairs per year



+ Life Expectancy

WHAT DETERMINES RUPTURE RISK ?

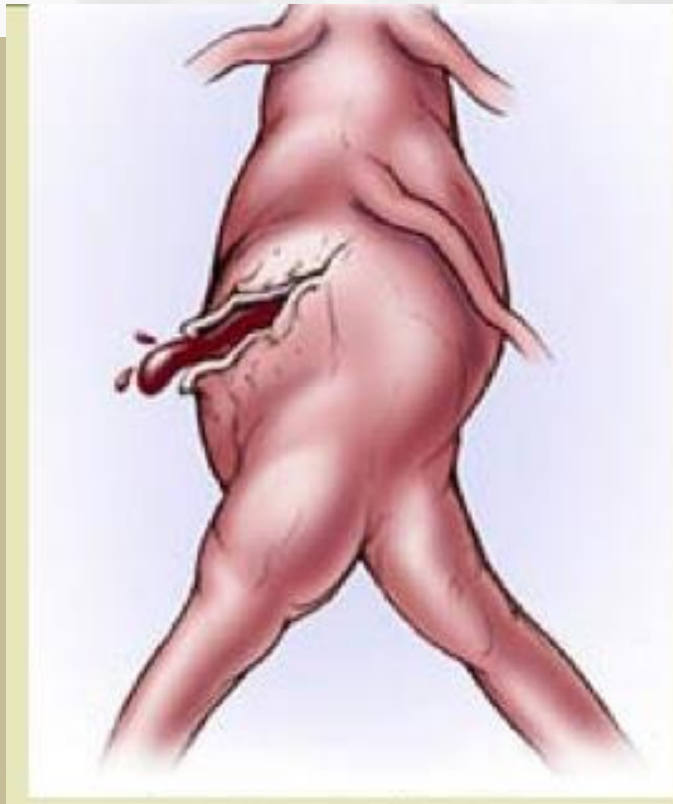
- SIZE (DIAMETER)
- DIAMETER
- DIAMETER
- SMOKING
- Hypertension, COPD
- Rapid expansion over time
- Saccular, Female

Annual Risk of Rupture

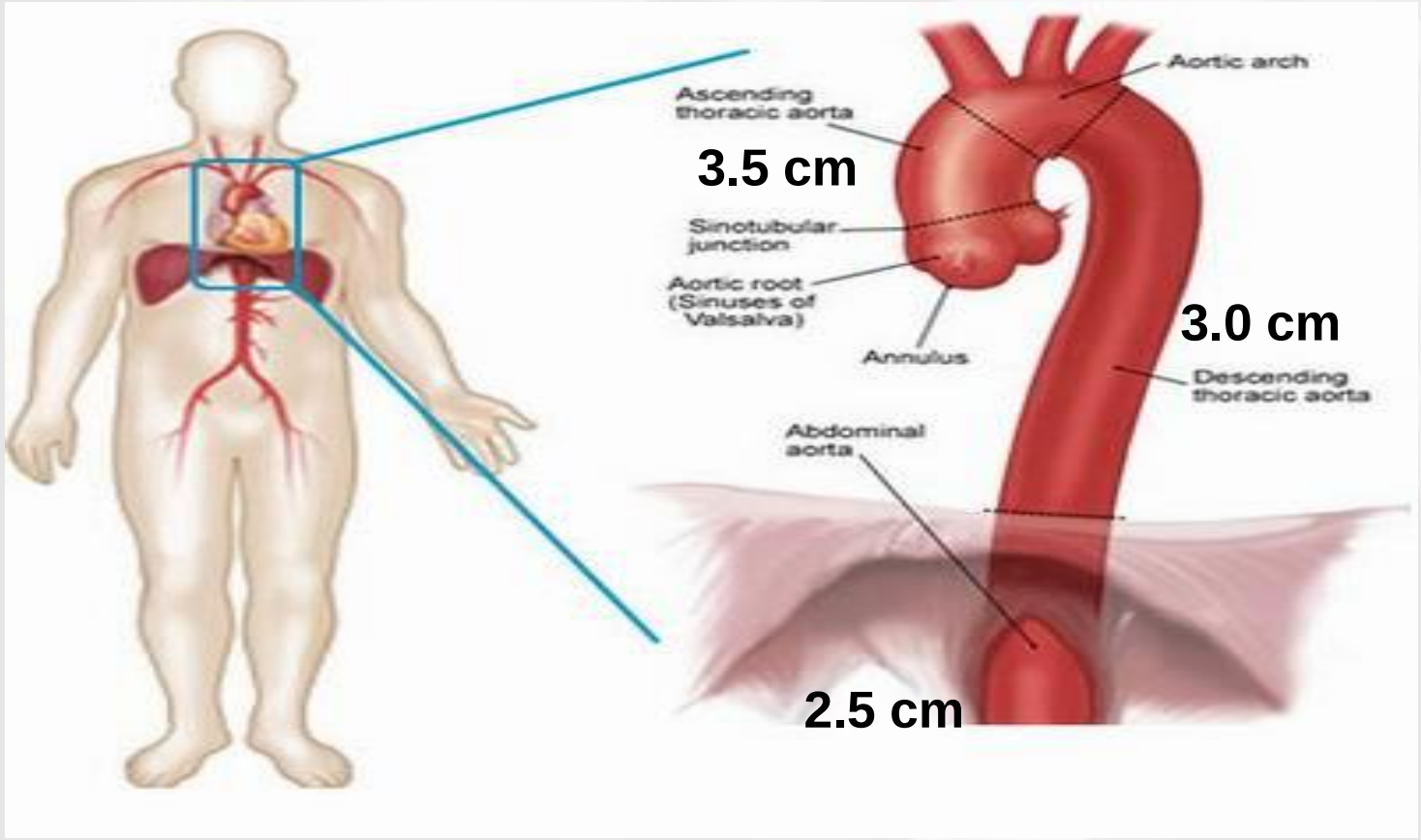
Diameter		Risk of Rupture
– < 4 cm	→	<1%
– 4 – 4.9	→	1-2%
– 5 – 5.9 cm	→	5-15%
– 6 – 6.9 cm	→	10-25%
– 7 – 7.9	→	20-40%
– > 8 cm	→	30-60%

