Acute Aorta – Endovascular Management

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President, Danish Society of Interventional Radiology

Acute Aorta
Acute Vascular Conditions

Acute aorta syndrome and its Mechanisms

- **Dissection**
- Intramural **haematoma**
- Penetrating atherosclerotic **ulcer**
- Aneurysm leak/ Aorta **rupture**
- **Trauma** - transection

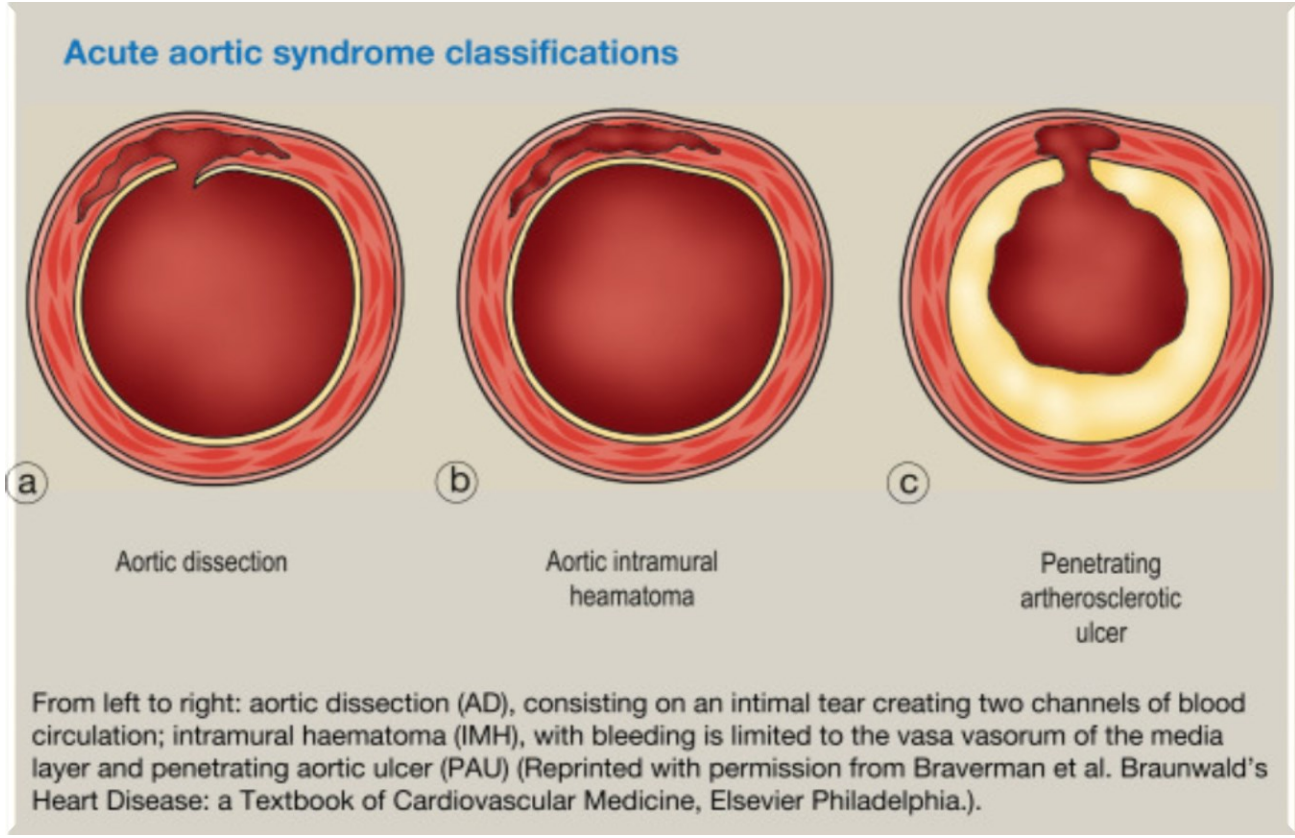
ELSEVIER

Surgery (Oxford)
Volume 39, Issue 3, March 2021, Pages 147-155

Cardiothoracic surgery

Major aortic surgery: from root to diaphragm

Ana Lopez-Marco, Aung Ye Oo



From left to right: aortic dissection (AD), consisting on an intimal tear creating two channels of blood circulation; intramural haematoma (IMH), with bleeding is limited to the vasa vasorum of the media layer and penetrating aortic ulcer (PAU) (Reprinted with permission from Braverman et al. Braunwald's Heart Disease: a Textbook of Cardiovascular Medicine, Elsevier Philadelphia.).

In the 1990s, the International Registry of Acute Aortic Dissections (**IRAD**) was developed

