Blunt Thoracic and Abdominal Aortic Injury

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Disclosures

Endologix- Ventana Medical Advisory Board

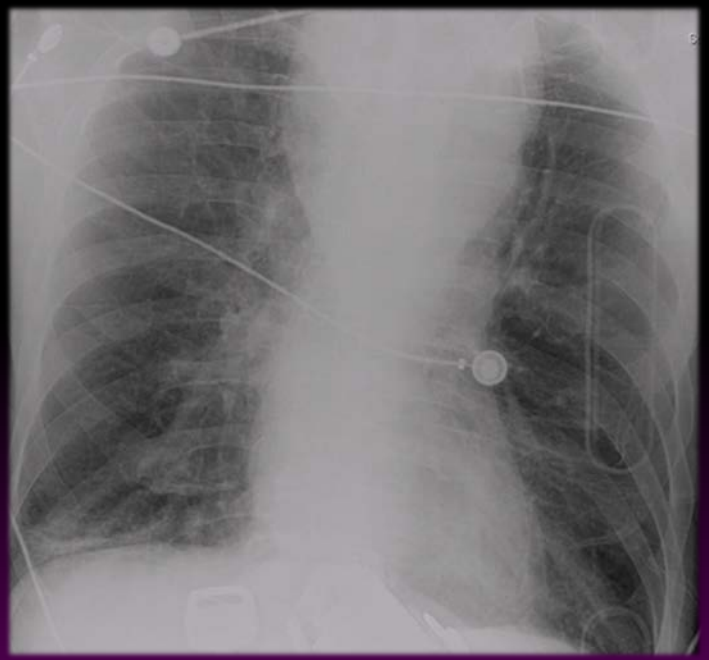
Co-Founder: AORTICA Corporation

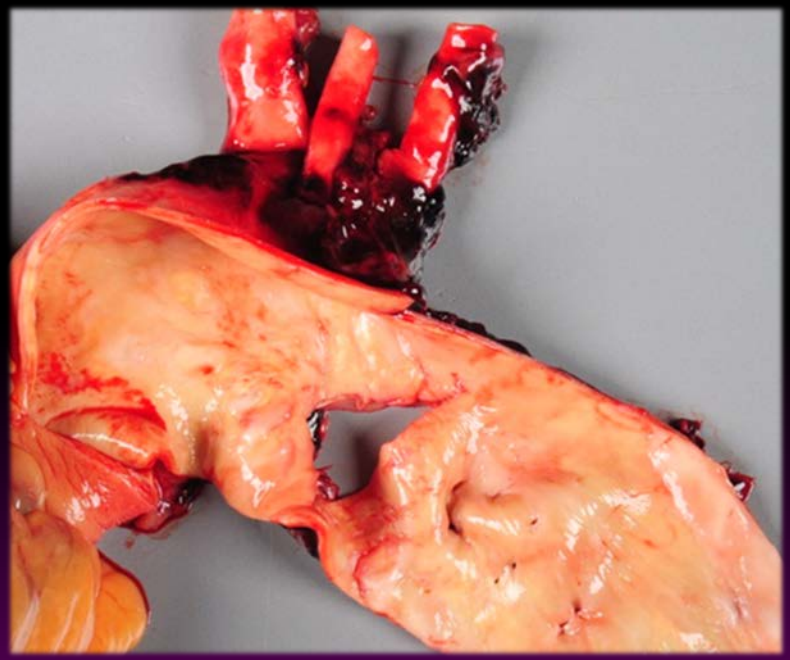
Intellectual Property: Cook Inc

Blunt Thoracic Aortic Injury (BTAI)

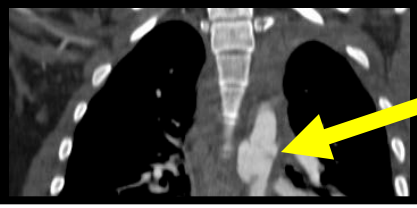
2nd leading cause of trauma-related death: 8,000 deaths/year

