

The management of patients with acute aortic syndrome and complex aortic aneurysms: Current state and future directions



Jesse Manunga, MD, FACS

January 16, 2023



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Management of patients with Acute Aortic Syndrome and Complex Aortic Aneurysms: Current State and Future Direction



Jesse Manunga, MD, FACS

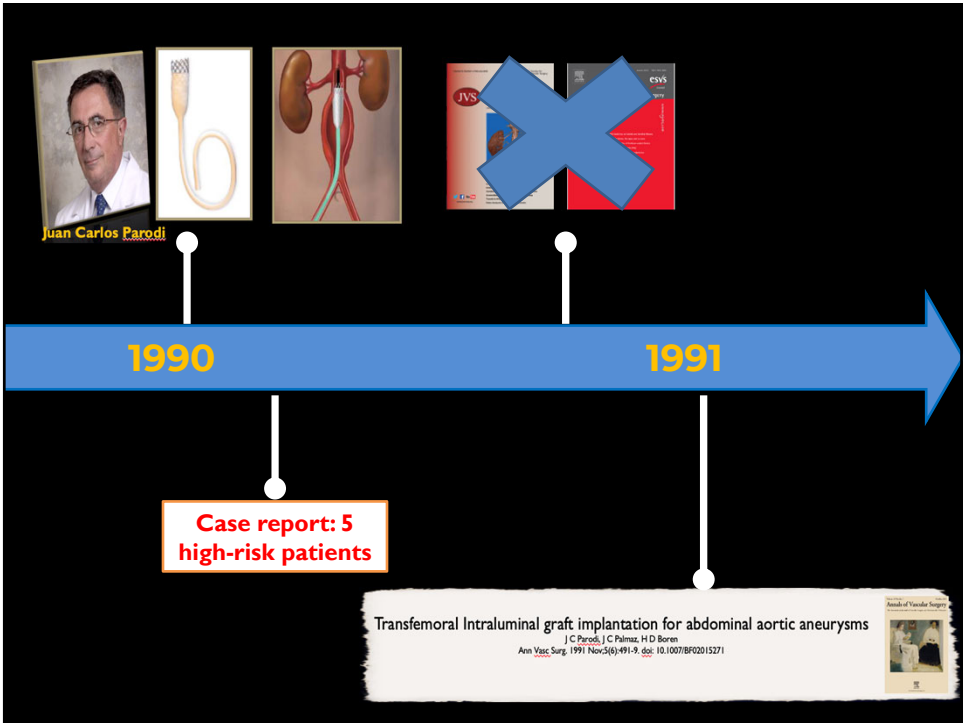
Vascular & Endovascular Surgery
Division of Vascular and Endovascular Surgery
Minneapolis Heart Institute/Abbott Northwestern Hospital

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FACULTY DISCLOSURE

none

3



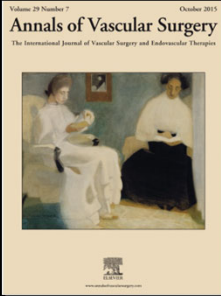
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Commentary

It has been said that the essence of great art is simplification. In working out the details of trans- femoral exclusion of abdominal aneurysms from the aortic stream, Dr. Juan Carlos Parodi and his col- leagues have simplified aortic surgery. Thus, their work is truly artistic as well as scientific. There is no doubt that the procedure achieves its purpose. Predictably, it will be offered at first to patients who are at prohibitive risk for conventional aortic surgery. As experience grows, it will be offered to patients who are good surgical risks, even those with aneurysms smaller than the ones conventionally requiring surgical repair. During this time, complications will occur, some of which are cited in this initial clinical experience. As every interventional procedure has its own complications, new problems will arise. Opposition to the procedure will be mounted. In vascular surgery no change for the better has occurred that wise and good men have not opposed. Now that this initial barrier is breached, new applications, including transluminal distal bypass are predictable. Such change is inevitable.

John J. Bergan, M.D. LaJolla, California

Bergan JC Ann Vasc Surg 1991;6:1991



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Parodi, Montefiore, and the first abdominal aortic aneurysm stent graft in the United States

Veith FJ et al Ann Vasc Surg 2005; 19(5):749-51



- 1992 – First EVAR in the US
- Physicians worked with Industry to perfect stent graft design
- Multiple manuscripts published on the technique
- 14 years after initial publications



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Endovascular aortic repair

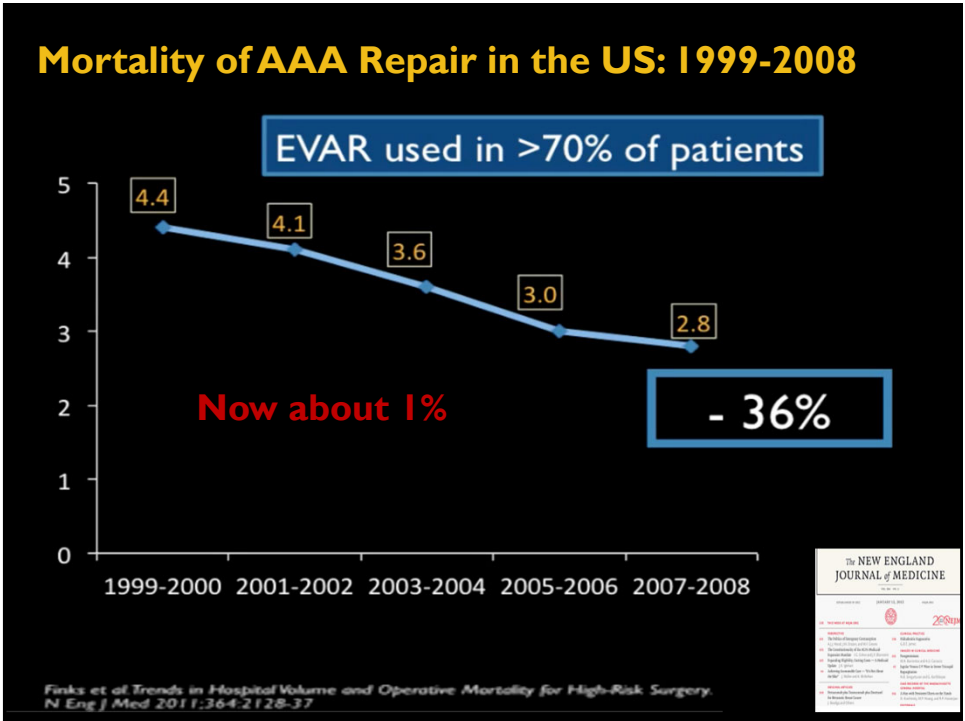
Advantages over open repair

Less:

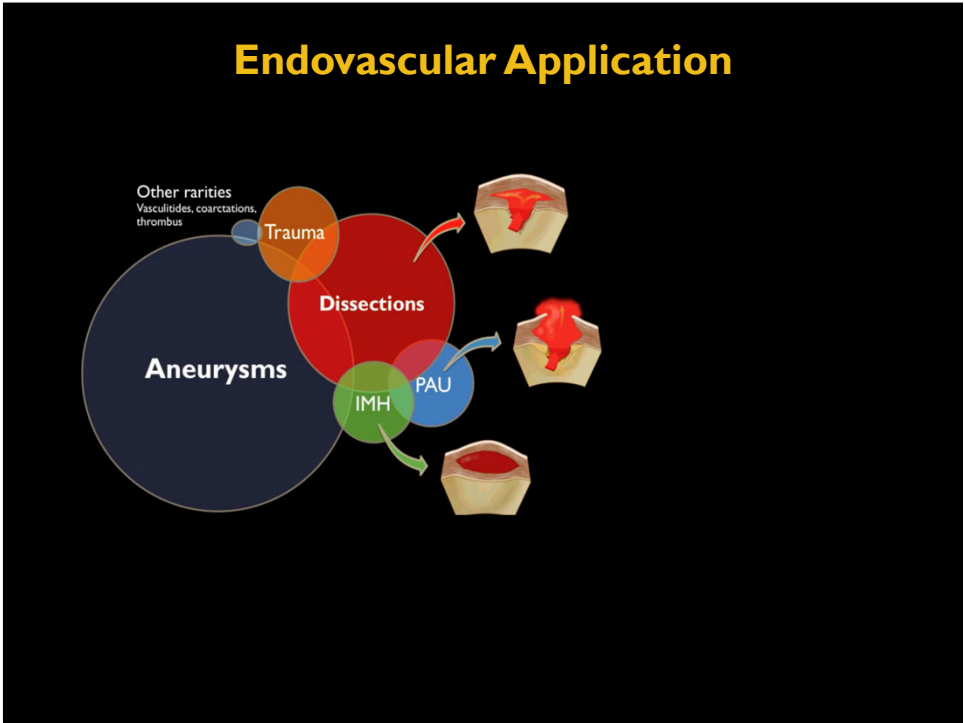
- Operative deaths
- Operative time
- Blood loss and transfusion requirements
- Mechanical ventilation
- ICU and hospital stay

DREAM trial. N Eng J Med 2004;351:1607-18
EVAR-1 trial. Lancet 2005; 365: 2179-86
OVER trial. JAMA 2009