Aortic **dissection account for 80%–90%** of acute aortic syndromes)

Incidence of acute aortic syndromes is 3.5 to 6.0 per 100,000 patient-years, and contemporary in-hospital mortality rate for acute aortic syndromes derived from the IRAD registry is ~21%

Acute Aortic Syndromes

R. Kevin Rogers MD, MSc, T. Brett Reece MD, Marc P. Bonaca MD, MPH and Connie N. Hess MD, MHS

Cardiology Clinics, 2021-11-01, Volume 39, Issue 4, Pages 495-503, Copyright © 2021 Elsevier Inc.

Multicenter Study > JAMA. 2000 Feb 16;283(7):897-903. doi: 10.1001/jama.283.7.897.

The International Registry of Acute Aortic Dissection (IRAD): new insights into an old disease

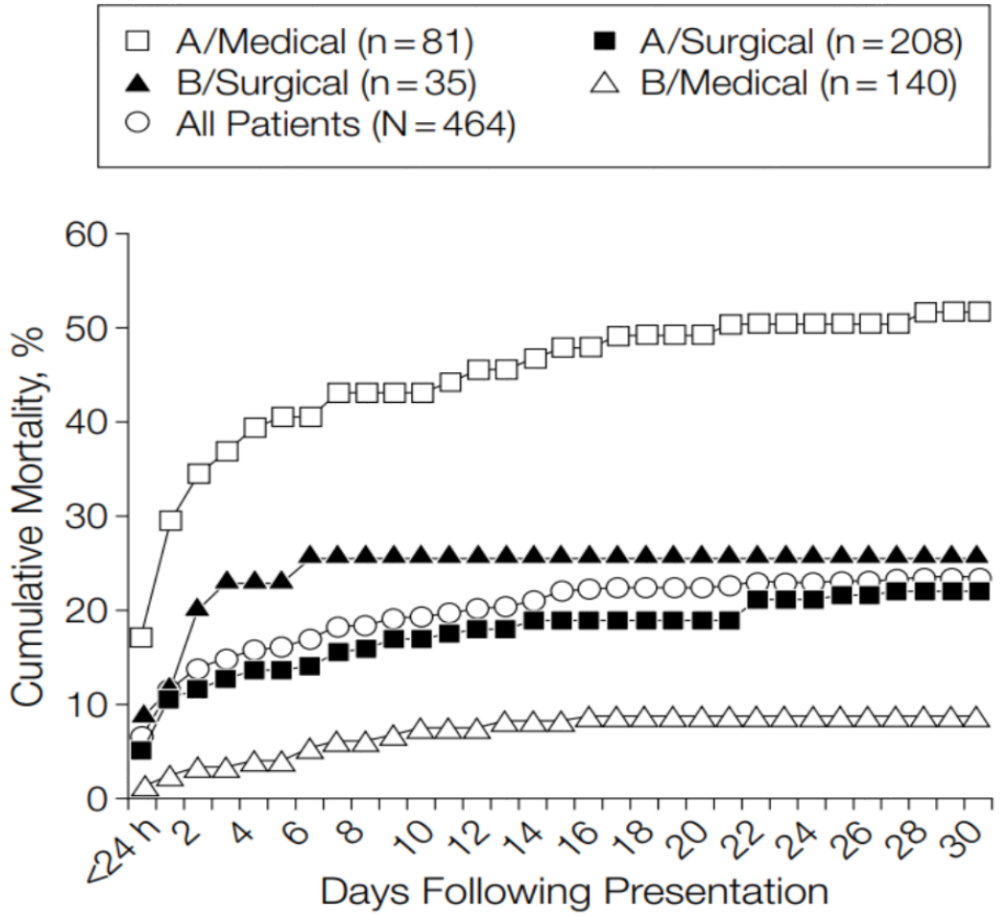
P G Hagan [1], C A Nienaber, E M Isselbacher, D Bruckman, D J Karavite, P L Russman, A Evangelista, R Fattori, T Suzuki, J K Oh, A G Moore, J F Malouf, L A Pape, C Gaca, U Sechtem, S Lenferink, H J Deutsch, H Diedrichs, J Marcos y Robles, A Llovet, D Gilon, S K Das, W F Armstrong, G M Deeb, K A Eagle