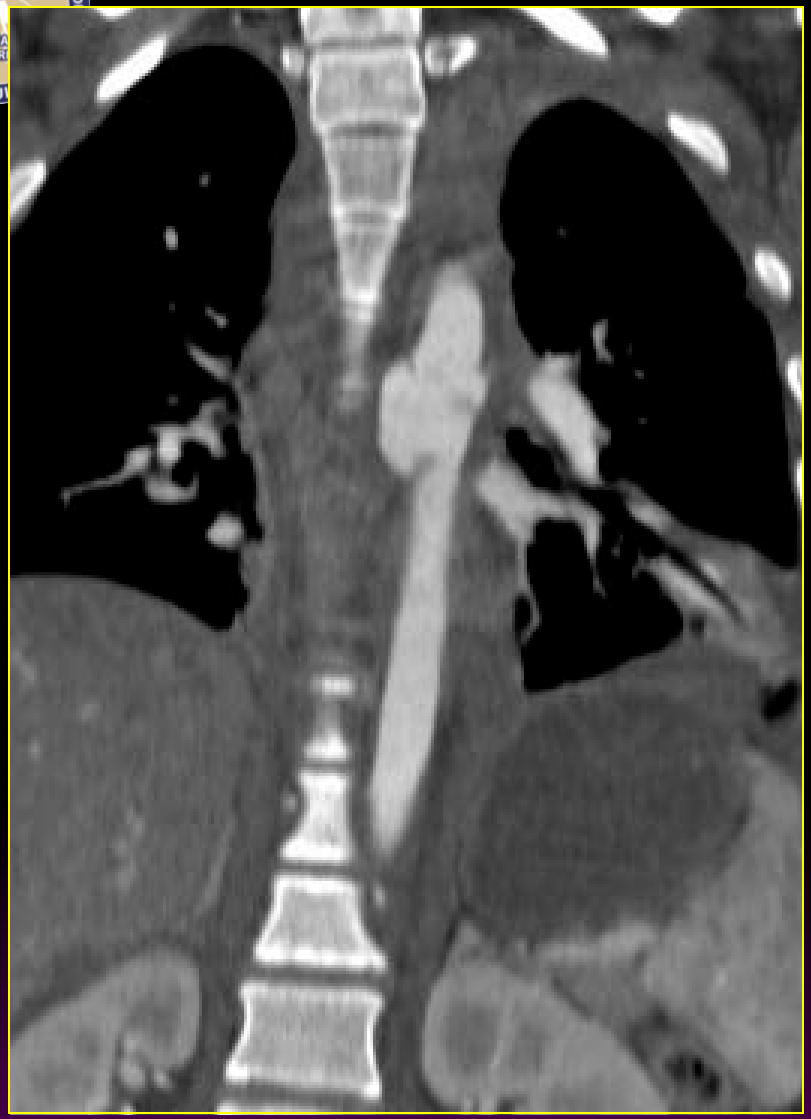
85% die before reaching the hospital

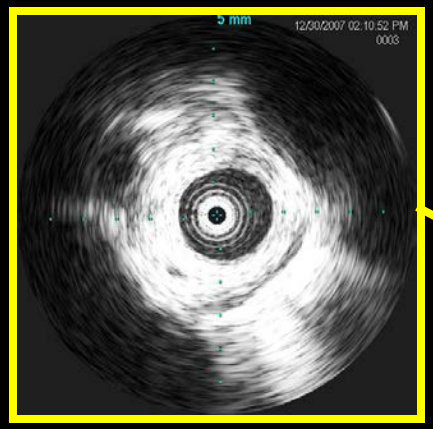




Fabian et al, J Trauma 1997



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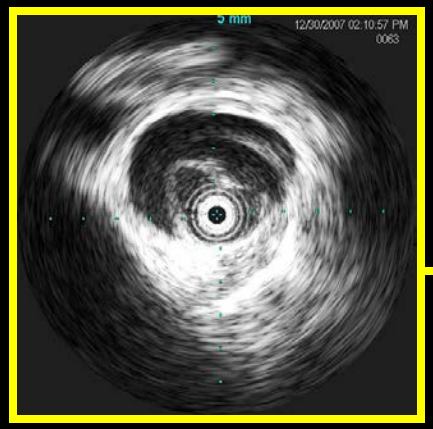
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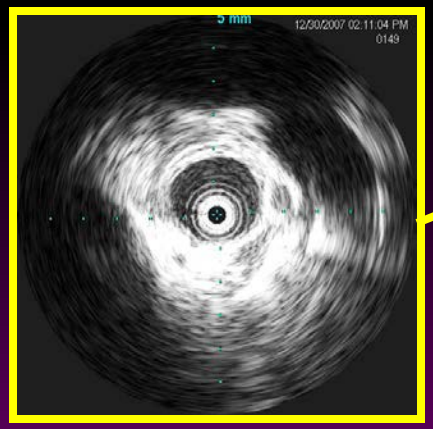
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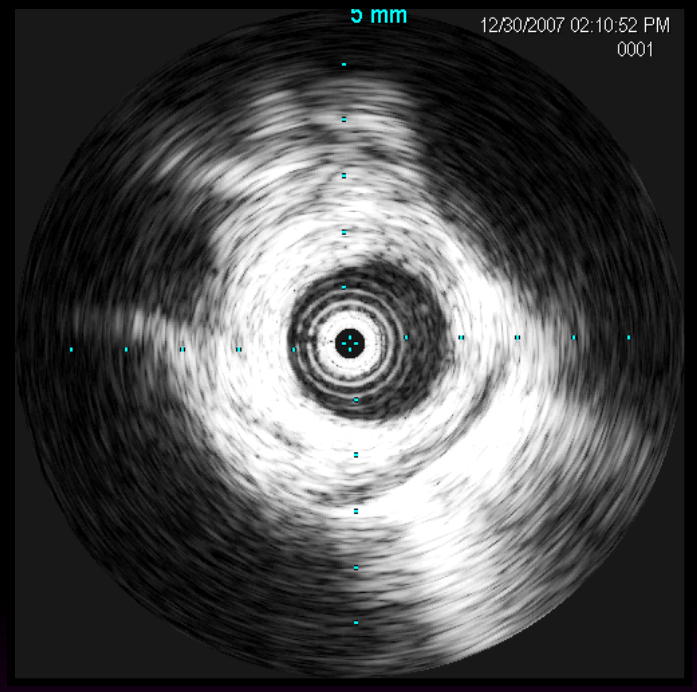