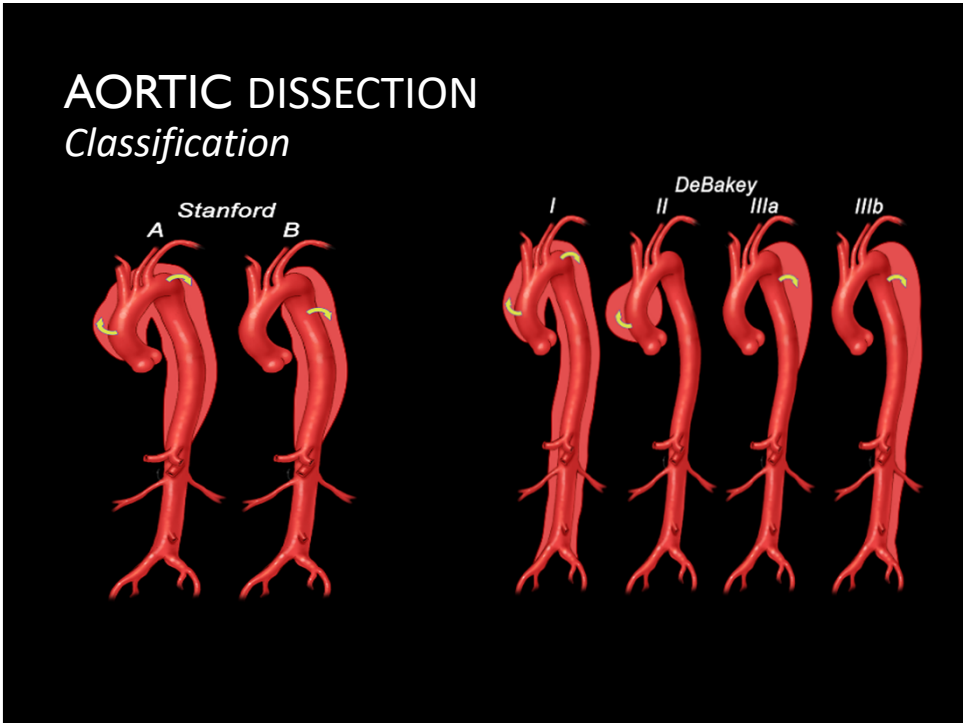
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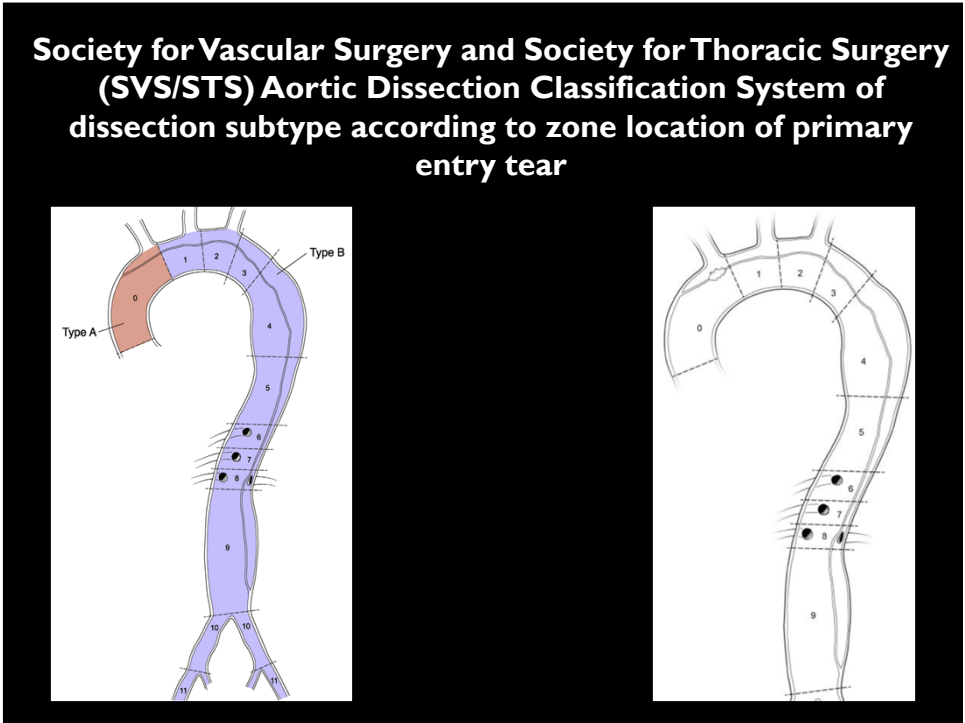
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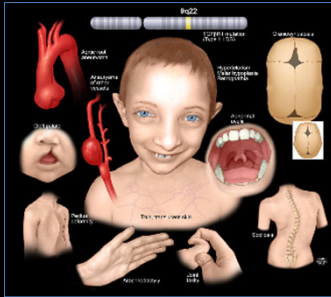
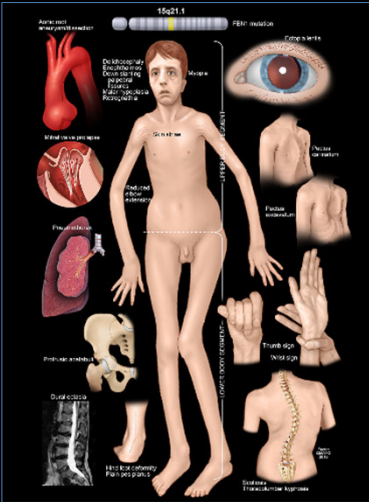
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RISK FACTORS

- Hypertension
- Intramural Hematoma
- Penetrating Ulcers - 1 in 8
- Connective Tissue Disorders
- Pregnancy
- Iatrogenic
- Hyperlipidemia
- Cocaine use
- Diabetes
- Smoking

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GENETICALLY TRIGGERED AORTIC DISEASES?



- Marfan's Syndrome
- Loyaes-Dietz Syndrome
- Familial TAD Syndrome
- Vascular EDS

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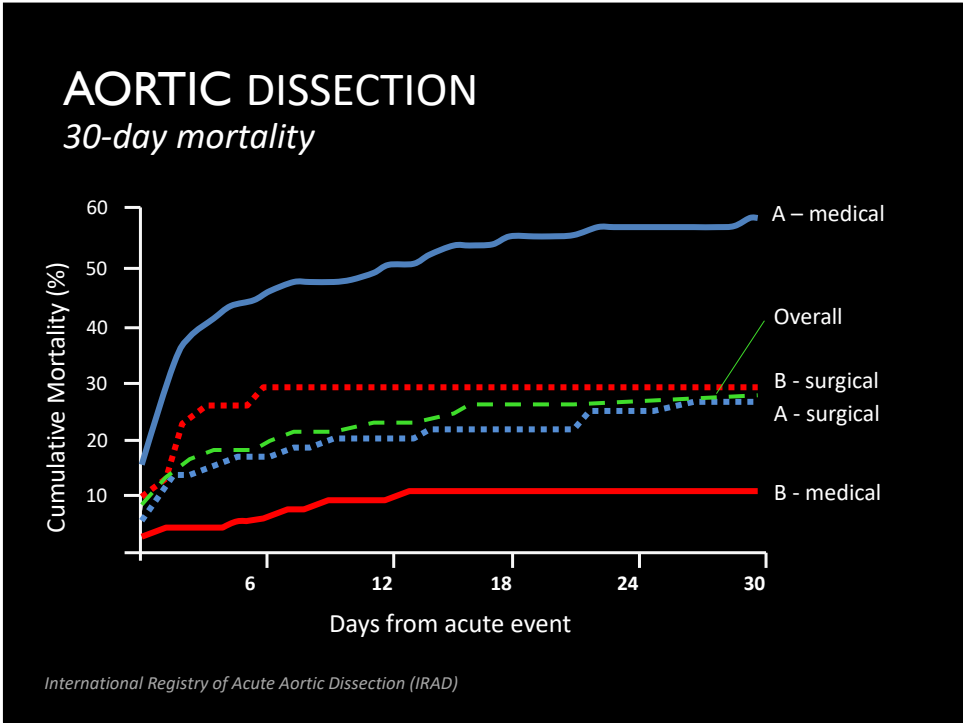
AORTIC DISSECTION EPIDEMIOLOGY

- Type B pts are typically 10 years older
- Peak incidence
 - Type B: 60-70 years
 - Type A: 50-60 years
- A lethal condition
 - Pre-hospital mortality: 20%
 - If untreated: 25% at 6 hrs, 50% by 24 hrs, 2/3rd in a week
 - 1% mortality per hour in acute setting



International Registry of Acute Aortic Dissection (IRAD)

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Management – Historical perspective

- **Type A Dissection**
 - A surgical emergency
 - Ascending aorta replacement or hemiarch
- **Type B dissection**
 - Anti-impulse therapy

hemiarch replacement

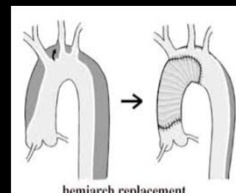
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Rethinking Management of AD

- **Type A Dissection**

- Limited aortic repair (ascending aorta replacement or hemiarch) **associated with 70% occurrence** of late distal aortic complications

- Aneurysmal degeneration
- Rupture
- Malperfusion
- Need for secondary or tertiary intervention