Table 4. Management and Outcomes of Acute Aortic Dissection

	Type A (n = 289) Management, No. (%)		Type B (n = 175) Management, No. (%)	
	Surgical	Medical	Surgical	Medical
No.	208 (72)	81 (28)	35 (20)	140 (80)
In-hospital mortality	54 (26)	47 (58)	11 (31.4)	15 (10.7)
Total*	101 (34.9)		26 (14.9)	

*Total mortality for both groups was 127 (27.4%). For definitions of type A and B dissections, see footnote to Table 1.

Figure. Thirty-Day Mortality by Dissection Type and Management



Peripheral Vascular Disease (WS Jones, Section Editor) | Published: 14 January 2022

Diagnosis and Management of Acute Aortic Syndromes: Dissection, Penetrating Aortic Ulcer, and Intramural Hematoma

Rebecca Sorber & Caitlin W. Hicks

Current Cardiology Reports **24**, 209–216 (2022) | Cite this article

Autopsy ~ 50% of patients with a Type A die before ever reaching a hospital

<1 in 4 with Type A are alive one month later

Delayed recognition - mortality rate of 1–2% per hour over the first 24 h and exceeding 75% in the first 2 weeks

Type A dissection is a cardiothoracic surgical emergency regardless of patient's symptoms or clinical stability.

Type B aortic dissection (TBAD) less common than Type A (TAAD)
30 days mortality rate –TAAD 50%, TBAD only 13%

Typical target systolic blood pressure < 120 mmHg and diastolic blood pressure < 80 mmHg, heart rate < 80 beats per minute

Diagnostics - Acute Aortic Disection

CT sensitivity of 95% to 100%; **specificity** of 98% to 100%

Transthoracic echocardiography (TTE) sensitivities and specificities as low as 60% for Stanford type A dissections and even lower for type B dissections.

Transesophageal echocardiography (TEE) - Sensitivity 89% and the specificity close to 99%.

MRI - sensitivity of 95% to 98% and specificity of 94% to 98%

CT is invaluable for treatment planning – The essence is TIME & ACCURACY

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JACC: Cardiovascular Imaging
Volume 7, Issue 4, April 2014, Pages 406-424