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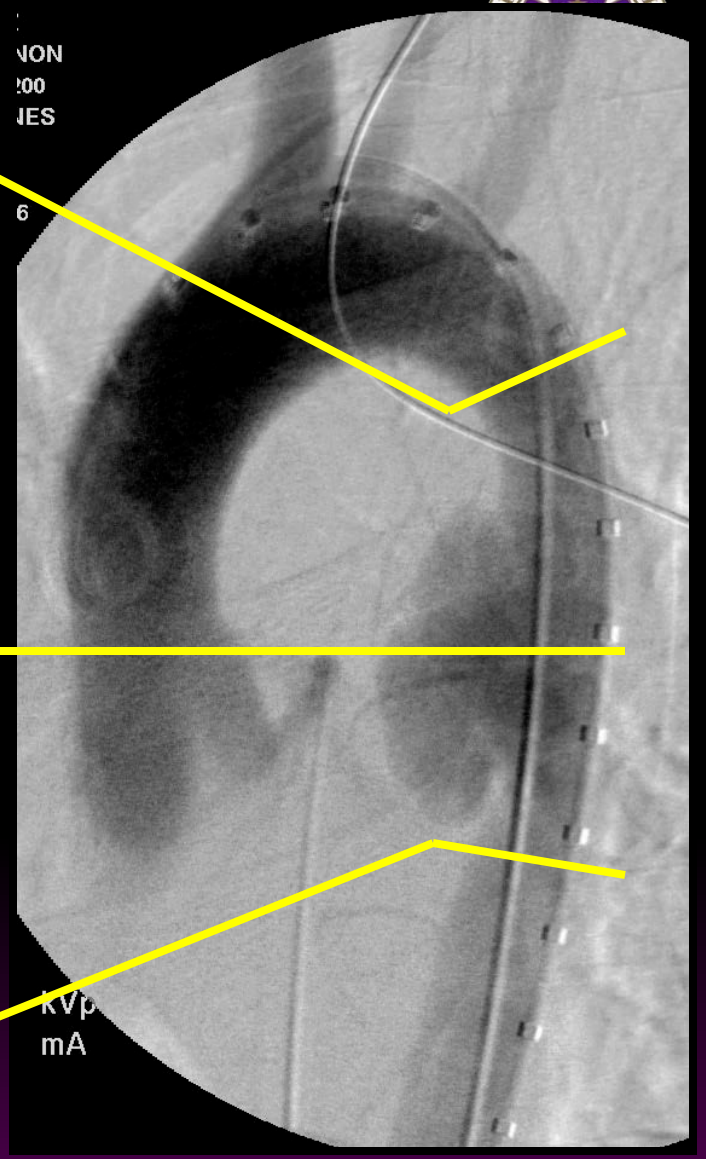
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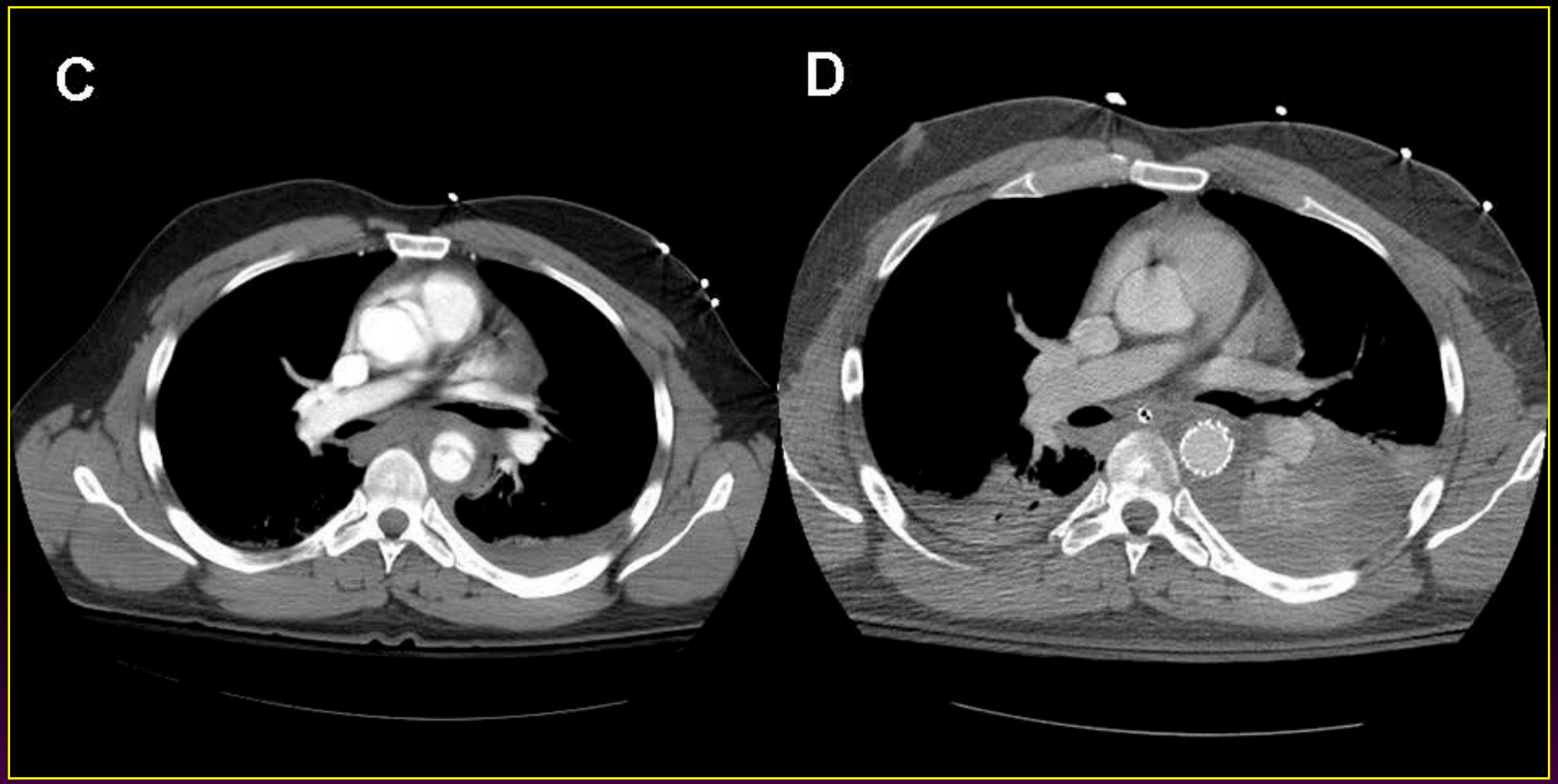
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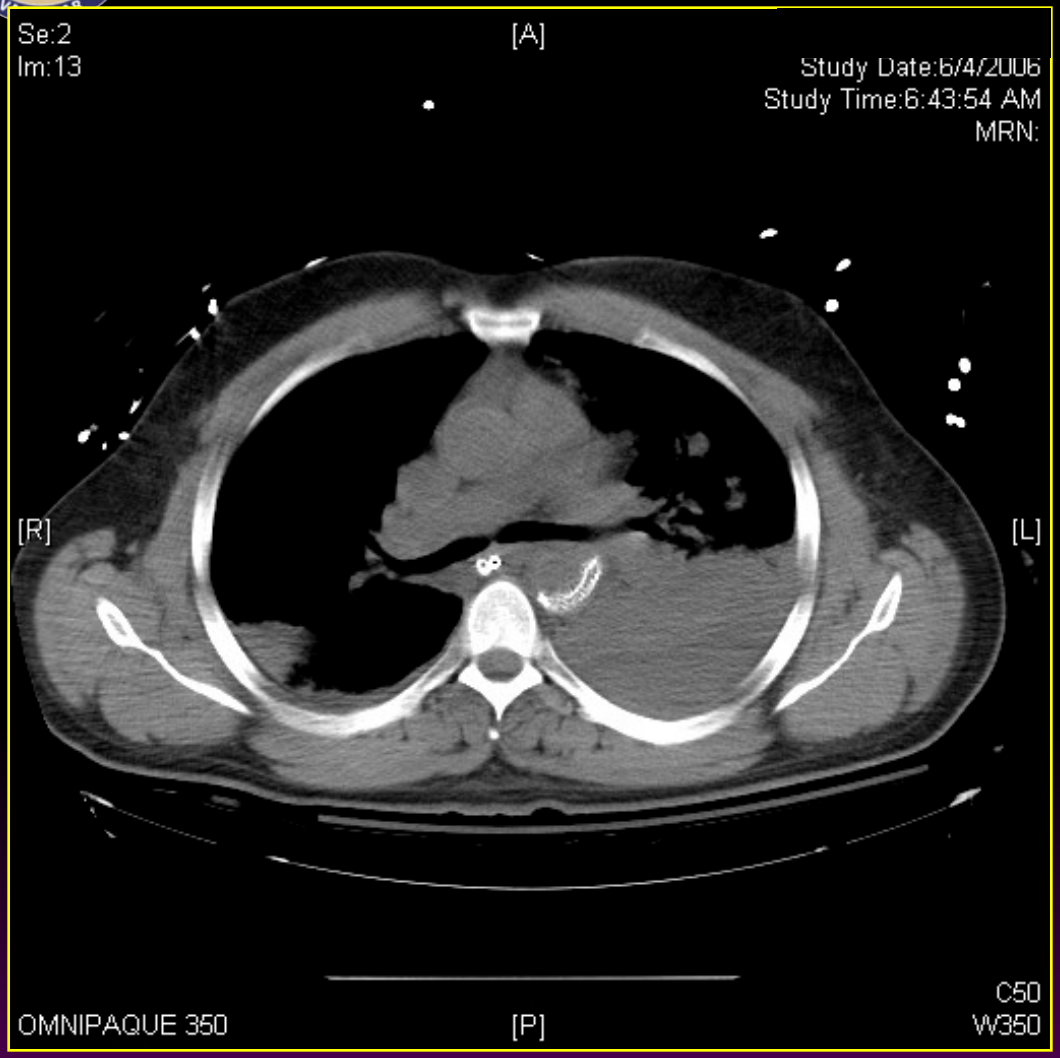
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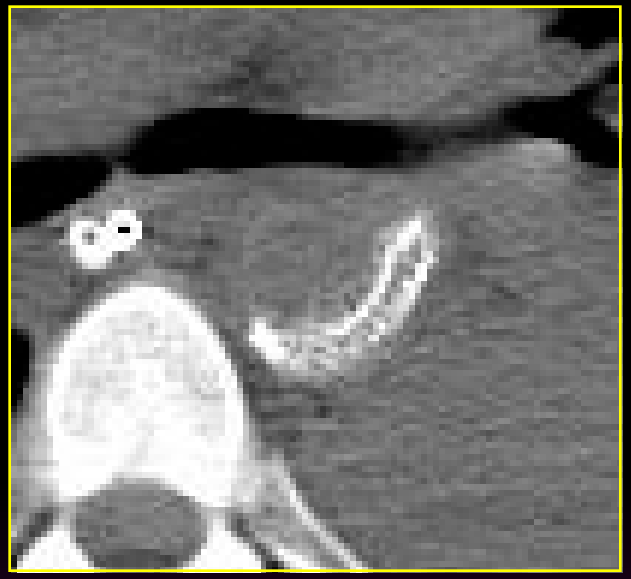
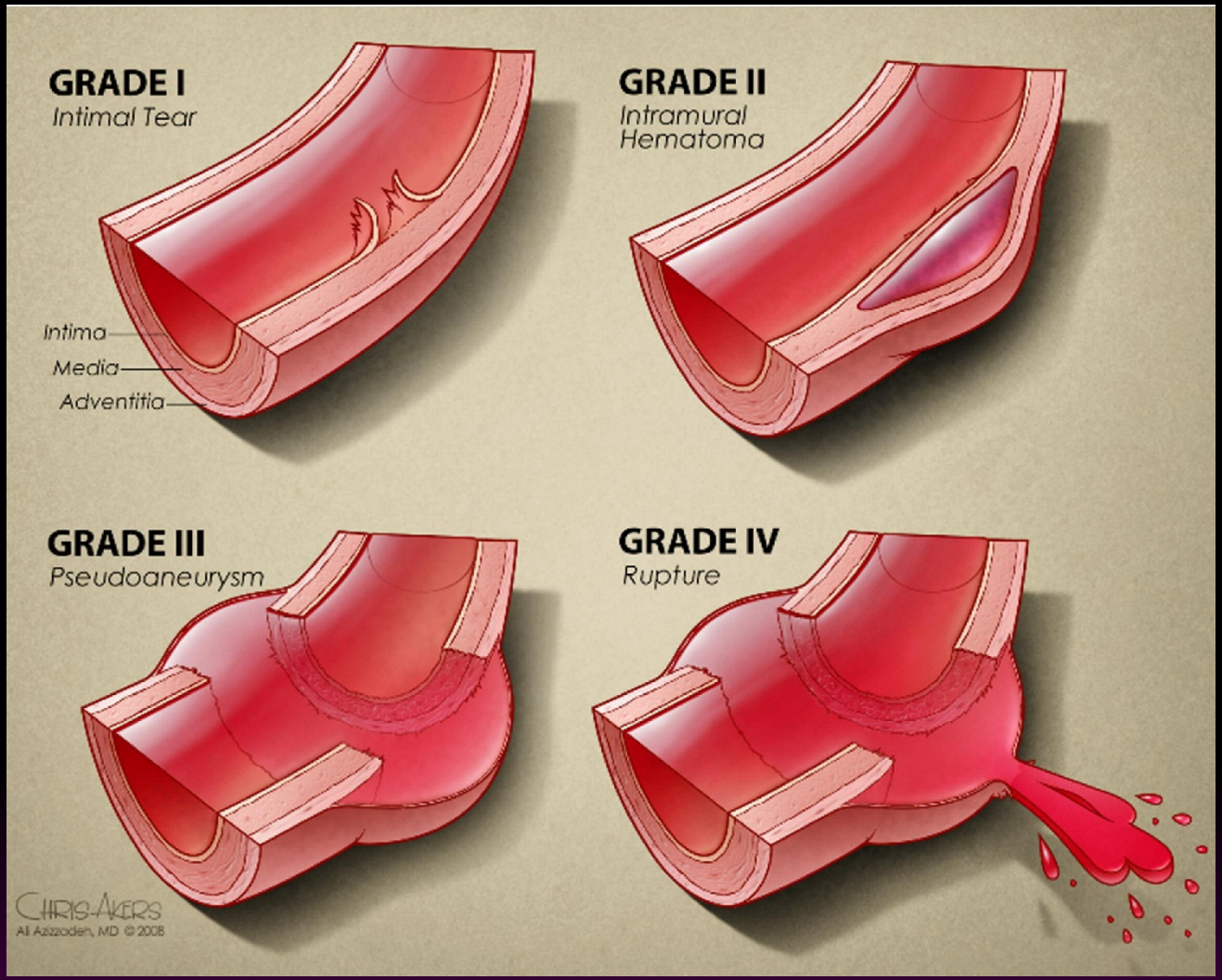