Outcome following Aneurysm Rupture

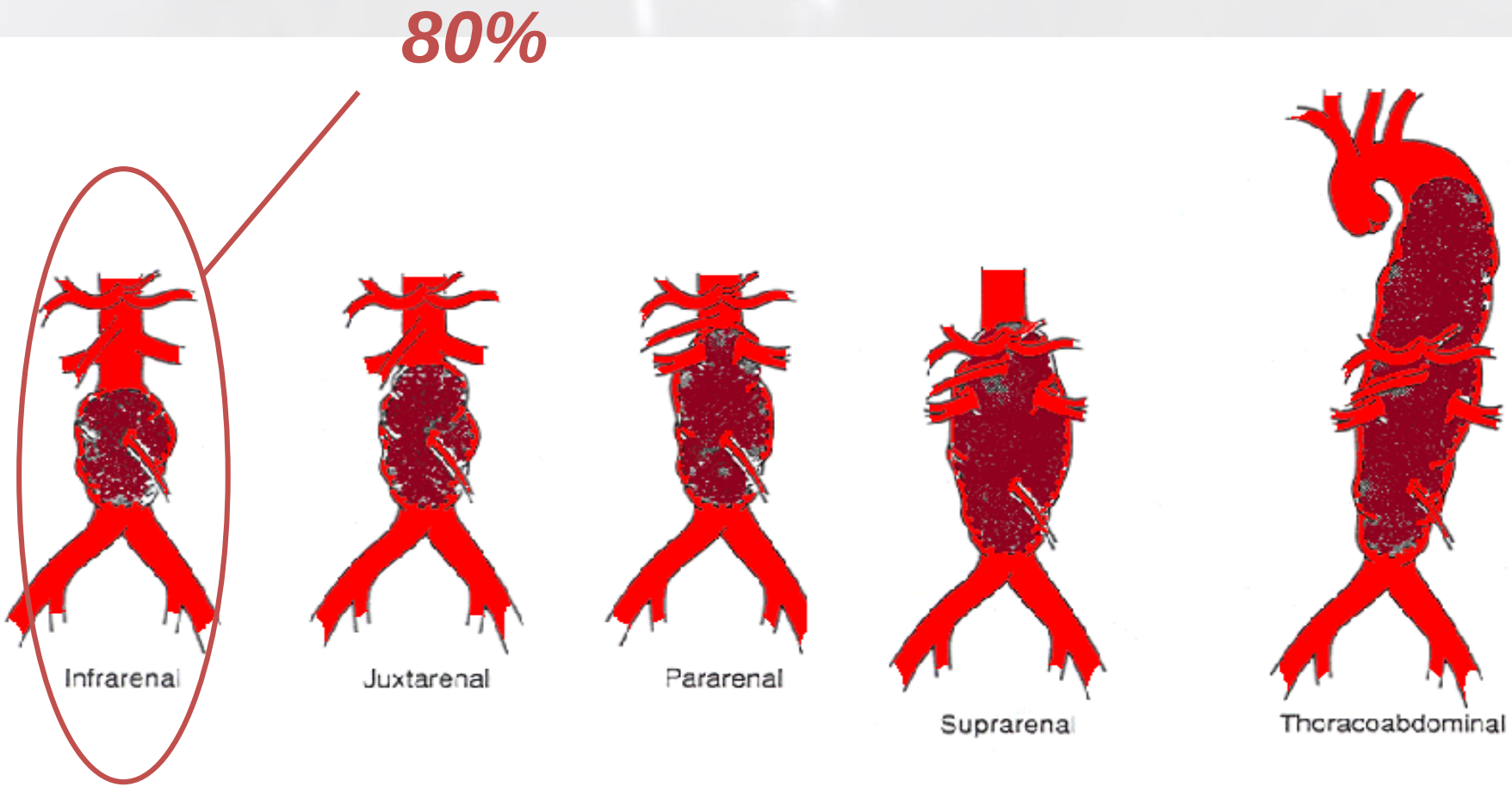
- **Immediate Death** 50%
- **Emergent Repair** 50%
- **Operative Mortality** 50 -90%
- **Overall Mortality** 90 %



Basic Aortic Anatomy



AAA Classification



Definitions and Diagnosis

- Most aneurysms found incidentally
  - CT scan/Ultrasound for other indication
  - Physical Examination
- Some familial association
  - 15% of patients with AAA have affected relative

Screening and Evaluation

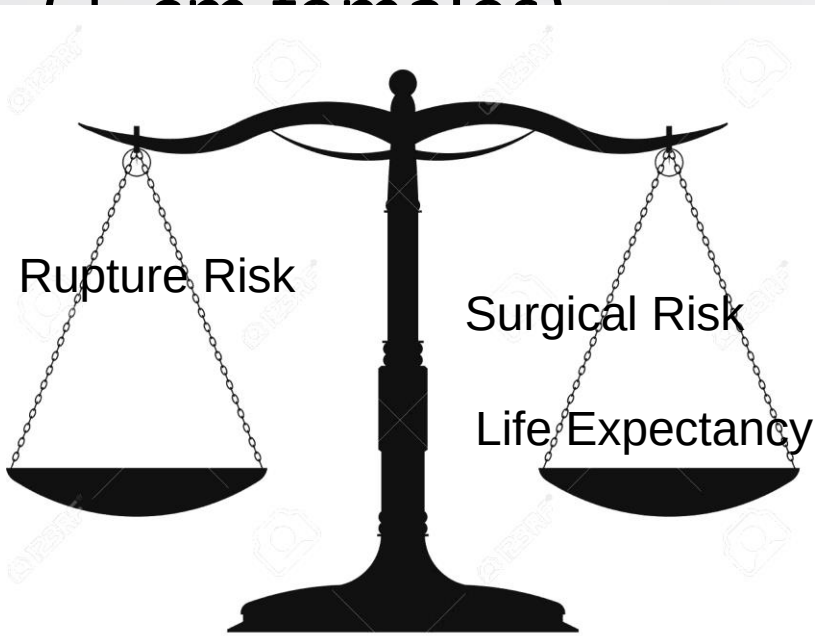
- **Physical Exam**
  - AAA size,
  - obesity of the patient,
  - skill of the examiner,
  - focus of the examination
  - 29% of AAAs 3 to 3.9 cm
  - 50% of AAAs 4 to 4.9 cm
  - 75% of AAAs 5 cm or larger

SAAAVE ACT

- **Medicare Guidelines**:
  - Referral for the AAA ultrasound screening from a physician or other qualified non-physician practitioner as a result of their "Welcome to Medicare" physical exam.
  - He or she has never had an AAA ultrasound screening paid for by Medicare.
  - The person with Medicare has at least one of the following risk factors:
    - **man or woman with a family history of abdominal aortic aneurysm**
    - **a man age 65 to 75 who has smoked at least 100 cigarettes in his lifetime**