State-of-the-Art Paper

The Role of Imaging in Aortic Dissection and Related Syndromes

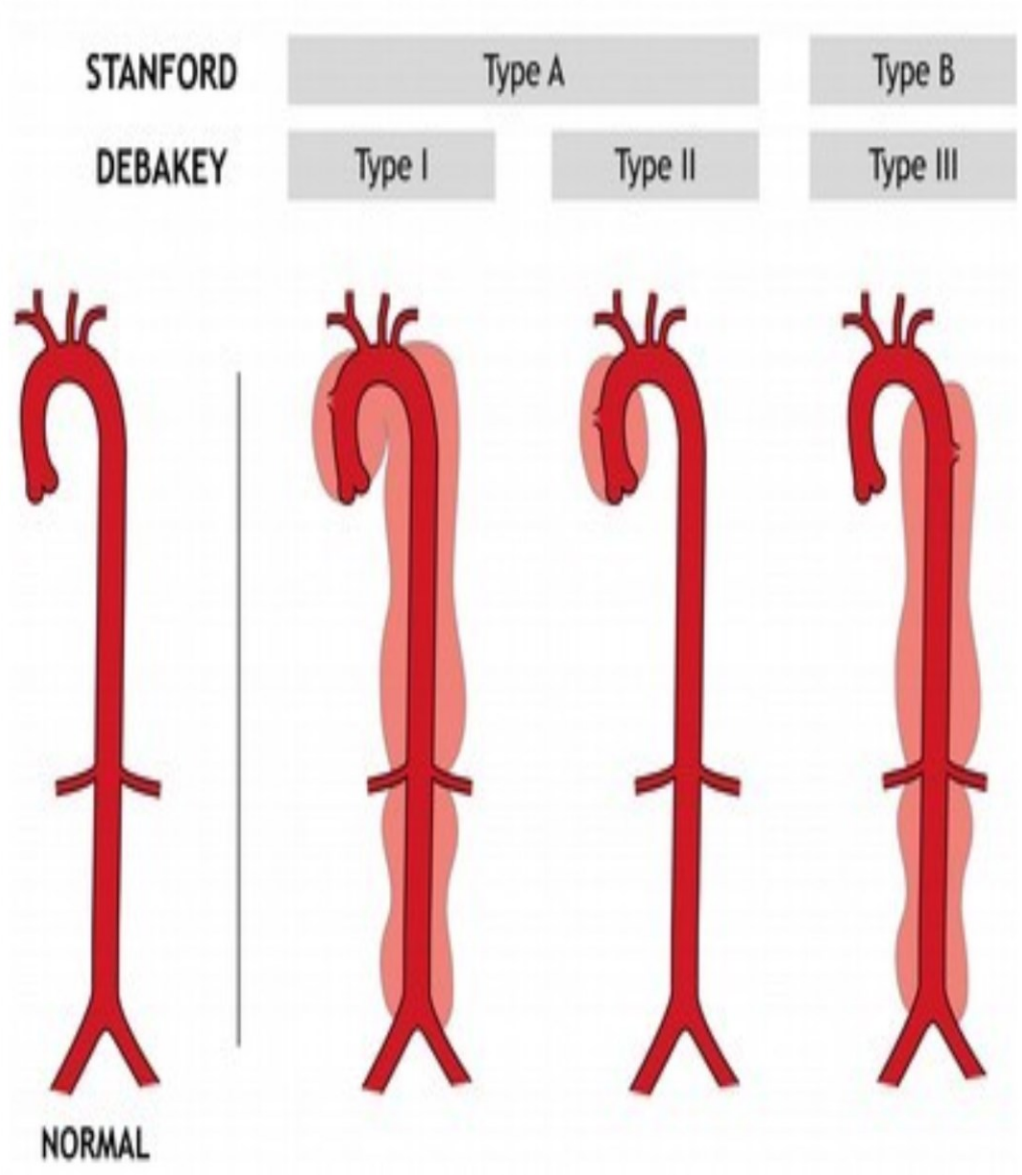
Ragavendra R. Baliga MD, MBA *, Christoph A. Nienaber MD, PhD †, Eduardo Bossone MD, PhD ‡, Jae K. Oh MD §, Eric M. Isselbacher MD ‖, Udo Sechtem MD ¶, Rossella Fattori MD, PhD #, Subha V. Raman MD **, Kim A. Eagle MD ††

What the image should include??

1. Should be ECG triggered
2. Non-contrast, Arterial and Venous phases
3. Include iliac-common femoral arteries for extension and possible endovascular treatment
4. Neck vessels included in the scan
5. Must include reconstructions

What shold you look for??