AAST

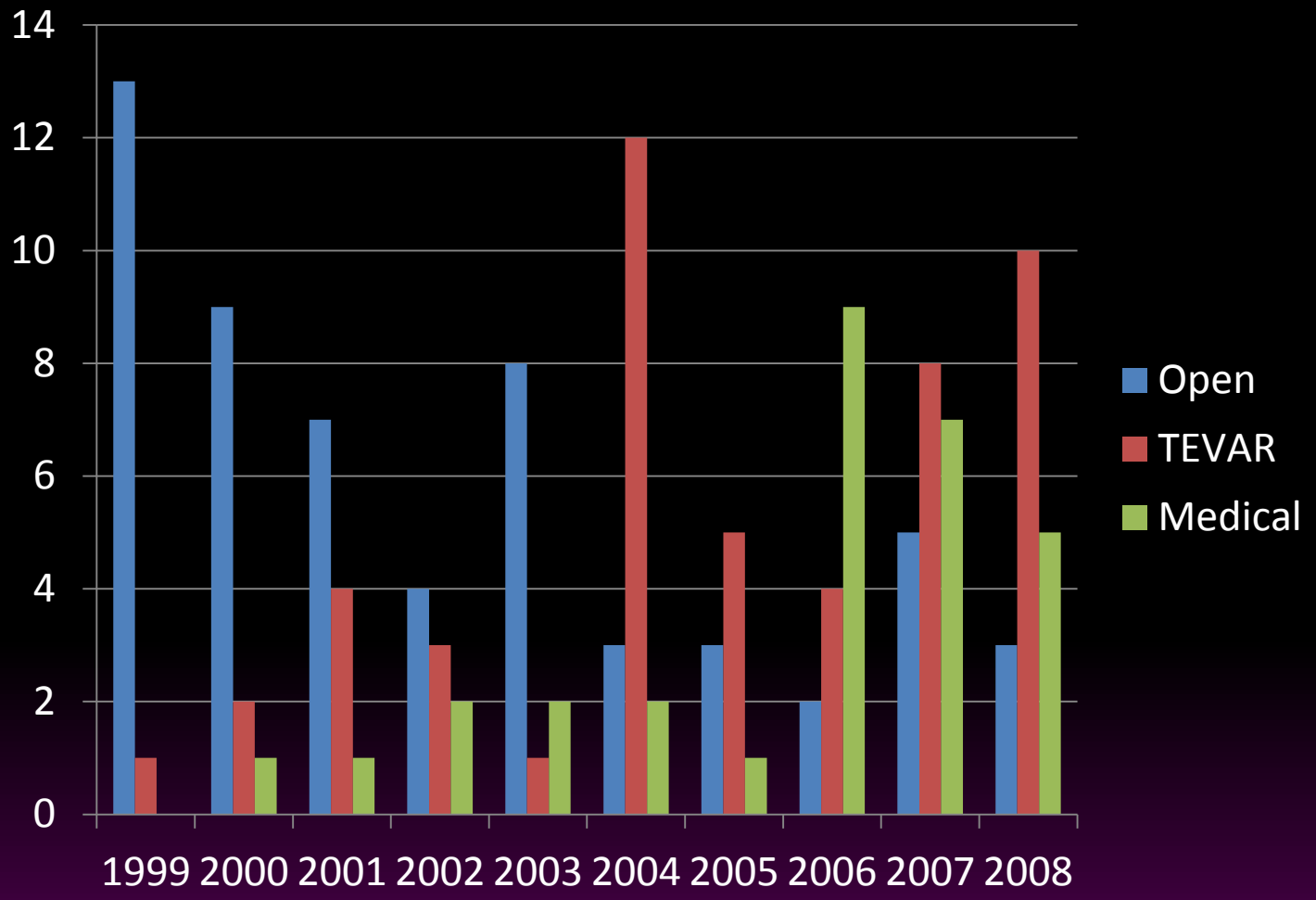
- Conclusions: “Most surgeons select stent grafts for traumatic thoracic aortic ruptures, irrespective of associated injuries, injury severity, and age. Stent Grafts are associated with significantly lower mortality and fewer blood transfusions, but there is a considerable risk of serious device-related complications. *There is a major and urgent need for improvement of the available endovascular devices*.”

Demetriades et al, J Trauma.2008 Mar;64(3):561-70



Journal of Vascular Surgery 2011 53, 187-192DOI: (10.1016/j.jvs.2010.08.027)

Harborview- 10 years, 140 patients



TOTALS	14	12	12	9	11	17	9	15	20	18

The Harborview Experience 1999-2008

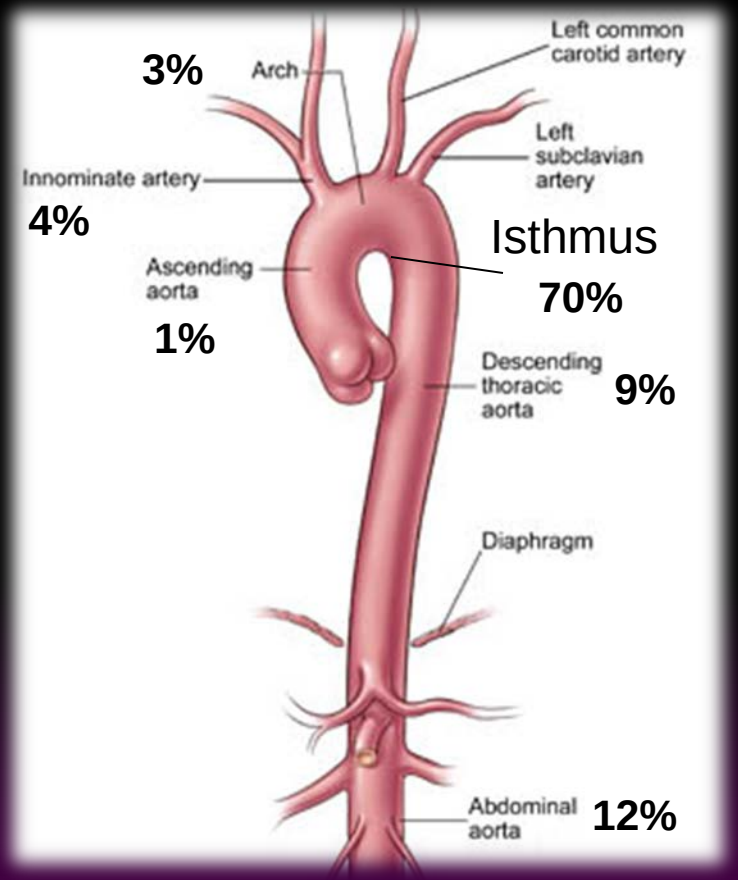
0.5% of all trauma patients who survive to ED presentation

BAI N = 140

- Mean age: 40 years old (range 10-89)

Endovascular repair n = 49

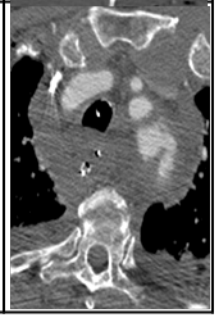
- Patients with multiple injuries



BAI presented at the 64th Society for Vascular Surgery annual meeting


A
B
C

UW BAAI Classification

Absent External Contour Abnormality			Present External Contour Abnormality		
Type of Aortic Injury	***Definition***	***Example***	***Type of Aortic Injury***	***Definition***	***Example***
Intimal Tear	No aortic external contour abnormality: tear and/or associated thrombus is <10mm		**Pseudoaneurysm**	Aortic external contour abnormality: contained	
Large Intimal Flap	No aortic external contour abnormality: tear and/or associated thrombus is >10mm		**Rupture**	Aortic external contour abnormality: not contained, free rupture	

Harborview- 10 years, 140 patients

Table 3	Total	Open Repair	TEVAR	Non-operative Treatment	Dead	Non-BAI Death	BAI-related Death
Intimal tear	23	1	2	20	3	3	0
Large Intimal Flap	8	2	4	2	0	0	0
Pseudoaneurysm	100	43	43	14	24	15	9
Rupture	9	9	0	0	8	2	6
Total	**140**	55	49	36	35	20	15

2014 VASCULAR ANNUAL MEETING
BOSTON JUNE 5–7

Endovascular Repair for Blunt Thoracic Aortic Injury using the Zenith TX2 Low Profile Device

•Benjamin Starnes, MD
•on behalf of **TRANSFIX investigators**

- The TRANSFIX study was sponsored by Cook Medical, Inc. Dr. Starnes has NO relevant disclosures as it relates to this presentation.