Indications for Repair

- Emergent Repair for ruptured AAA
- Urgent Repair for Symptomatic AAA
- 5.5 cm or greater for elective repair with reasonable life expectancy (~5 cm females)
- ***Rapid growth***
  - ***5 mm in 6 months or 10 mm 1 y***
- ***Treatment of an Asymptomat… indicated when the risk of rup… risk of operation.***



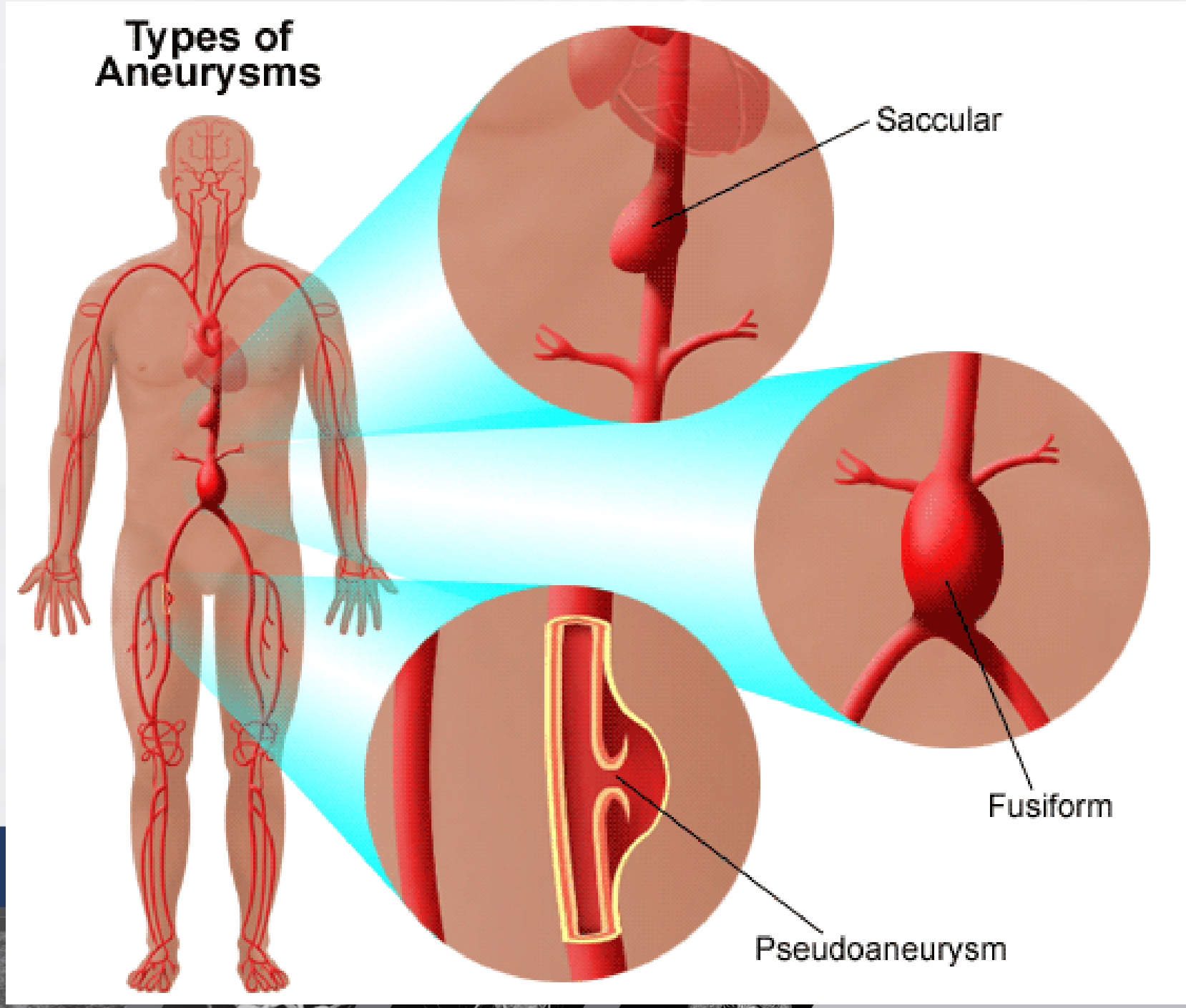
Indications for Repair

- After size threshold ……..
- Operative Risk
- Life Expectancy

The Society for Vascular Surgery practice guidelines on the care of patients with an abdominal aortic aneurysm

- *Elliot L. Chaikof, MD, PhD, Ronald L. Dalman, MD, Mark K. Eskandari, MD, Benjamin M. Jackson, MD, W. Anthony Lee, MD, M. Ashraf Mansour, MD, Tara M. Mastracci, MD, Matthew Mell, MD, M. Hassan Murad, MD, MPH, Louis L. Nguyen, MD, MBA, MPH, Gustavo S. Oderich, MD, Madhukar S. Patel, MD, MBA, ScM, Marc L. Schermerhorn, MD, MPH, Benjamin W. Starnes, MD*

- *Journal of Vascular Surgery*
- Volume 67, Issue 1, Pages 2-77.e2 (January 2018)
- DOI: 10.1016/j.jvs.2017.10.044


Types of Aneurysms
Saccular
Fusiform
Pseudoaneurysm

Operative Risk for Elective AAA Repair

Table VI, A. Mortality risk scoring scheme for patients undergoing repair of an abdominal aortic aneurysm (AAA)

Parameter	Points
Treatment	
EVAR	0
OAR (infrarenal)	2
OAR (suprarenal)	4
Aneurysm size, mm	
<65	0
≥65	2
Age, years	
≤75	0
>75	1
Gender	
Male	0
Female	1
Comorbidities	
Myocardial disease	1
Cerebrovascular disease	1
Chronic obstructive pulmonary disease	2
Laboratory value	
Creatinine, mg/dL	
<1.5	0
1.5 to <2	2
≥2	2

Total = 14 points

EVAR, Endovascular aneurysm repair; *OAR*, open aneurysm repair.
From Eslami MH, Rybin D, Doros G, Kalish JA, Farber A; Vascular Study Group of New England. Comparison of a Vascular Study Group of New England risk prediction model with established risk prediction models of in-hospital mortality after elective abdominal aortic aneurysm repair. J Vasc Surg 2015;62:1125-33.e2.

Table VI, B. Risk categorization based on mortality risk scoring scheme (Table VI, *A*) for patients undergoing repair of an abdominal aortic aneurysm (AAA)

Points	Probability of mortality, %	Proposed risk designation
0	0.12	Low-risk group
1	0.20	
2	0.34	
3	0.59	
4	1.00	
5	1.71	Medium-risk group
6	2.91	
7	4.90	
8	8.14	High-risk group
9	13.2	
10	20.75	
11	31.05	Prohibitive high-risk group
12	43.63	
13	57.10	
14	69.59	

From Eslami MH, Rybin D, Doros G, Kalish JA, Farber A; Vascular Study Group of New England. Comparison of a Vascular Study Group of New England risk prediction model with established risk prediction models of in-hospital mortality after elective abdominal aortic aneurysm repair. J Vasc Surg 2015;62:1125-33.e2.