2. Type A or B - Type A mortality



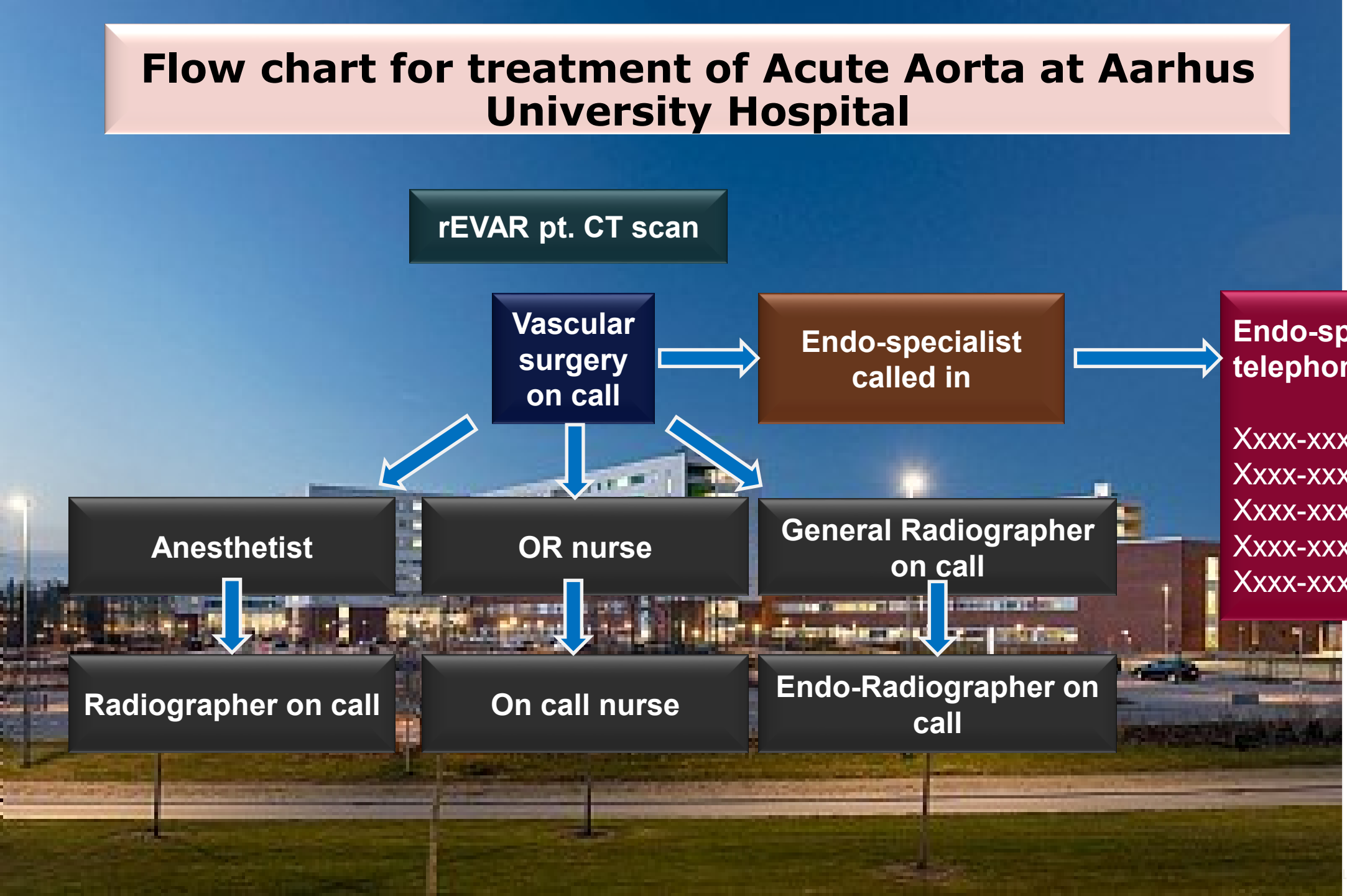
EMERGENCY RADIOLOGY 2023

May 8th - May 11th, 2023

8th Nordic Course in Emergency