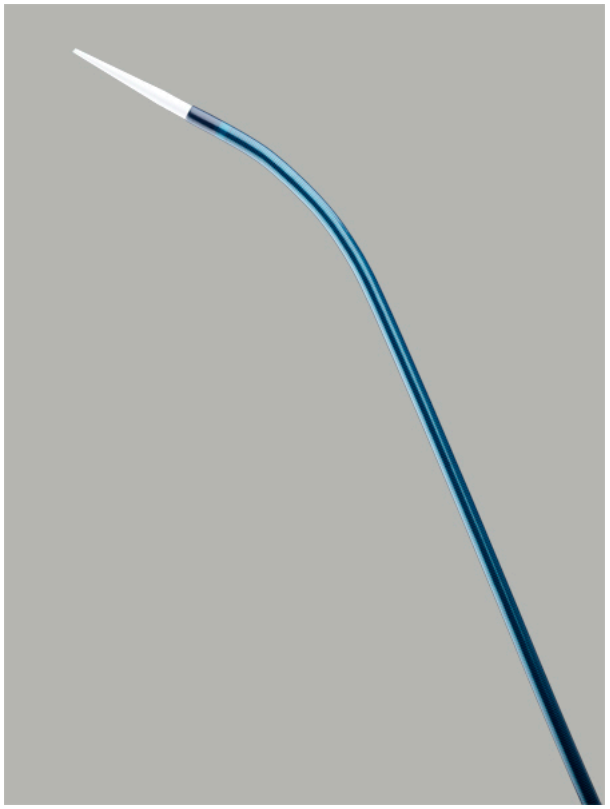
Zenith TX2 Low Profile Endovascular Graft
(Zenith Alpha Thoracic Endovascular Graft)

Zenith TX2	Zenith TX2-LP (Zenith Alpha Thoracic)
20-24 Fr introduction system	16-20 Fr introduction system
22-42 mm diameter devices	18-46 mm diameter devices
Aortic arch radius > 35 mm	Aortic arch radiuc ≥ 20 mm
Stainless steel Z-stents	Nitinol Z-stents
Standard Dacron	Thinner, more tightly woven Dacron
Covered proximal stent	Bare rounded proximal stent
-	MR compatible

Straight Tapered

Investigational Device
in the United States

Smallest Diameter Delivery System -16 Fr

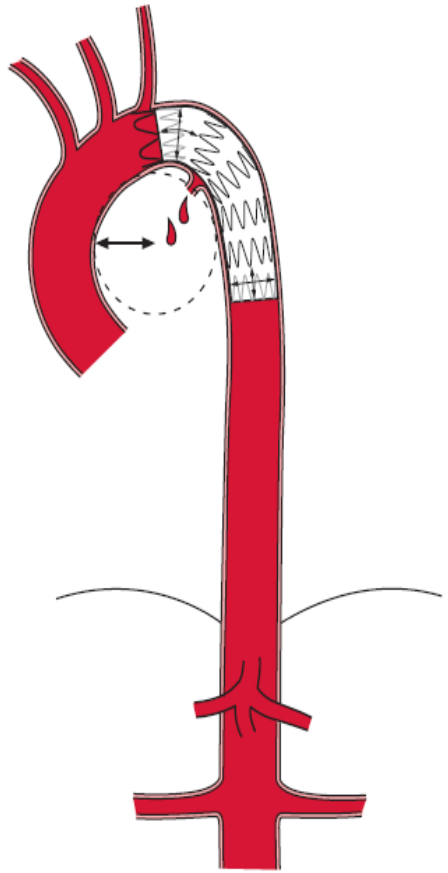


Study Design

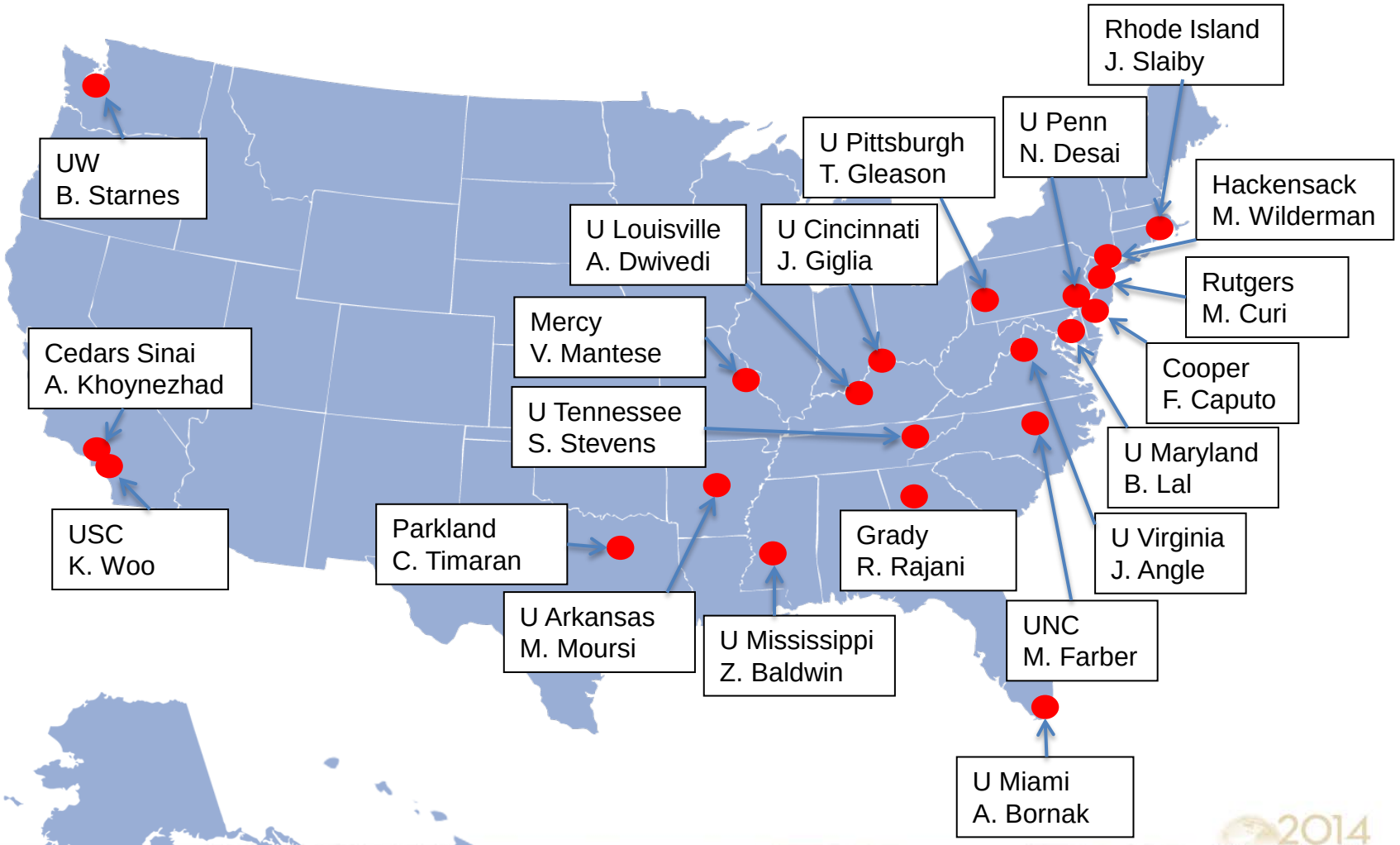
- **Prospective, non-randomized study**
  - **Study enrollment complete - 50 patients treated between Jan 2013 and May 2014.**
  - **All patients beyond 30 days from index procedure.**
- **Primary safety endpoint:**

  30-day mortality
- **Primary effectiveness endpoint:**

  30-day device success
- **Patients will be followed through 5 years**



TRANSFIX Investigators



Procedural Results

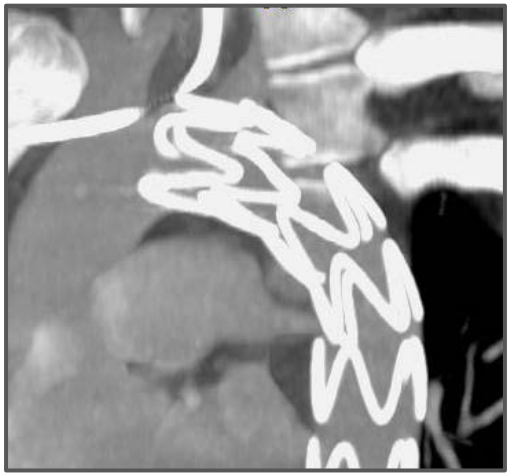
- **Technical success in 100% (48/48) of patients**
- **No intraoperative mortality**