- **Type B dissection**

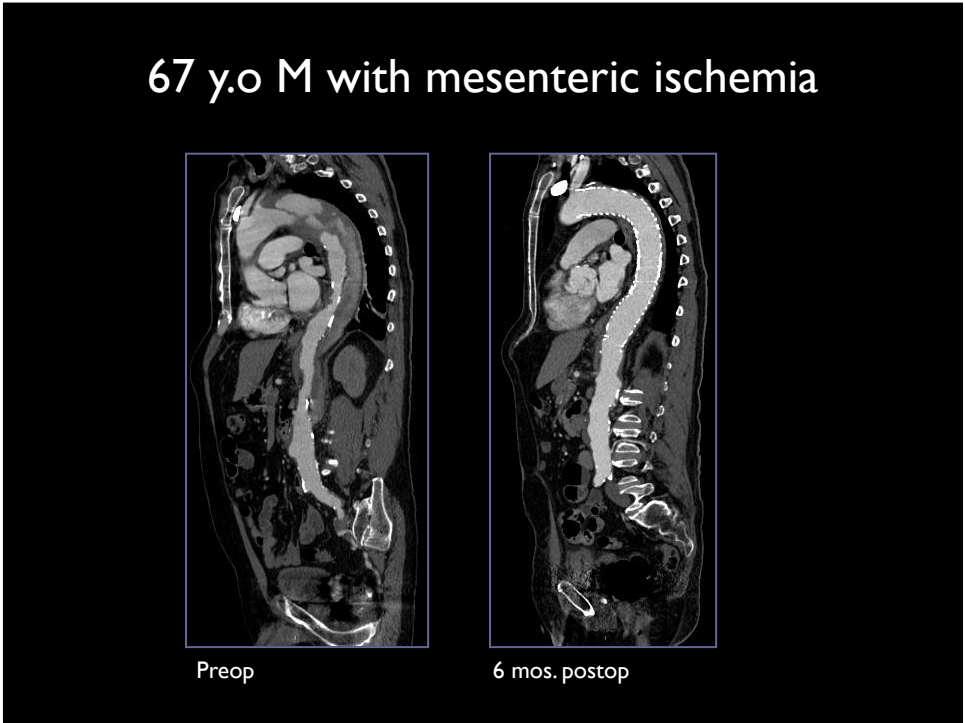
- Anti-impulse therapy
 - 30% 5 year mortality
 - < 50% survival long-term

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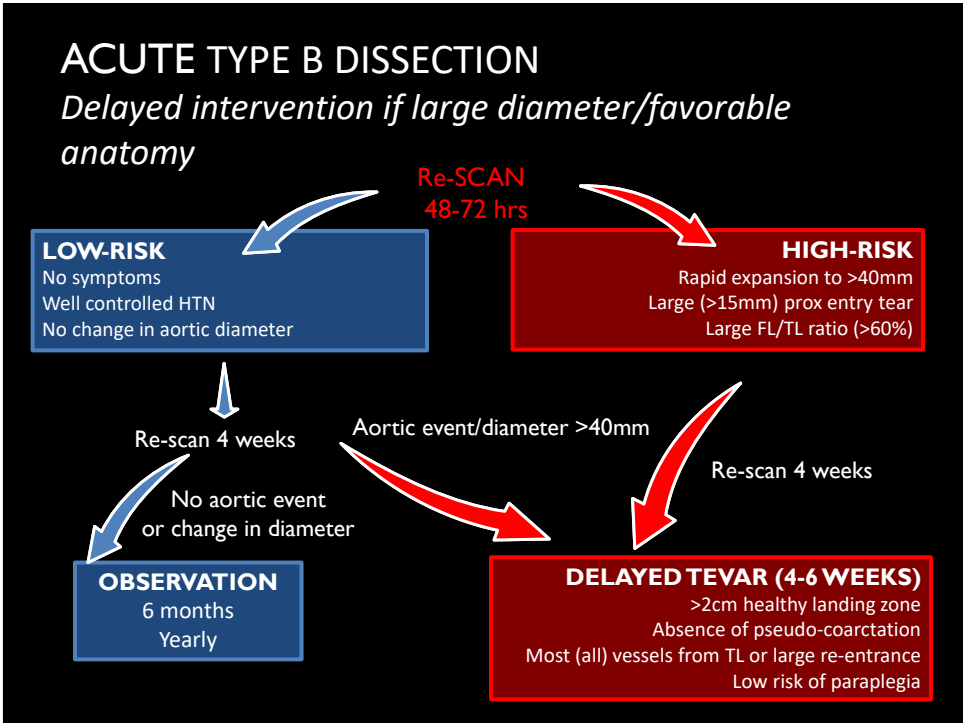
Is this acceptable or Even Justifiable in the Endovascular Era?

How do we use the advantages of endovascular therapy to increase survival of pts with aortic dissection?

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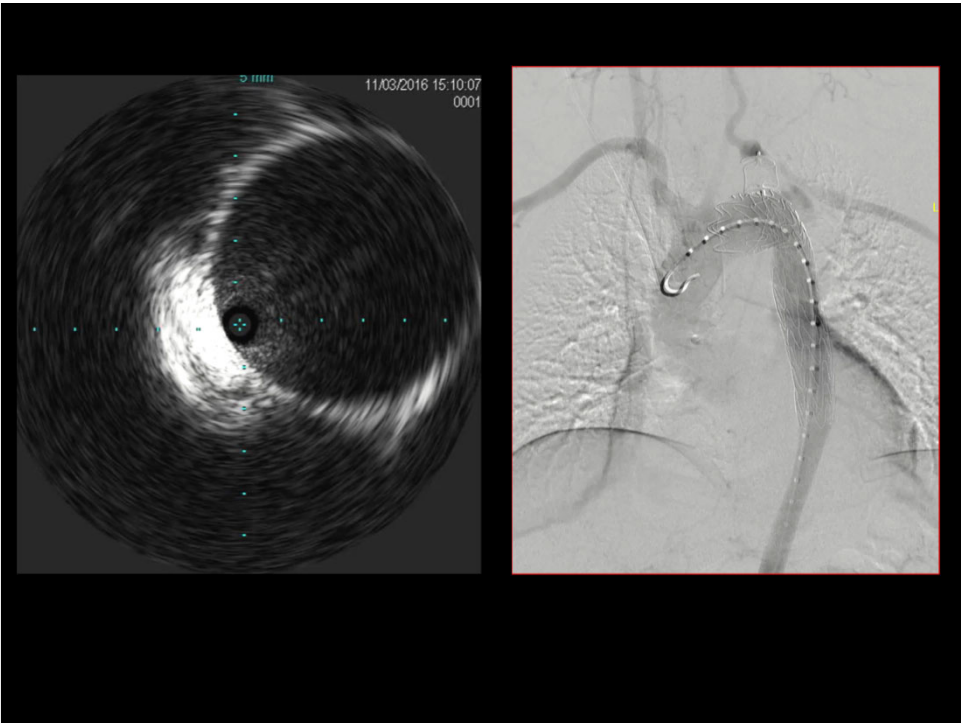


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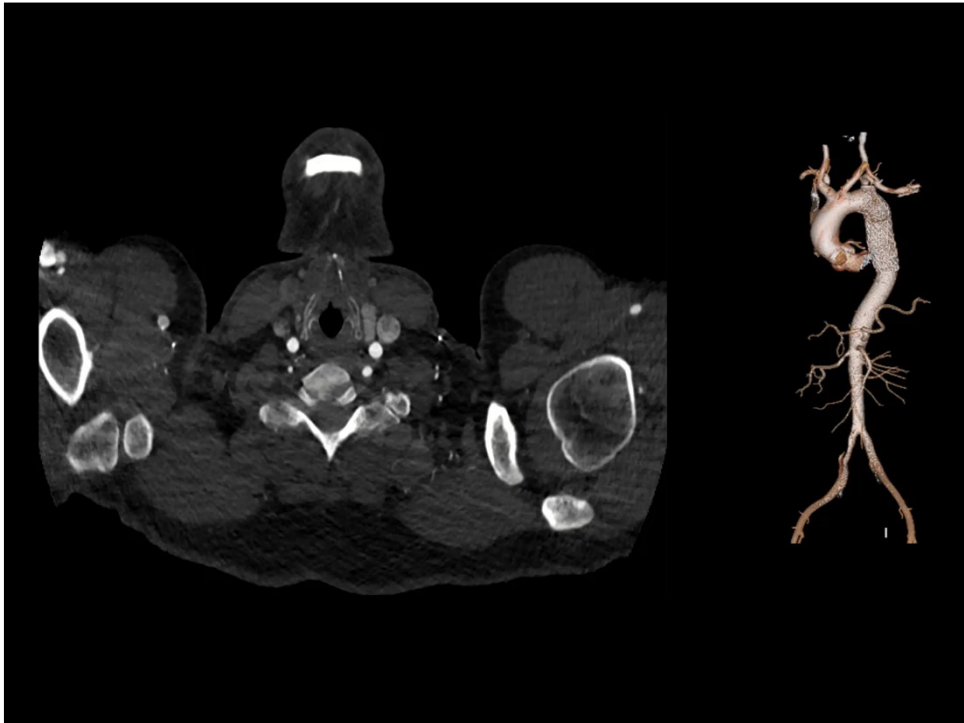
**43 y.o. Male with Sudden onset of Chest,
abdominal and Back Pain**