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OAR (infrarenal)	2
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Aneurysm size, mm	
<65	0
≥65	2
Age, years	
≤75	0
>75	1
Gender	
Male	0
Female	1
Comorbidities	
Myocardial disease	1
Cerebrovascular disease	1
Chronic obstructive pulmonary disease	2
Laboratory value	
Creatinine, mg/dL	
<1.5	0
1.5 to <2	2
≥2	2

70 yo female with 6.6 cm AAA

= 8

EVAR, Endovascular aneurysm repair; *OAR*, open aneurysm repair.
From Eslami MH, Rybin D, Doros G, Kalish JA, Farber A; Vascular Study Group of New England. Comparison of a Vascular Study Group of New England risk prediction model with established risk prediction models of in-hospital mortality after elective abdominal aortic aneurysm repair. J Vasc Surg 2015;62:1125-33.e2.

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11	31.05	Prohibitive high-risk group
12	43.63	
13	57.10	
14	69.59	

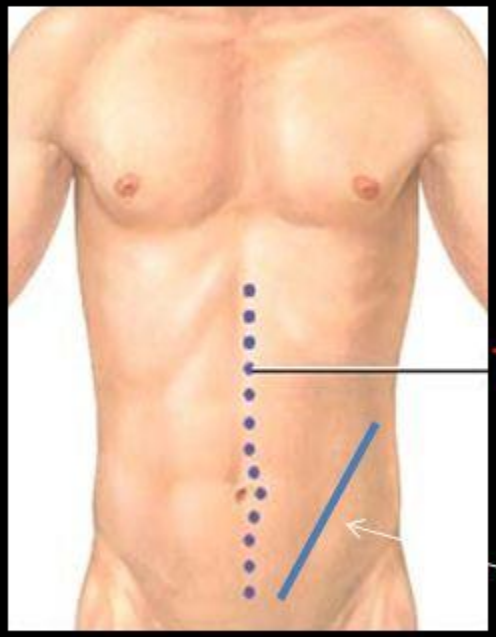
Rupture risk for 6.6 cm AAA 10-25%

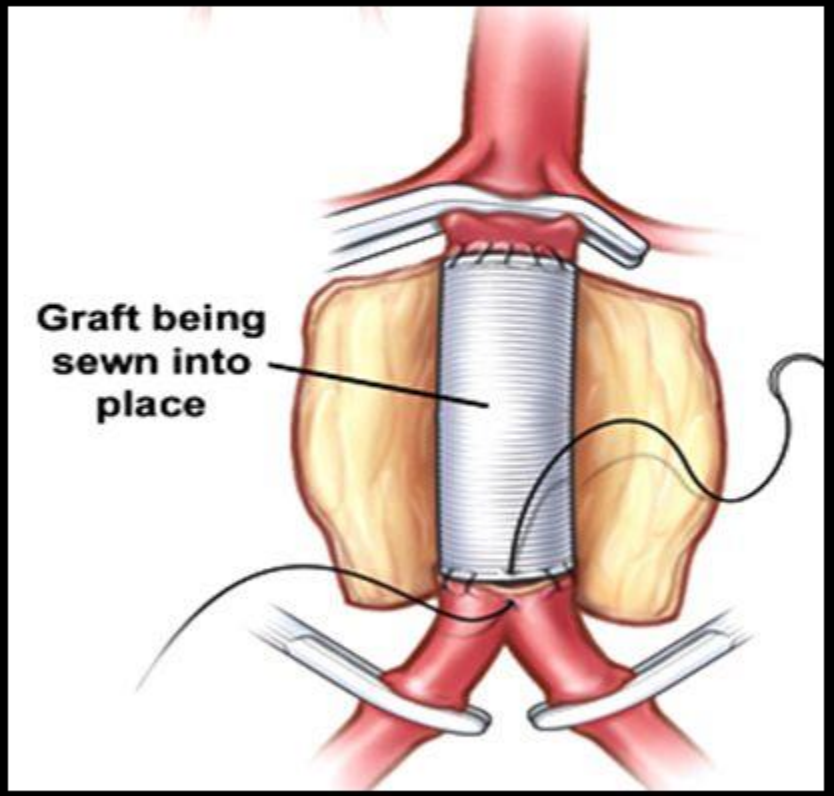
From Eslami MH, Rybin D, Doros G, Kalish JA, Farber A; Vascular Study Group of New England. Comparison of a Vascular Study Group of New England risk prediction model with established risk prediction models of in-hospital mortality after elective abdominal aortic aneurysm repair. J Vasc Surg 2015;62:1125-33.e2.

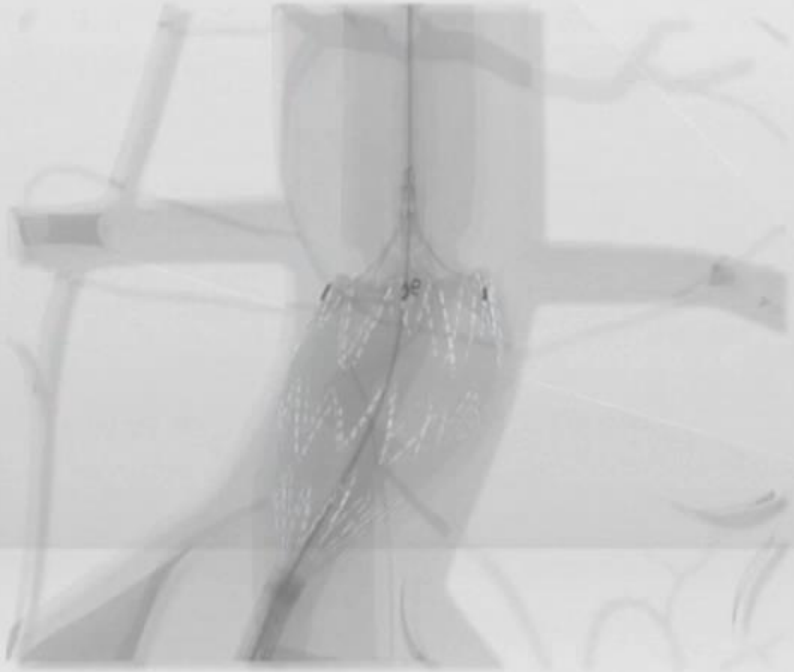
If pt now needs open repair and is 76 yo score goes to 11