Radiology, Aarhus, Denmark

Endovascular Treatment

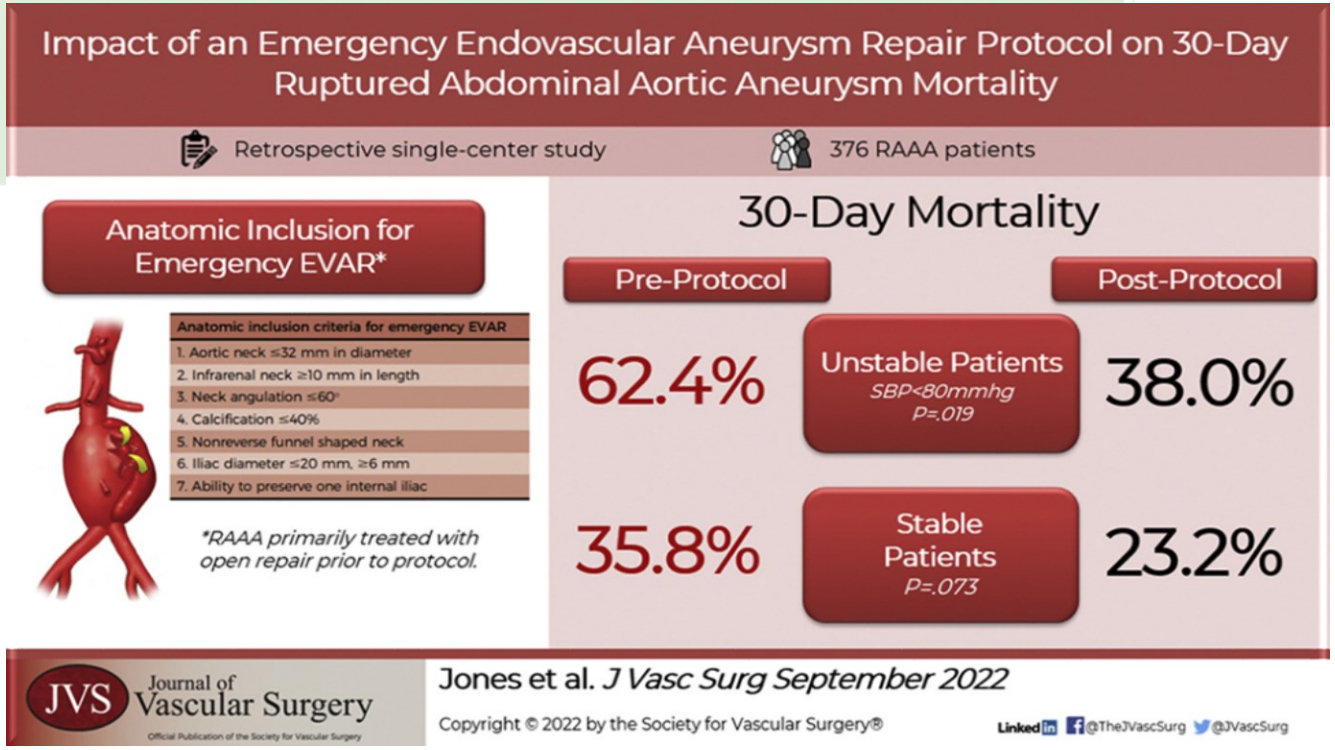
Flow chart for treatment of Acute Aorta at Aarhus University Hospital