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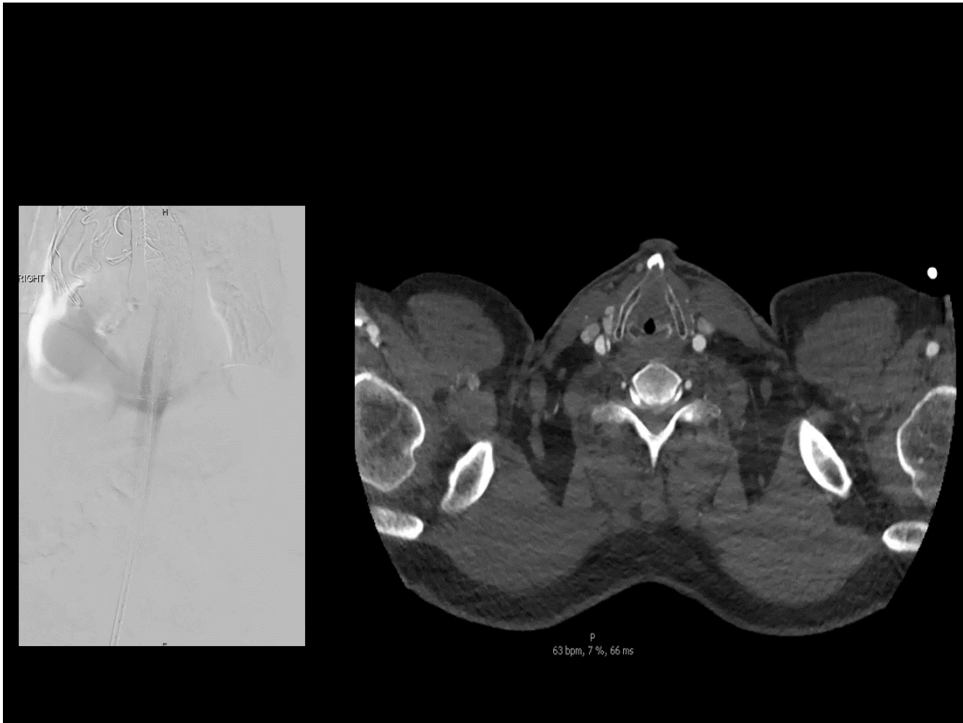
The Abbott Northwestern/MHI Experience




2014

- We pushed for vascular surgery involvement in the management of all dissection patients, including Type A
 - Pts should have, at a minimum an aggressive hemi-arch but we prefer an frozen elephant trunk!
- Meeting with cardiac surgery
 - Why?
 - Difficult operation with very high complication rates!
 - Stroke
 - Paraplegia
- Believed changes would lead to improved outcomes


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The MHI experience:



From the Society for Vascular Surgery

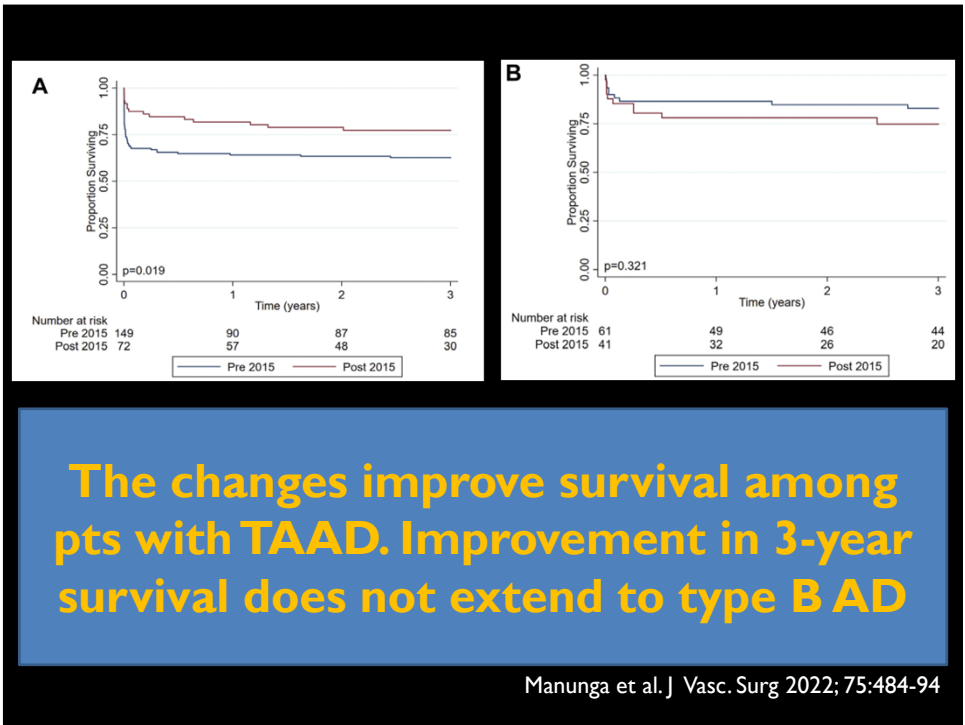
Check for updates

Impact of a multidisciplinary acute aortic dissection program: Improved outcomes with a comprehensive initial surgical repair strategy

Variables	Total	Pre 2015	Post 2015	P value
No. patients	221	149	72	.182
Management				
Medical therapy alone	26 (12)	23 (15)	3 (4)	.014
Medical therapy + surgical repair	195 (89)	126 (85)	69 (96)	.874
Ascending aorta replacement	94 (43)	82 (55)	12 (17)	<.001
Ascending + arch replacement	96 (43)	40 (27)	56 (78)	<.001
Without TEVAR	79 (36)	40 (27)	39 (54)	<.001
With TEVAR				
Ascending + total arch	14 (5)	4 (3)	7 (10)	.042
Composite graft/AVP alone	1 (0)	1 (1)	0 (0)	1.000
With TEVAR	17 (8)	0 (0)	17 (25)	<.001
Hemiarch + distal stent	1 (0)	0 (0)	1 (1)	.326
Total arch + distal stent (FET)	14 (6)	0 (0)	14 (19)	<.001
Ascending along + distal stent	1 (0)	0 (0)	1 (1)	.326
Incomplete surgery	4 (2)	4 (3)	0 (0)	.306
Adjunct procedures				
CABG	21 (10)	14 (9)	7 (10)	.358
Intravascular ultrasound	24 (11)	0 (0)	24 (33)	<.001
Completion angiography	24 (11)	0 (0)	24 (33)	<.001
Renal artery stent	7 (3)	0 (0)	7 (10)	<.001

ABSTRACT Objective: Patients with acute (ATBAD) v...
Methods: ...
Results: ...
Conclusion: ...
Keywords: Acute aortic dissection; Improved survival; Multidisciplinary approach; Surgical repair

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The MHI experience: Take Home Message

From the Society for Vascular Surgery

Impact of a multidisciplinary acute aortic dissection program: Improved outcomes with a comprehensive initial surgical repair strategy

Jesse Manunga, MD, FACS,^{a,b} Jenna Smith, BS,^b Christian W. Schmidt, MS,^b Jessica Titus, MD,^a Karol Mudy, MD,^c Matthew B. DeLeon, PhD,^d Benjamin S. Fur, MD,^e Yusef Taha, MD,^a Alessia Miro, MD,^a Nedaa Skeh,^a

ABSTRACT
Objective: A with acute ty (ATBAD) was
Methods: Th between 20 characteristi
Results: Dur patients with a mean age groups. After most that ur Seventy-four endografting vs 10% post. Kaplan-Meie however, thi 30 days afte
Conclusions overall patie performed. 2022;75:484-
Keywords: Acute aortic dissection; Improved survival; Multidisciplinary approach; Surgical repair

Mortality for the Overall program:

Pre: 26%

Post: 10%

A 38% decrease in mortality

Type A Aortic Dissection patients:

Pre: 23%

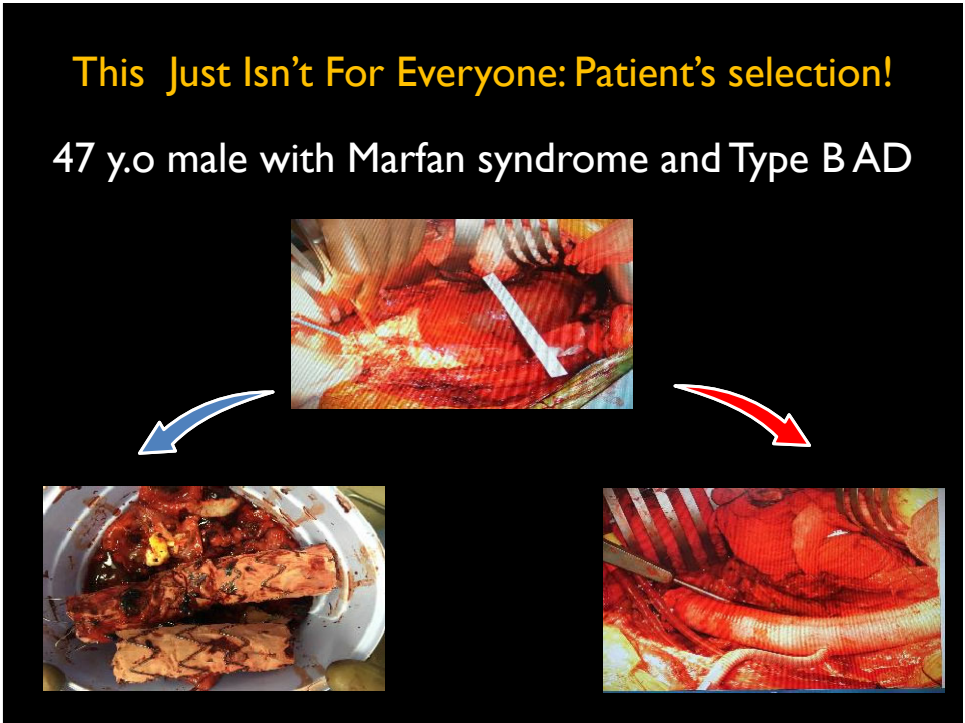
Post: 9%

A 39% decrease in mortality

28



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30



31

Risk of Rupture (AAA)	
Diameter (cm)	Annual risk of rupture (%)
< 4 cm	~ 0
4 – 5 cm	0.5 – 5 %
<u>5 – 6 cm</u>	<u>3 – 15 %</u>
6 – 7 cm	10 – 20 %
7 – 8 cm	20 – 40 %
> 8 cm	30 – 50 %

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Commentary

It has been said that the essence of great art is simplification. In

Volume 29 Number 7 October 2011
Annals of Vascular Surgery
The International Journal of Vascular Surgery and Endovascular Therapies

As experience grows, it will be offered to patients who are good surgical risks, even those with aneurysms smaller than the ones conventionally requiring surgical repair... As every interventional procedure has its own complications, new problems will arise.

predictable. Such change is inevitable.