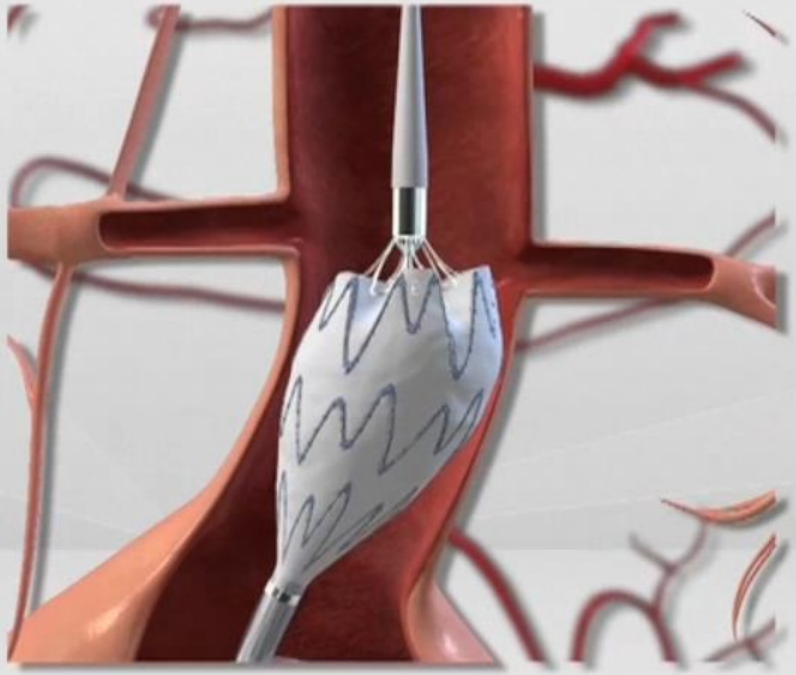
Types of Repair

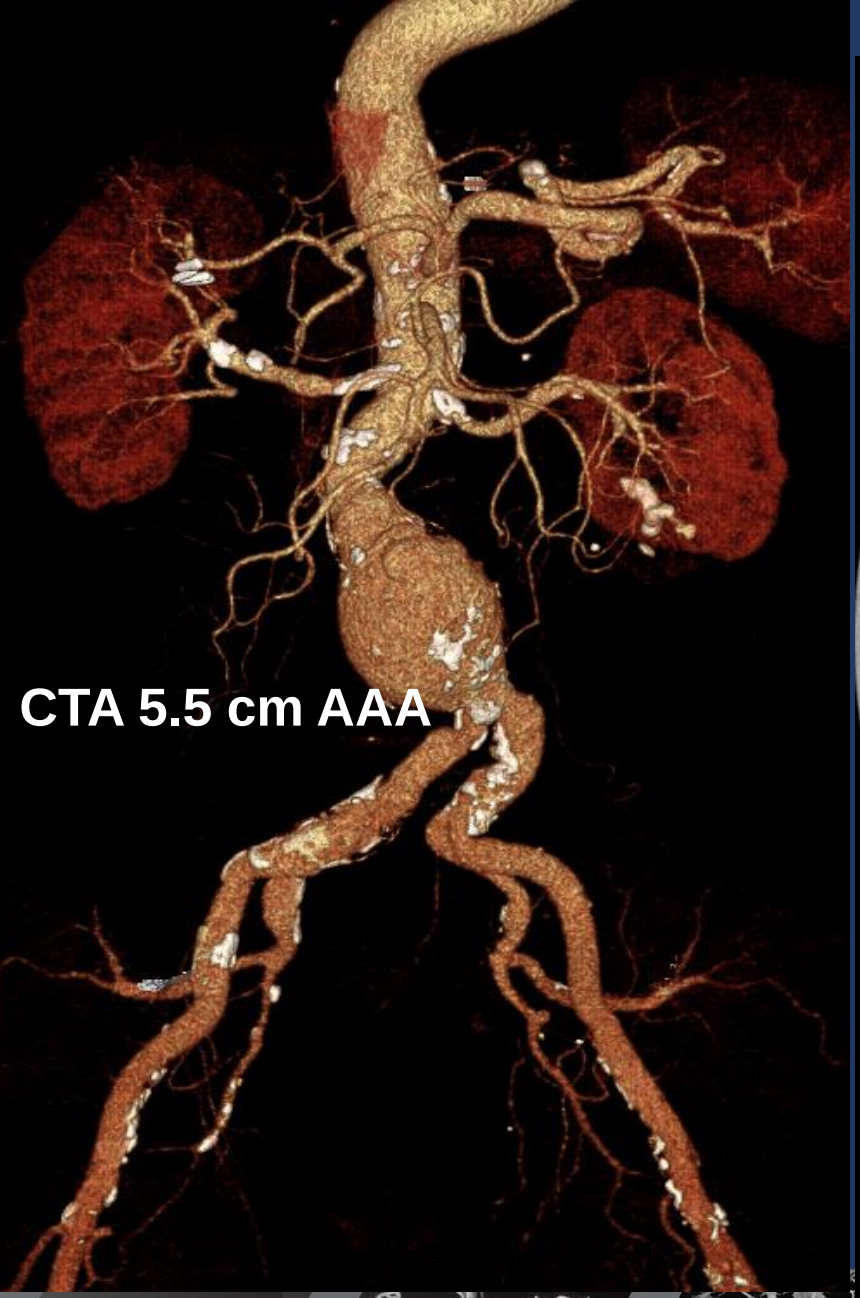
Open AAA Repair

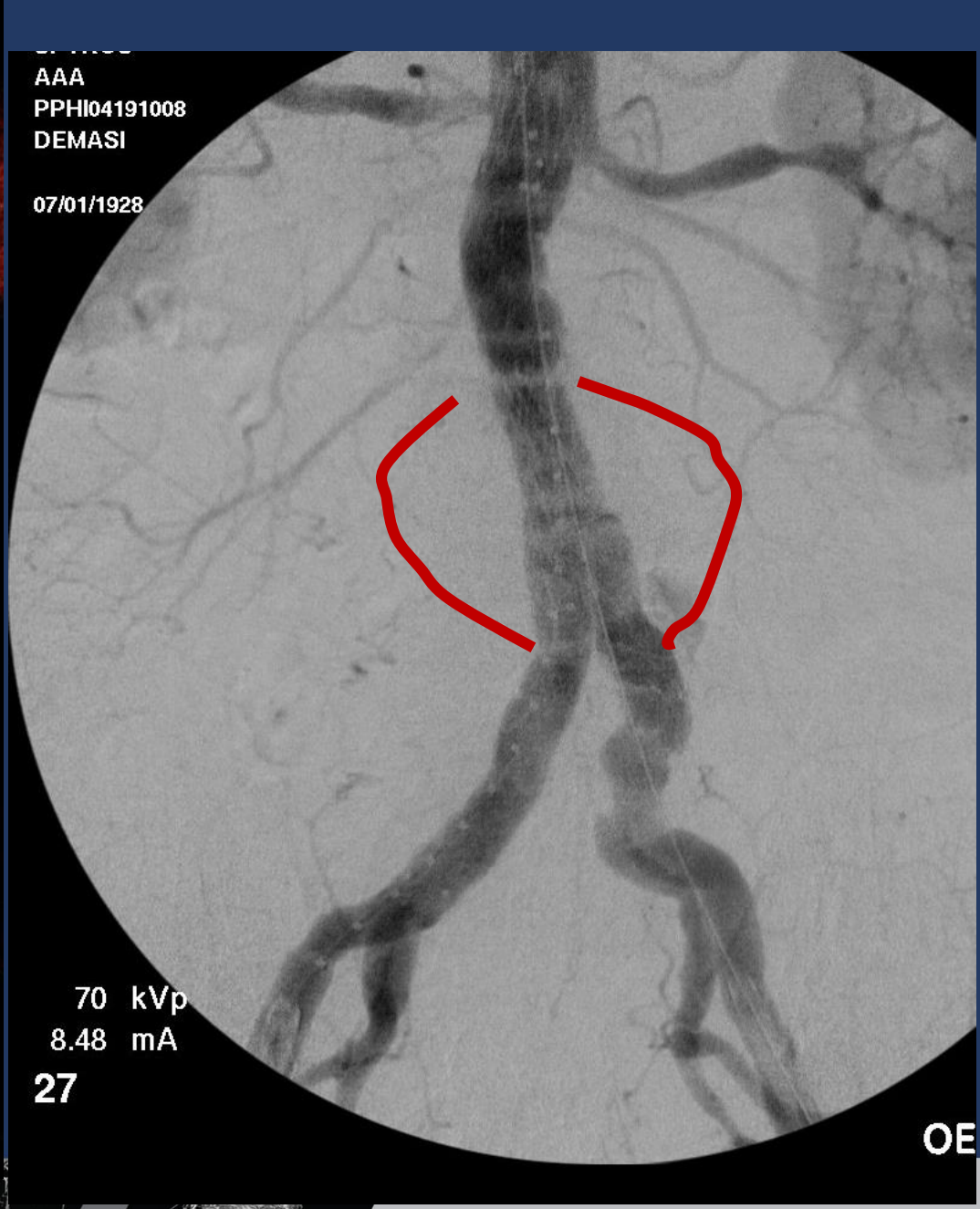




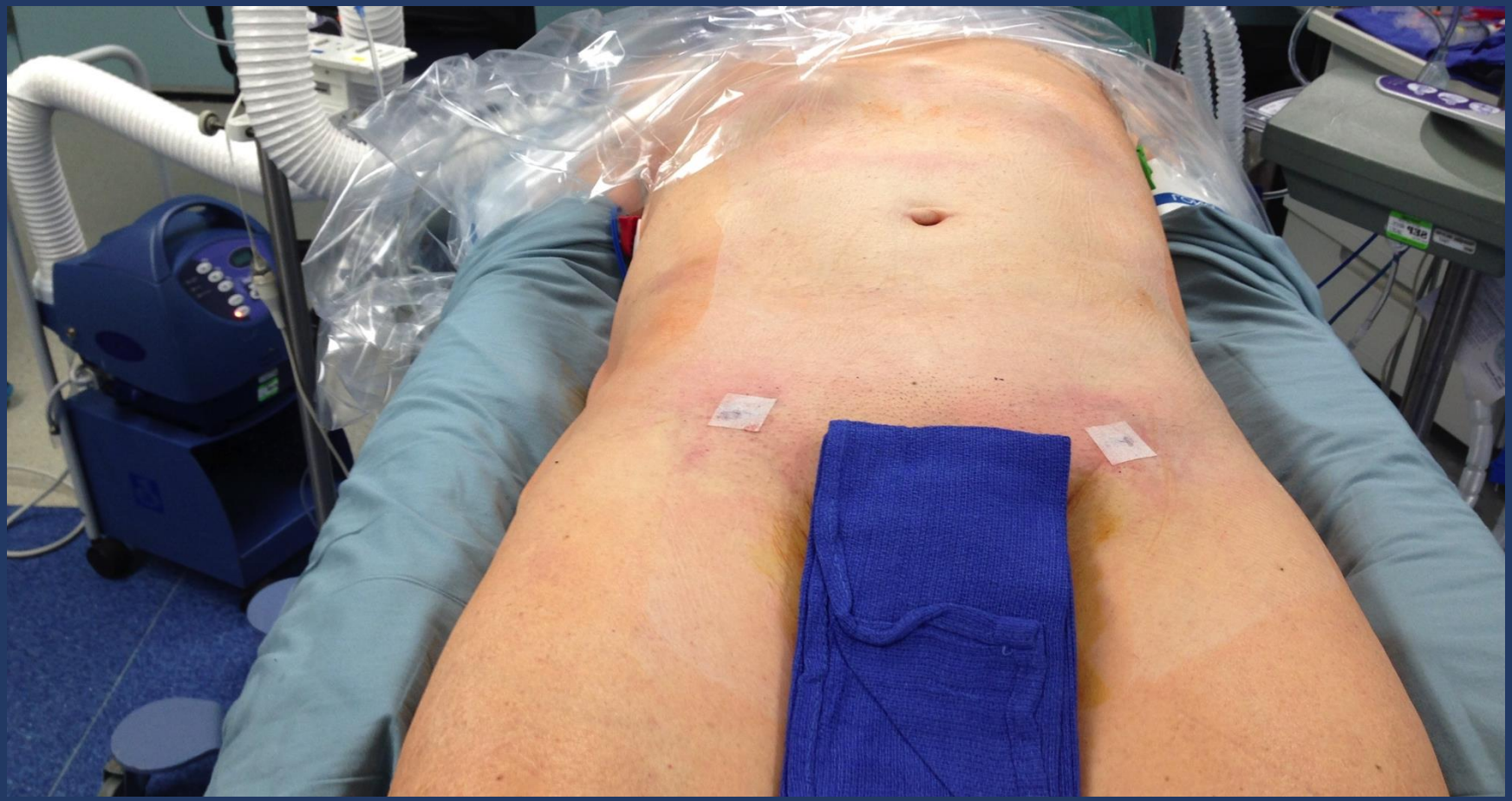





CTA 5.5 cm AAA


AAA
PPHI04191008
DEMASI
07/01/1928
70 kVp
8.48 mA
27
OE

EVAR



Post Open AAA Repair

EVAR – POD 0

Surgeon : Post op Open AAA

Surgeon Post op EVAR

$p<0.05$ in all cases	AneuRx	Open Repair
• Blood loss (ml)	641	1596
Blood replaced (units)	0.3	1.6
• ICU time (days)	0.9	2.5
• Ambulate w/o assistance (days)	1.5	4.0
• Regular diet (days)	1.4	5.1
• Hospital LOS (days)	3.4	9.4