	Mean ± SD (range)
Procedure time (min)	85 ± 45 (34 - 278); N=48
Estimated blood loss (cc)	107 ± 148 (0 - 1000); N=48
Duration of ICU stay (days)	14 ± 12 (1 - 51); N=45
Duration of hospital stay (days)	23 ± 21 (2 - 120); N=46

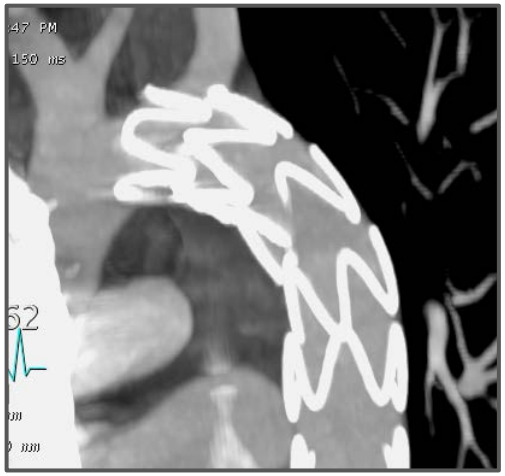
Image Example

Complete aortic healing at 6 months

Pre-procedure

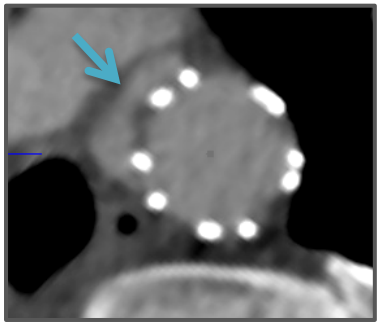


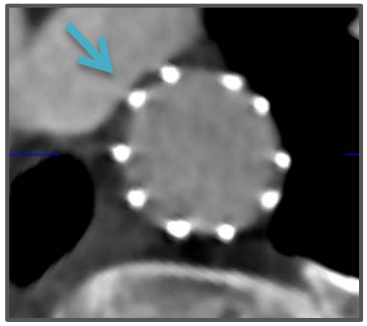
1 month



6 months

Spontaneous resolution of an endoleak (type II per site; type unknown per corelab)





Conclusions

- **Short-term results indicate that TX2 Low Profile device appears safe and effective for the treatment of BTAI**
- **Completely Percutaneous access in 40% of patients**
- **Technical success in 100% of patients**
- **No aortic injury-related mortality within 30 days**
- **Smallest delivery profile**
- **MR-compatible**

Conclusions- BAI

- The use of TEVAR for BAI has become standard in most modern aortic centers
- More BAI is being diagnosed with modern imaging techniques
- Minimal Aortic Injury (-EACA) requires observation only
- Newer devices show promise for treating BAI with less device-related complications

Blunt Abdominal Aortic Injury (BAAI)

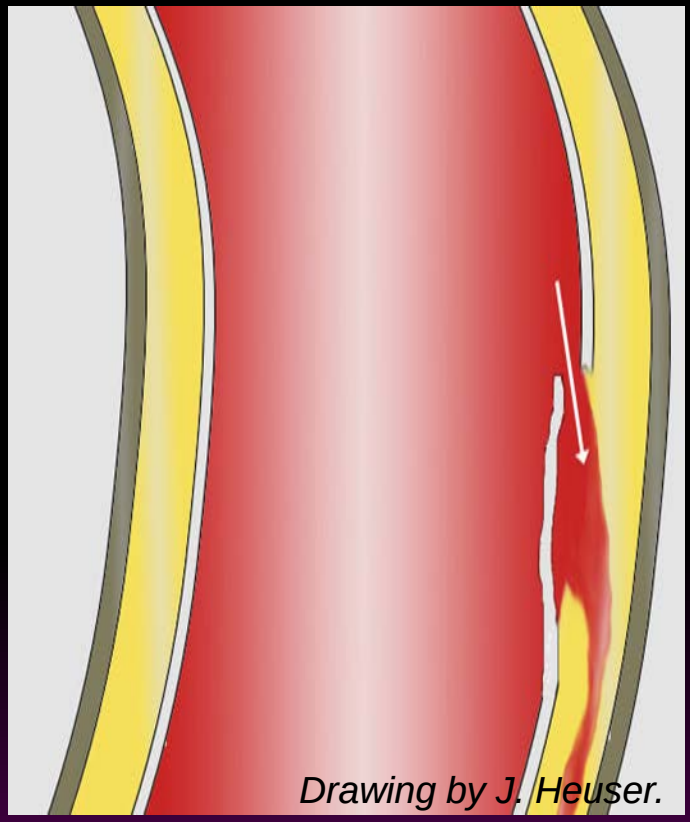
5% of all blunt aortic injuries

- Protected position of abdominal aorta

24% fatality

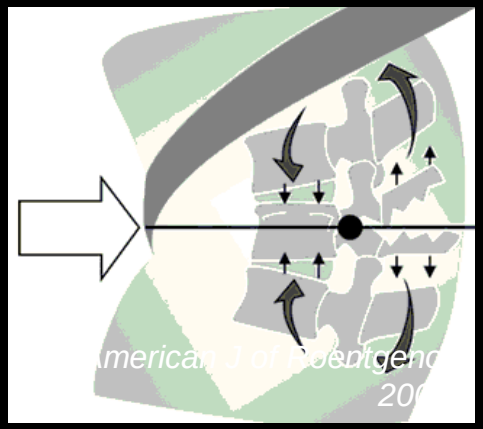
Mechanisms

- Rapid deceleration
- Direct anterior posterior crushing
- Direct laceration



Drawing by J. Heuser.

BAAI contemporary literature



Chance fracture Smith & Kaufer

Marty-Ane Endovascular (dissection)

Seat belt syndrome Garret & Braunstein

Seat belt aorta Dajee

Lock 33 cases

Riesman 46 cases

Roth 62 cases

1962 1967 1979 1987 1990 1996 1997

Blunt Abdominal Aortic Injury (BAAI)

Presentation

- Acute arterial insufficiency (81%)
- Acute abdomen (55%)
- Weakness/paralysis (47%)
- Abdominal wall contusion (24%)

Image: Aerts et al, European J of trauma & emergency surgery, 2007

AIM

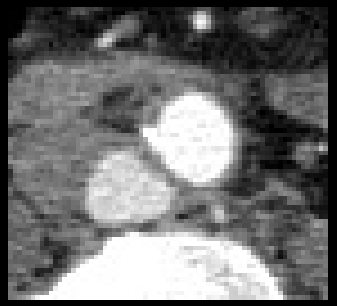
- Review our experience at a major US Level I Trauma Center with blunt abdominal aortic injury

- Retrospective
- 1996 to 2010
- Blunt Trauma only
- Injuries to aorta from diaphragmatic hiatus to aortic bifurcation

UW BAAI Classification

Aortic contour abnormality

No — Yes



Intimal defect (dissection &/or thrombus)

< 10 mm — ≥ 10 mm

Intimal Tear

Large intimal flap (LIF)

Contained rupture

Yes — No

Pseudoaneurysm (PSA)

Rupture/branch vessel avulsion

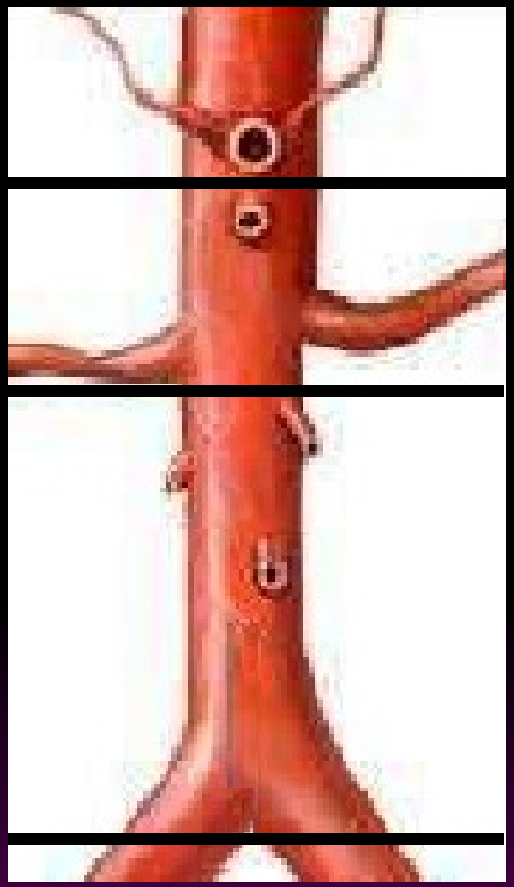
BAI presented at the 64th Society for Vascular Surgery annual meeting