John J. Bergan, M.D. LaJolla, California

Bergan JC Ann Vasc Surg 1991;6:1991

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81M with small AAA, short infra-renal neck and type I endoleak after EVAR

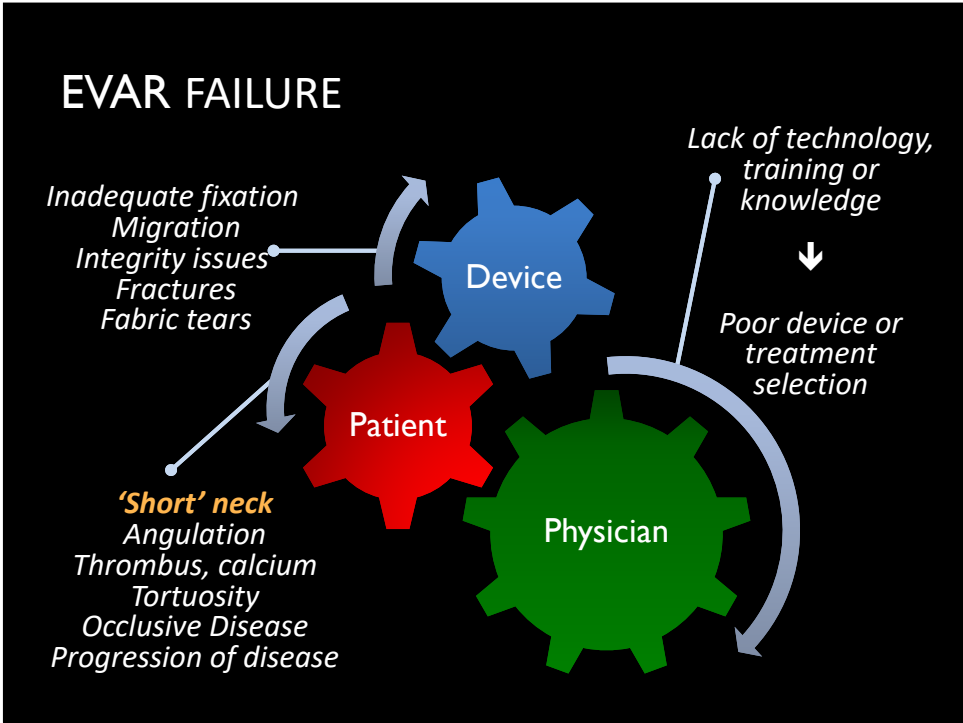
81M

No cut

85M
Jan 7, 2013
6-cm AAA

82M
June 3, 2010
5-cm AAA

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...APPLY JUDGEMENT

The diagrams show four variations of the aortic arch and neck, illustrating challenges for EVAR:

- Neck thrombus and calcification
- Angulation
- Length
- Diameter
- Hostile neck – combination of above

These factors are collectively labeled as a **"Riskier Aorta"**.

~ 20-40% of patients with aneurysms do NOT meet criteria for repair with commercially available infrarenal devices

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WHAT IS HEALTHY AORTA?

- Is any aorta in a patient with an aneurysm healthy?
 - Probably not...
- Given this, the real question should be...
- WHAT IS HEALTHY ENOUGH?



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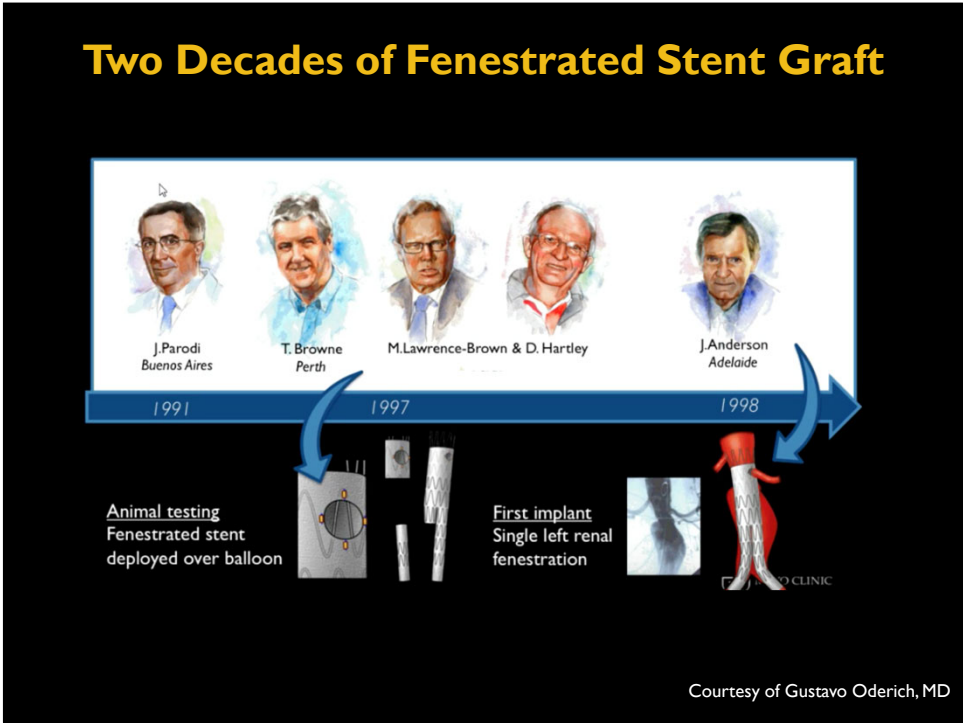
HEALTHY ENOUGH

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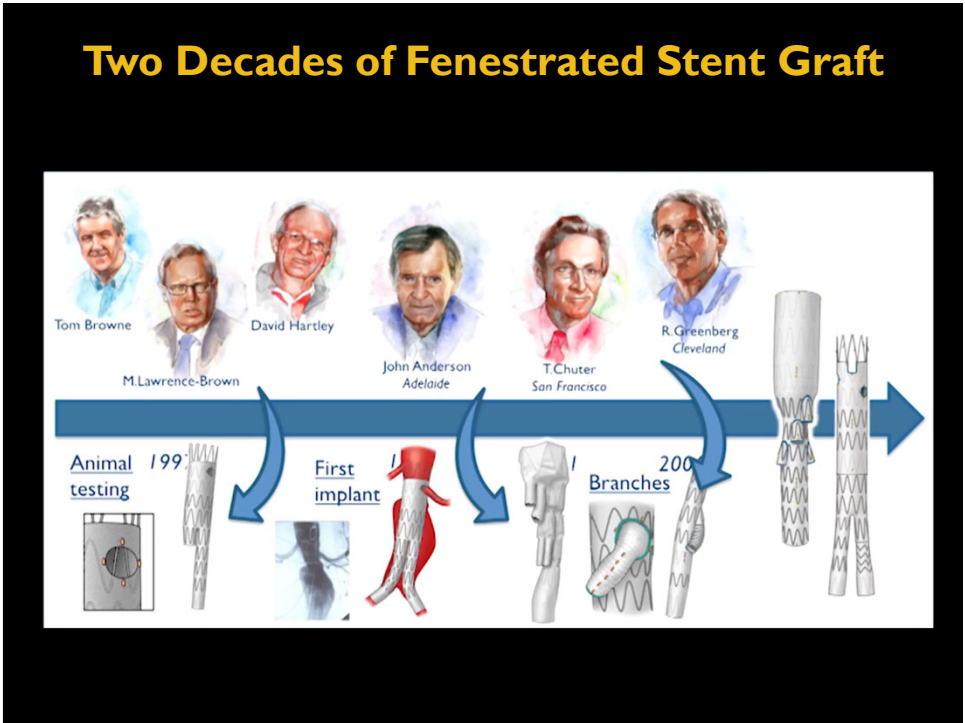
Offering a repair that will outlive
the patient

Landing the device above renal or
mesenteric arteries

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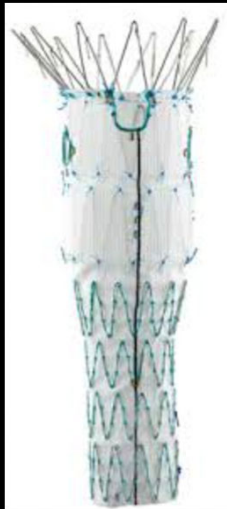


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First commercial fenestrated device in the US: Cook Medical, Inc.