1st EVAR Trials in US 1995

J Vasc Surg 1999; 29:292-308

EVAR vs Open Repair

- Wealth of RCT Data
  - EVAR 1 – UK
  - OVER – VA
  - DREAM - NETHERLANDS
  - ACE – FRENCH

Original Article

Endovascular versus Open Repair of Abdominal Aortic Aneurysm

The United Kingdom EVAR Trial Investigators

N Engl J Med
Volume 362(20):1863-1871
May 20, 2010

The NEW ENGLAND JOURNAL of MEDICINE

Table 1. Baseline Characteristics of the Patients.*

Characteristic	Endovascular Repair (N=626)	Open Repair (N=626)
Age — yr	74.1±6.1	74.0±6.1
Male sex — no. (%)	565 (90.3)	570 (91.1)
Diameter of abdominal aortic aneurysm (626 and 625 patients) — cm	6.4±0.9	6.5±1.0
Body-mass index (625 and 620 patients)†	26.5±4.6	26.5±4.3
Diabetes (624 and 620 patients) — no. (%)	61 (9.8)	68 (11.0)
Smoking status (625 and 625 patients) — no. (%)		
Current smoker	134 (21.4)	136 (21.8)
Former smoker	419 (67.0)	444 (71.0)
Never smoked	72 (11.5)	45 (7.2)
History of cardiac disease — no. (%)‡	269 (43.0)	261 (41.8)
Blood pressure — mm Hg		
Systolic (621 and 624 patients)	148±22	147±21
Diastolic (619 and 623 patients)	82±12	82±13
Ankle–brachial pressure index (613 and 599 patients)§	1.01±0.18	1.03±0.18
Forced expiratory volume in 1 second (618 and 622 patients) — liters	2.1±0.7	2.2±0.7
Serum creatinine (625 and 622 patients) — μmol/liter		
Median	102	102
Interquartile range	91–118	90–120
Serum cholesterol (608 and 601 patients) — μmol/liter	5.1±1.2	5.1±1.1
Statin use (619 and 623 patients) — no. (%)	216 (34.9)	224 (36.0)
Aspirin use — no. (%)	338 (54.0)	325 (51.9)

* Data were available for all patients except for characteristics where numbers in the endovascular-repair group and the open-repair group, respectively, are shown. Plus–minus values are means ±SD. To convert the values for creatinine to milligrams per deciliter, divide by 88.4. To convert the values for cholesterol to milligrams per deciliter, divide by 0.02586.

† The body-mass index is the weight in kilograms divided by the square of the height in meters.

‡ Cardiac disease was defined as any of the following: myocardial infarction, angina, cardiac revascularization, cardiac-valve disease, clinically significant arrhythmia, and uncontrolled congestive heart failure.

§ The ankle–brachial pressure index is the ratio of the blood pressure in the lower legs to the blood pressure in the arms; the mean for both legs is shown.

Table 2. Deaths from Any Cause and from Aneurysm-Related Causes, According to Time since Randomization.

Outcome	Endovascular Repair (N=626)	Open Repair (N=626)	Hazard Ratio (95% CI)		P Value†
			Unadjusted	Adjusted*	
	no./total no. (rate/100 person-yr)				
Any death					
All patients	260/626 (7.5)	264/626 (7.7)	0.98 (0.82–1.16)	1.03 (0.86–1.23)	0.72
Time since randomization					
0–6 mo	26/626 (8.5)	45/626 (15.0)	0.57 (0.35–0.92)	0.61 (0.37–1.02)	0.06
>6 mo–4 yr	125/599 (6.7)	116/581 (6.3)	1.06 (0.82–1.37)	1.12 (0.86–1.45)	0.39
>4 yr	109/472 (8.4)	103/461 (7.9)	1.04 (0.80–1.37)	1.09 (0.82–1.44)	0.57
Aneurysm-related death					
All patients	36/626 (1.0)	40/626 (1.2)	0.89 (0.57–1.39)	0.92 (0.57–1.49)	0.73
Time since randomization					
0–6 mo	14/626 (4.6)	30/626 (10.0)	0.46 (0.24–0.87)	0.47 (0.23–0.93)	0.03
>6 mo–4 yr	[illegible]	[illegible]	1.48 (0.60–3.61)	1.46 (0.56–3.82)	0.44
>4 yr	10/472 (0.8)	2/461 (0.2)	4.96 (1.09–22.65)	4.85 (1.04–22.72)	0.05

* Hazard ratios have been adjusted for baseline age, sex, diameter of abdominal aortic aneurysm, forced expiratory volume in 1 second, serum creatinine level (log transformed), use or nonuse of statins, body-mass index, smoking status, systolic blood pressure, and serum cholesterol level. A total of 77 patients were excluded from the follow-up analysis because of missing data.

† P values have been adjusted for baseline covariates.