Abdominal Aorta Zones of Blunt Injury

Zone I

Zone II

Zone III



diaphragmatic hiatus to SMA
includes celiac artery

includes SMA to renal arteries

inferior to renal arteries to aortic bifurcation

Results

- 37,922 blunt trauma admissions
- 220 Blunt aortic injury
- 28 BAAI
- Incidence: 0.07% of those surviving to the hospital
- 13% of blunt aortic injuries

Patient Demographics

Male	19 (68%)
Median age (range)	28.5 (6-61)

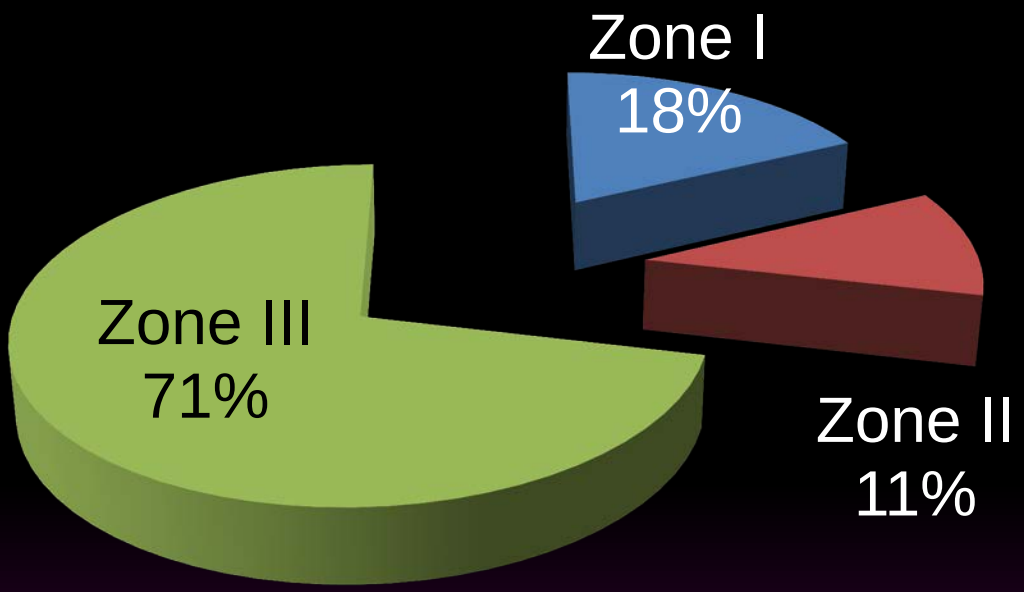
<u>Mechanism of Injury</u>

Motor vehicle crash	57%
Motor cycle crash	11%
Car vs. pedestrian	11%
Car vs. bicycle	3.6%
Fall	7%
Crush injury	7%
All terrain vehicle crash	3.6%

Associated Injuries

Values are percentages	All N = 28	Intimal Tear n = 6	LIF n = 11	PSA n = 3	Rupture n = 8
Traumatic Brain Injury	21	33	0	33	38
“seat belt sign”	36	17	55	33	25
Solid organ injury	29	33	18	33	38
Mesenteric injury	36	0	55	33	38
Small bowel injury	39	0	55	33	50
Colon Injury	39	0	64	33	38
Spine Fracture	50	33	46	0	63
Pelvic Fracture	32	0	36	33	50
IVC injury	21	0	0	0	75

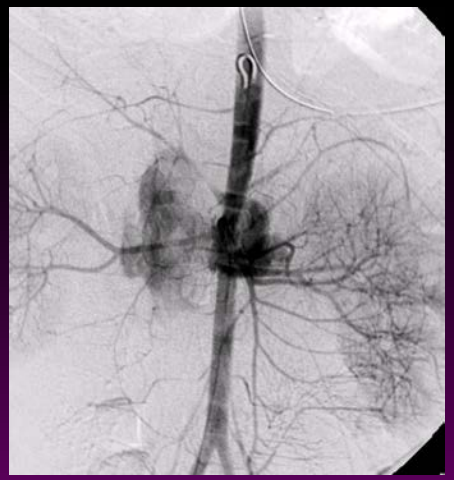
BAAI Location



Mortality

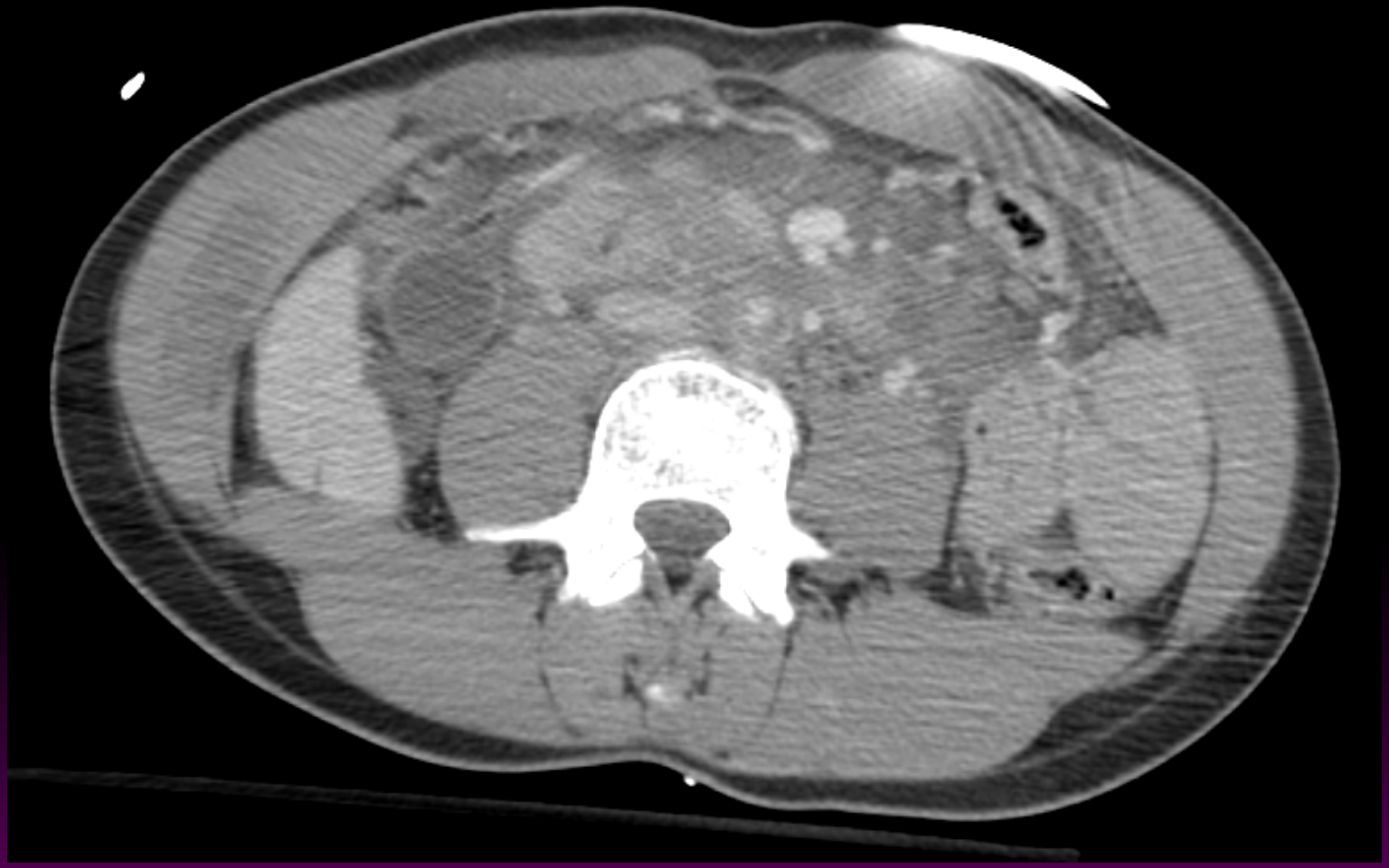
Overall	32%
LIF	9%
Rupture	100%
Hemorrhage	N = 6
Traumatic brain injury	N = 2