2012

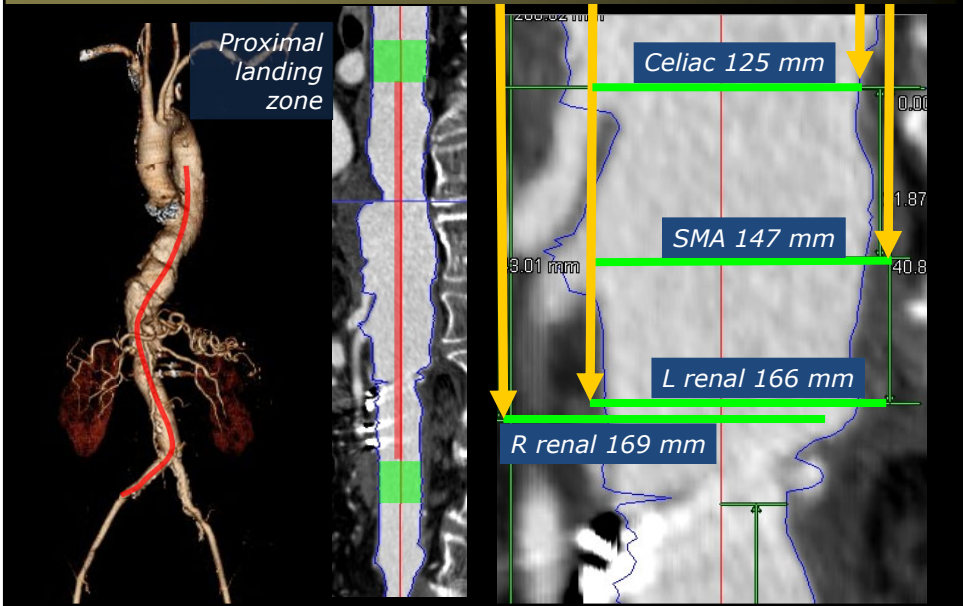


One size doesn't fit all

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Centerline of flow

Accurate estimates of lengths

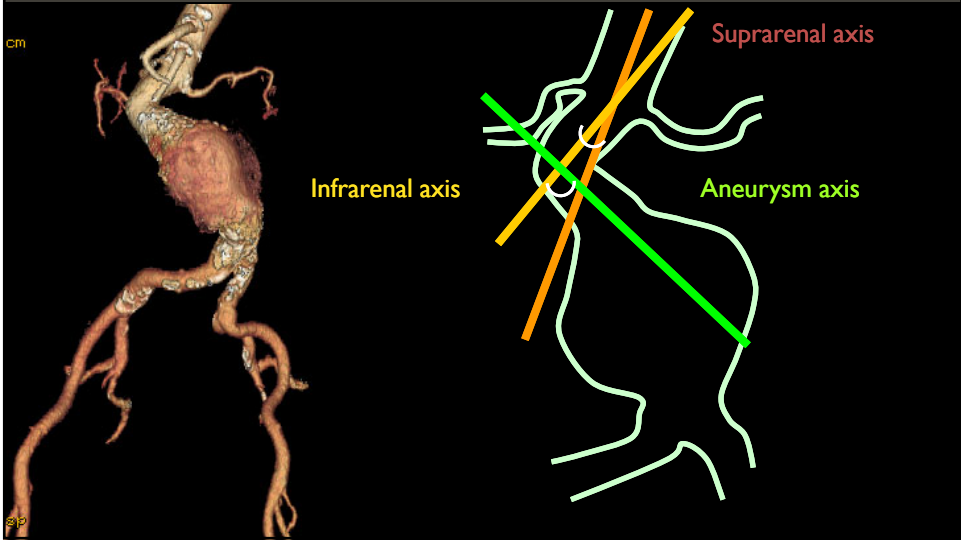


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Angulation

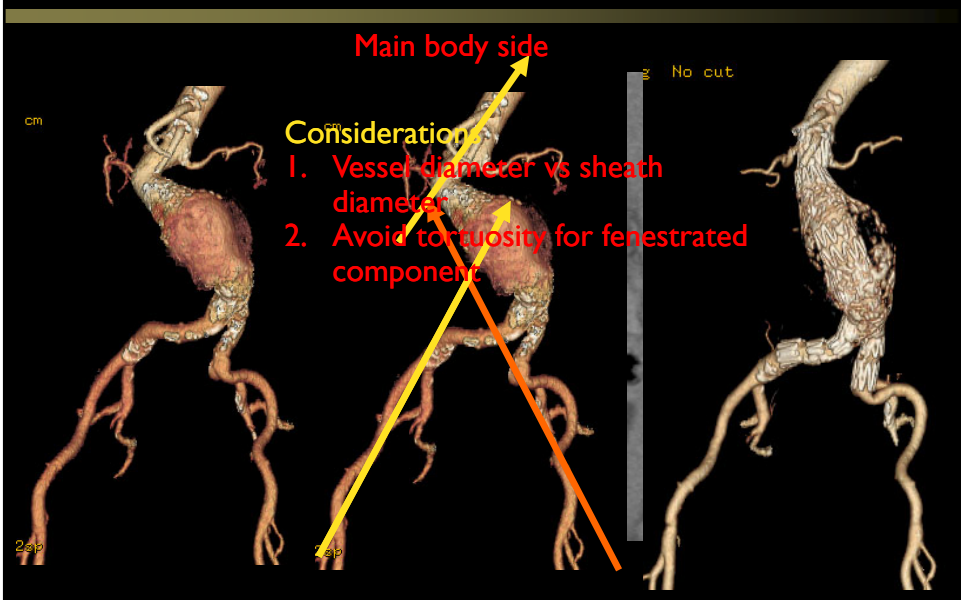
Implications for planning

Neck angulation < 45-60°



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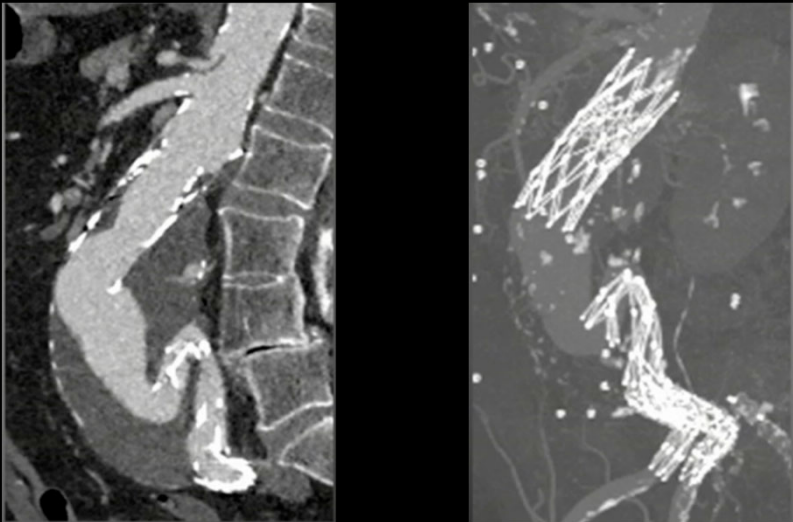
Angulated landing zone



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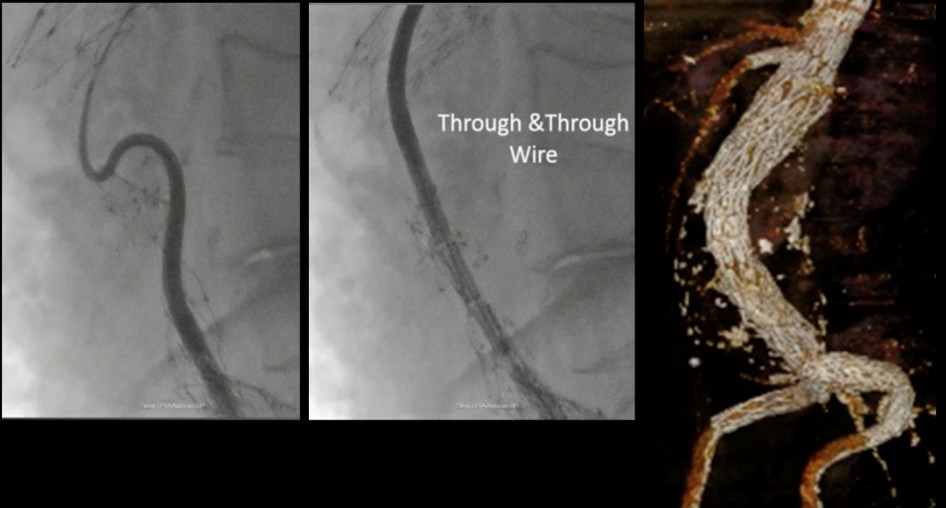
EVAR Failure

81 yr old male with history of EVAR, hostile abdomen, aneurysm sac growth



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EVAR FAILURE



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From the Society for Vascular Surgery

Single-center experience with complex abdominal aortic aneurysms treated by open or endovascular repair using fenestrated/branched endografts

Jesse Manunga, MD,^{a,b} Timothy Sullivan, MD,^{a,b} Ross Garberich, MS, MBA,^b Peter Alden, MD,^{a,b} Jason Alexander, MD,^{a,b} Nedaa Skeik, MD,^{a,b} Jessica Titus, MD,^{a,b} Elliott Stephenson, MD,^{a,b} and Andrew Cragg, MD,^{a,b} Minneapolis, Minn

ABSTRACT

Objective: The objective of this study was to evaluate outcomes of patients with complex abdominal aortic aneurysms (cAAAs) treated with open repair (OR) or fenestrated/branched endovascular aneurysm repair (F/B-EVAR) from a single center.