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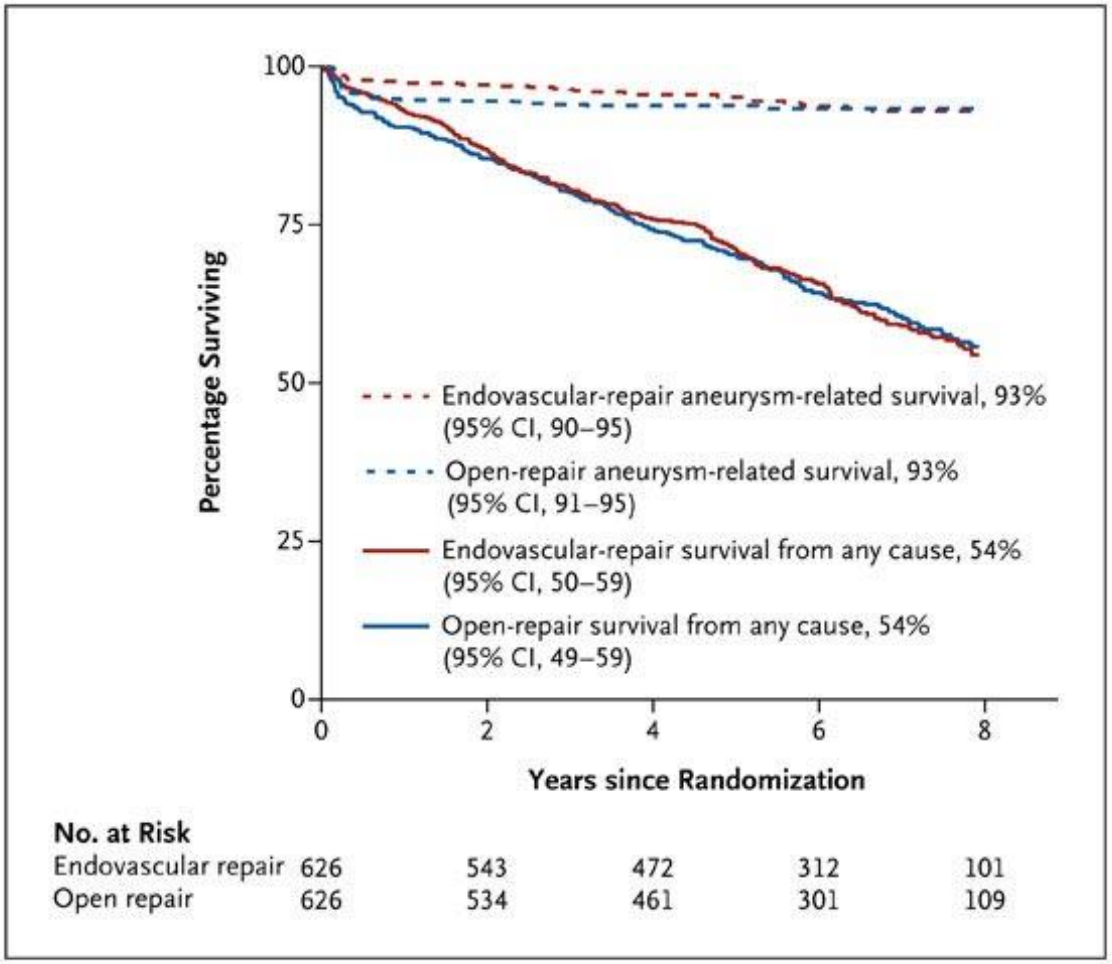
VA (OVER) Clinical Outcomes in the Two Treatment Groups.

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

Kaplan-Meier Estimates for Total Survival and Aneurysm-Related Survival during 8 Years of Follow-up



The United Kingdom EVAR Trial Investigators. N Engl J Med 2010;362:1863-1871

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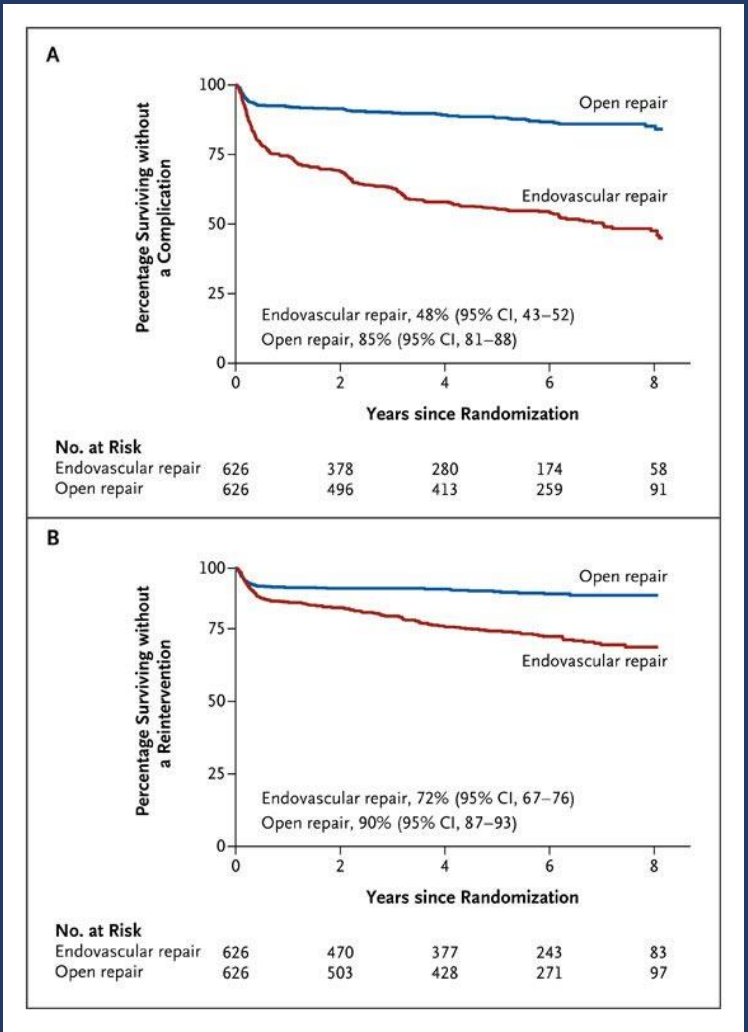
Kaplan-Meier Estimates for the Time to the First Graft-Related Complication or Reintervention during 8 Years of Follow-up



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EVAR vs Open
Summary of RCT's

- EVAR lower early mortality
- Long term survival no different
- Significantly higher rate of re-interventions in EVAR
- Long term Rupture risk in EVAR mandates life long surveillance imaging

RCT's

- Done in academic centers which do large volumes of open and Endo

- Data may not be applicable

Unmeasurables

- Patient preference
- Pain, time out of activities
- Fear
- Current Vascular Training

Initial Experience

February 1996 – Endograft case #1 – POD #3

Summary

- AAA management = Prevention of Rupture
- Physical Exam
- Screen for AAA in appropriate pts

We suggest surveillance imaging at 3-year intervals for patients with an AAA between 3.0 and 3.9 cm.	
Level of recommendation	2 (Weak)
Quality of evidence	C (Low)
We suggest surveillance imaging at 12-month intervals for patients with an AAA of 4.0 to 4.9 cm in diameter.	
Level of recommendation	2 (Weak)
Quality of evidence	C (Low)
We suggest surveillance imaging at 6-month intervals for patients with an AAA between 5.0 and 5.4 cm in diameter.	
Level of recommendation	2 (Weak)
Quality of evidence	C (Low)

Vascular Referral

At Initial Diagnosis

> 4 cm

Summary

- Indications for Repair

  Ruptured or Symptomatic

  > 5.5 cm in appropriately s