Zone I	60%
Zone II	100%
Zone III	15%



August 30, 2011

August 30, 2011

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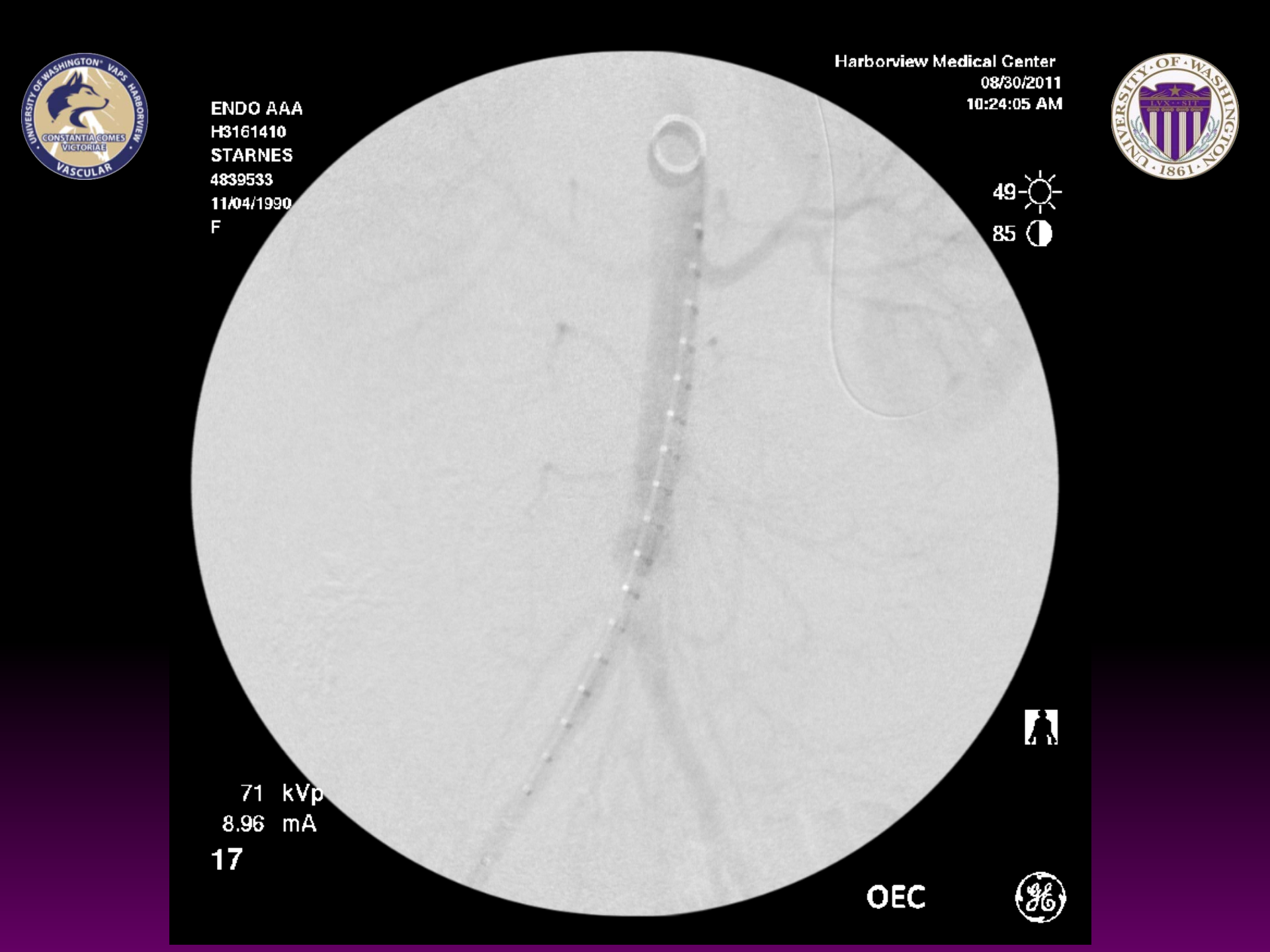
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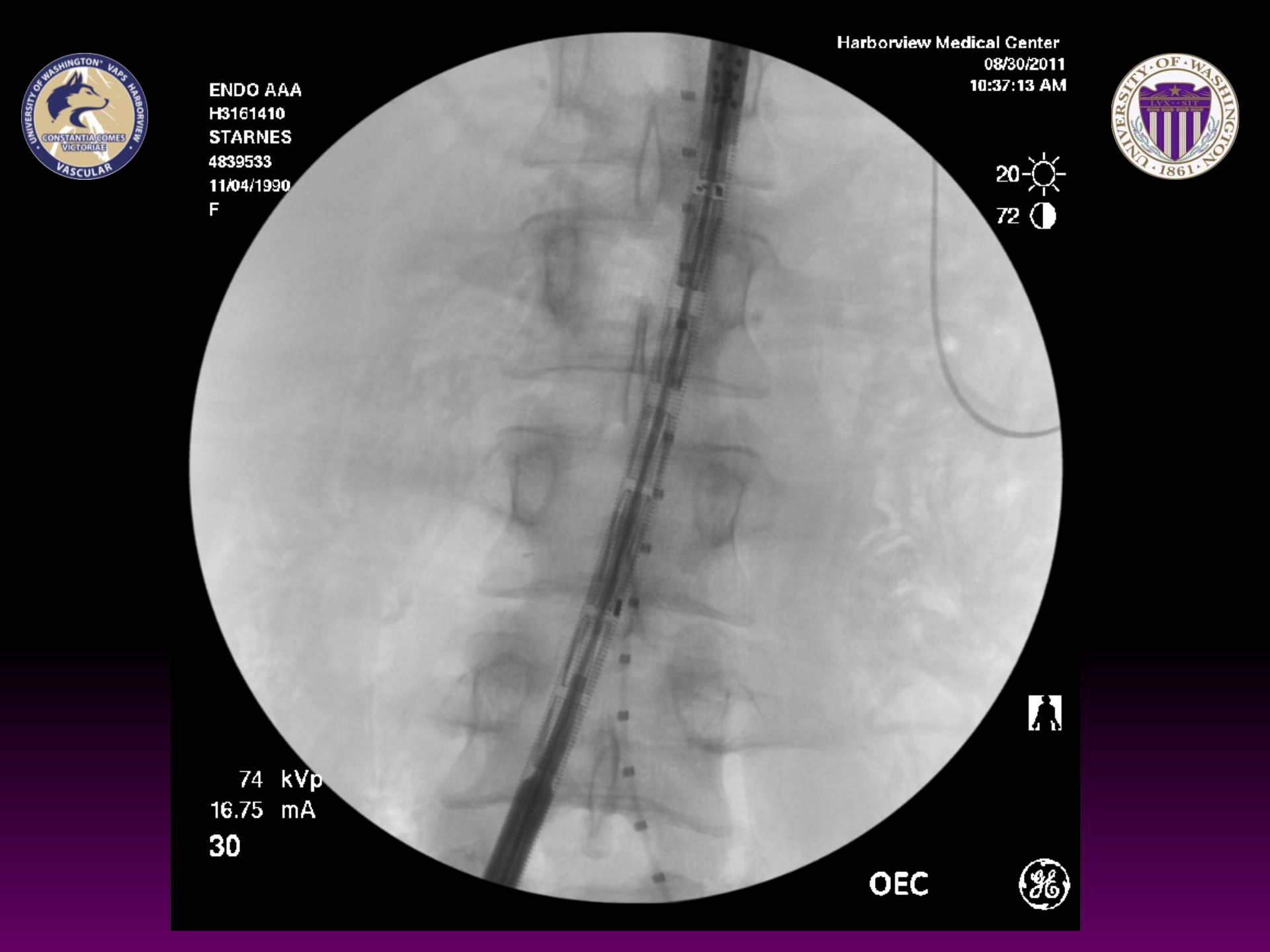
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Conclusions

BAAI is a spectrum of injury

Management

- Depends on the patient's hemodynamics & injuries
- Varies by type & location
- Intimal tears & some LIF can be managed non operatively
- Zone I & III amenable to endovascular repair
- Zone II requires open repair

Successful repair correlates with a favorable prognosis


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