Methods: A retrospective analysis of consecutive patients with cAAAs treated electively by OR or F/B-EVAR between January 2010 and February 2017 was conducted. Demographics of the patients, cardiovascular risk factors, procedure

Journal of Vascular Surgery

OR: 69 pts; F/B-EVAR: 84 pts (2013-2016)

F/B-EVAR group

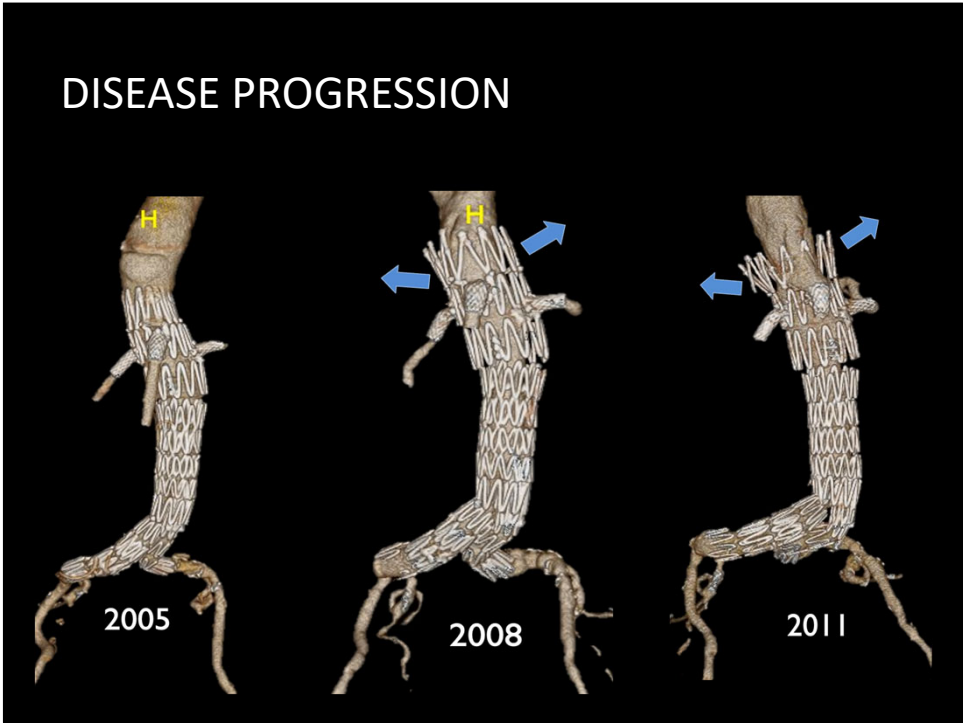
- Patients were older with increase comorbid conditions, however:
- Decrease transfusion requirement
- Decrease ICU and HLOS
- Lower MAEs
- More likely to be discharged directly home
- Similar 30 – day mortality (f/b-EVAR: 2.4%, OR: 2.9)

risk surgical patients is safe and effective and has comparable short-term results to those of low-risk patients undergoing OR. Patients treated by F/B-EVAR had shorter ICU and hospital LOS, lower MAEs, and faster convalescence. A decrease in procedure time and radiation dose was noted as experience was gained, even as complexity increased. (J Vasc Surg 2018;■1-11.)

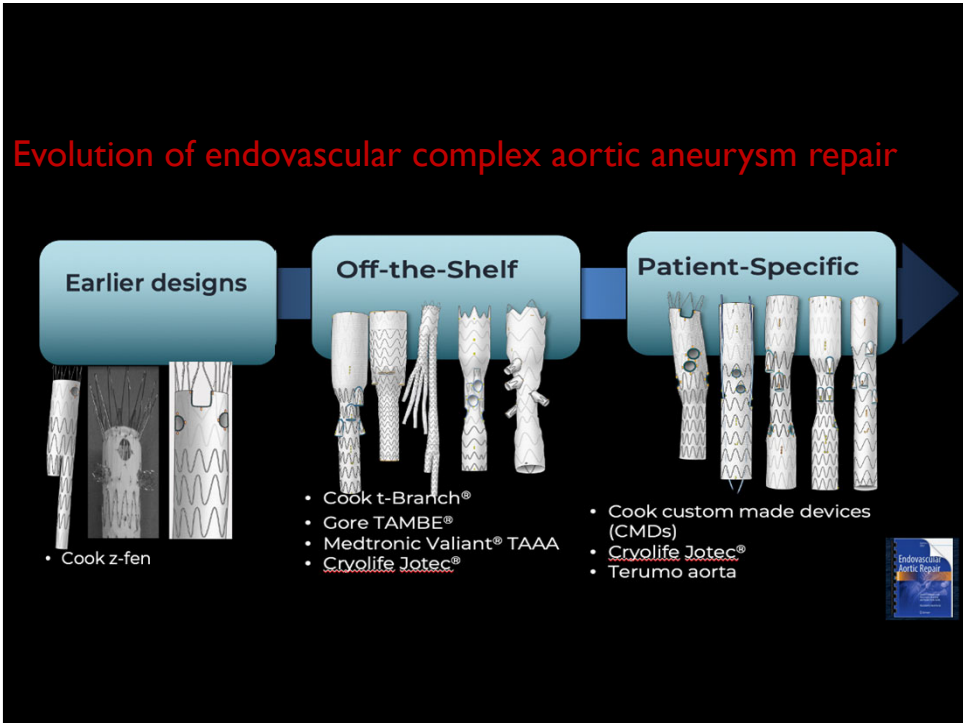
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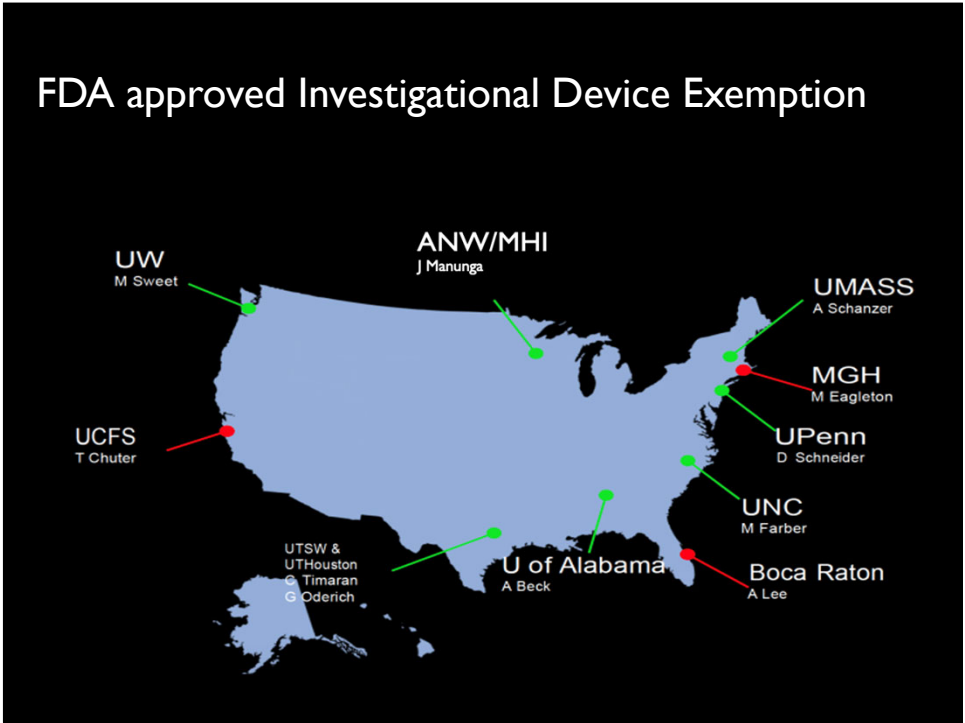
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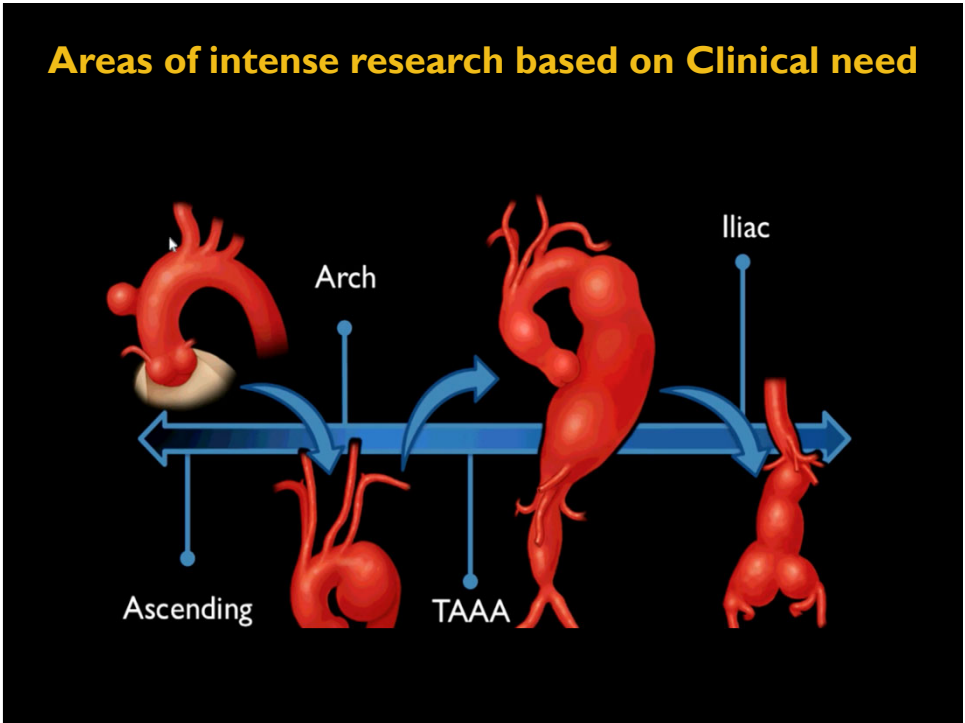
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2nd Area of need: Radiation Exposure

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DNA damage, chromosomal changes...

ORIGINAL RESEARCH ARTICLE

Radiation-Induced DNA Damage in Operators Performing Endovascular Aortic Repair

El-Sayed T (Modarai B) et al. Circulation 2017

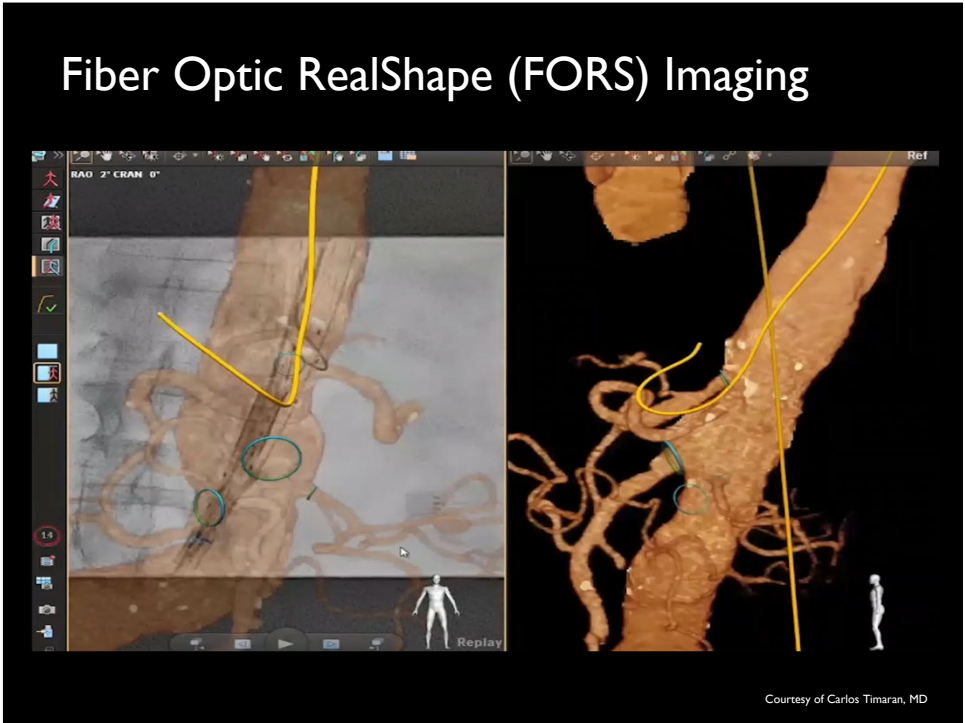
RESEARCH LETTER

Higher Incidence of Chromosomal Aberrations in Operators Performing a Large Volume of Endovascular Procedures

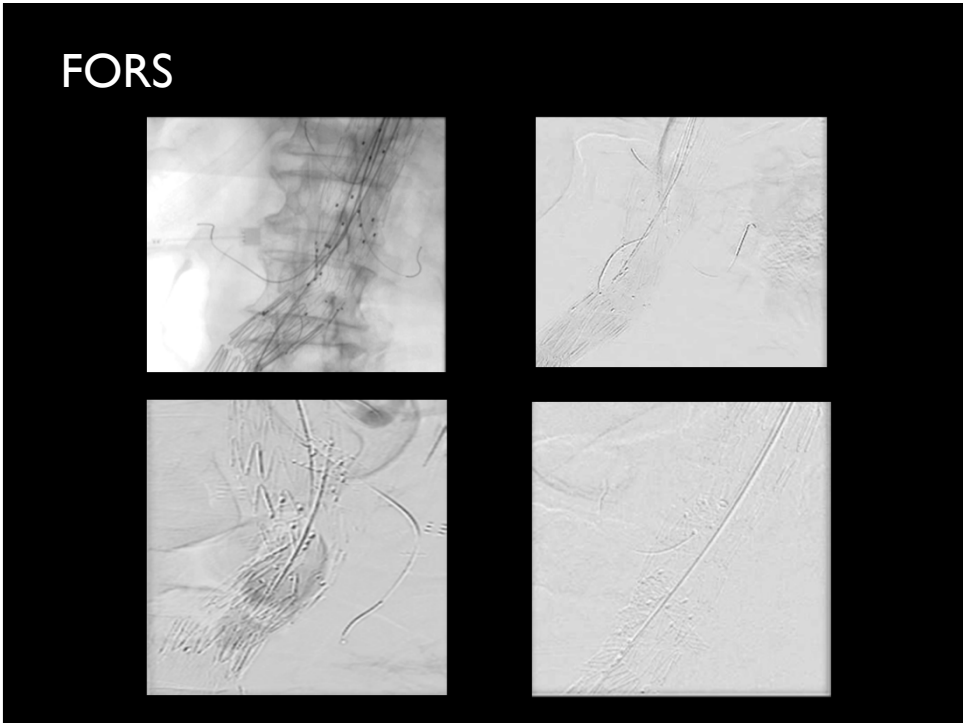
Abdelhalim M (Modarai B) et al. Circulation 2022

Fluorescence microscopy images showing DNA damage and chromosomal aberrations. The top row shows cells with blue/purple fluorescence, indicating DNA damage. The bottom row shows cells with orange/green fluorescence, indicating chromosomal aberrations. Arrows point to specific areas of interest.

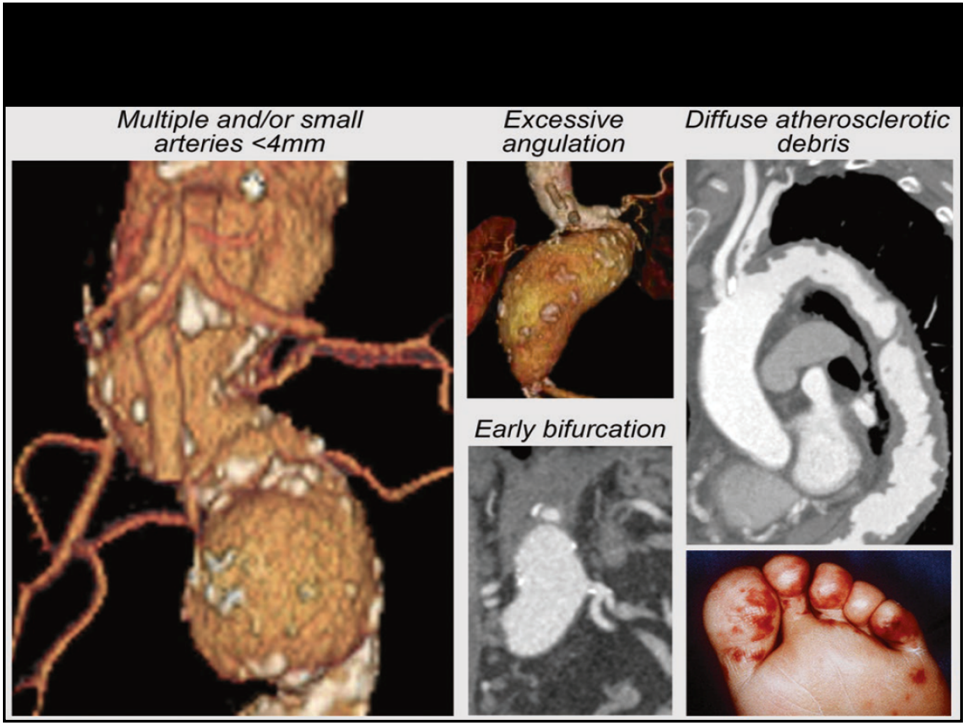
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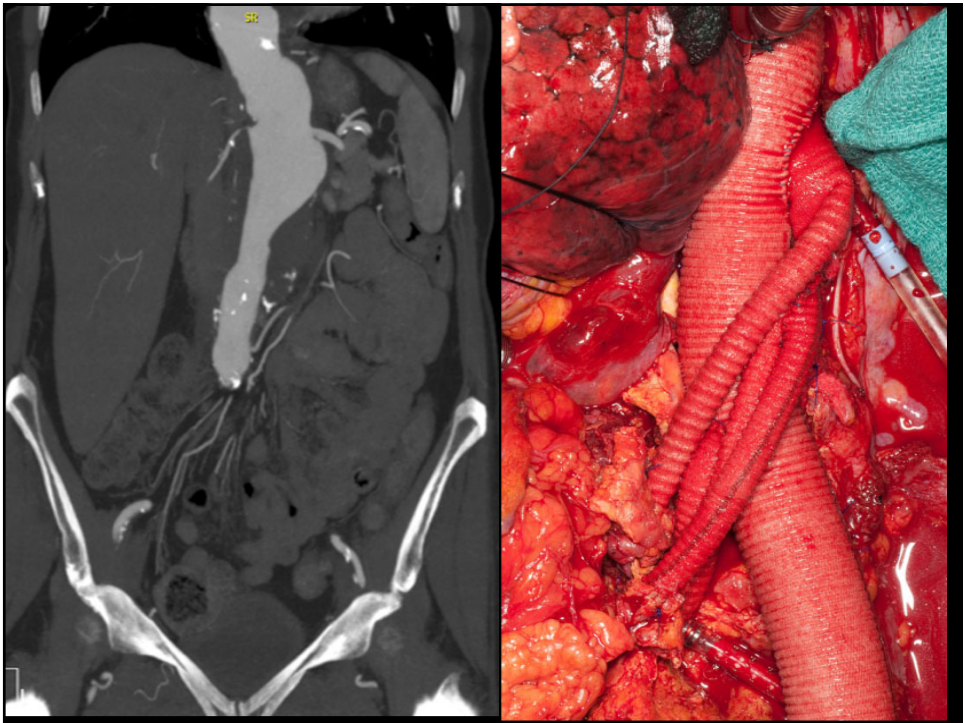
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