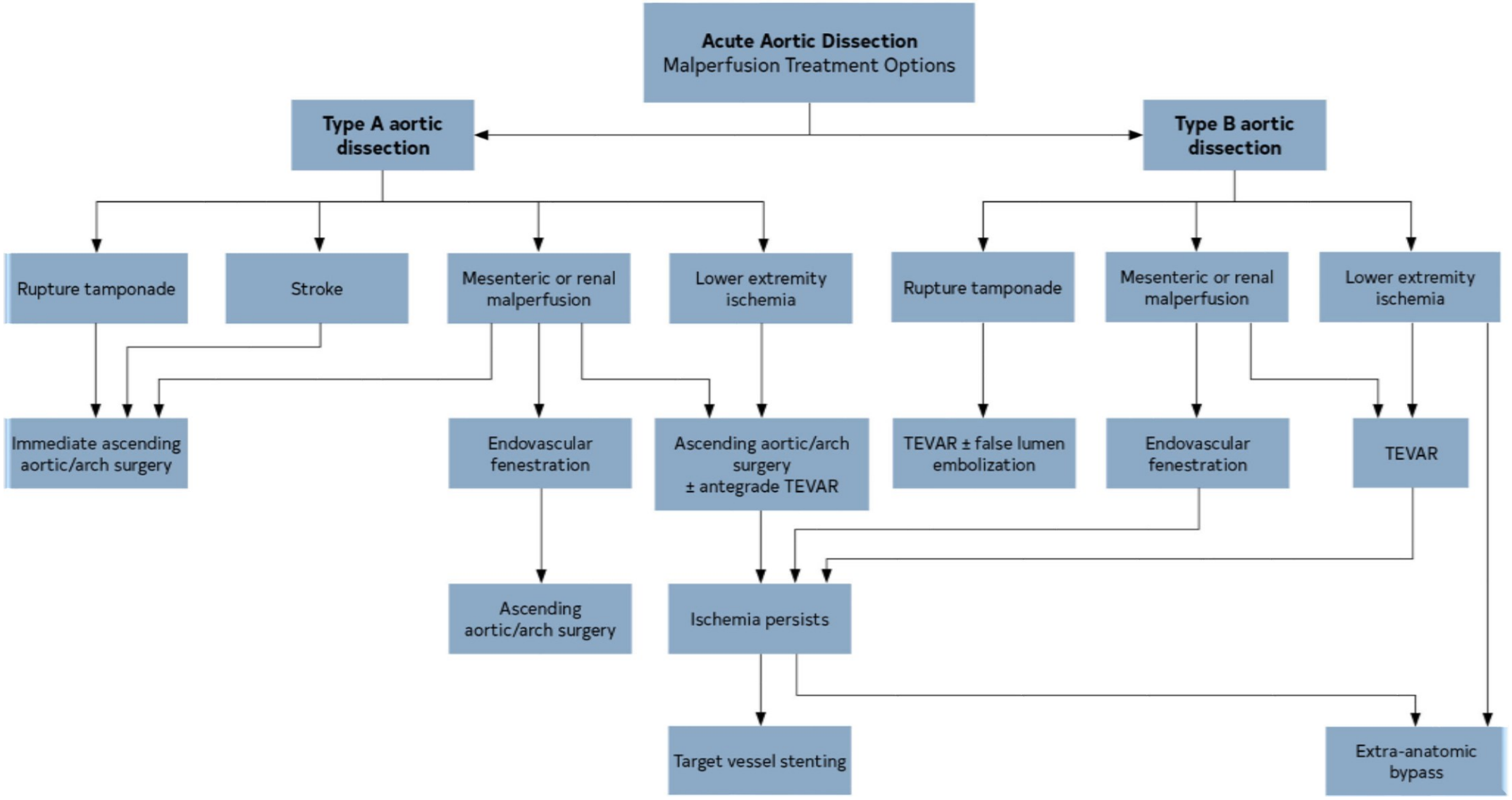
Fase 2 (Preparation before the patient arrives in the HYBRID-OR)

Endo-specialist	OR Nurse	Radiographers	Anesthesia Nurse + Doctor
• Makes reconstruktion • Measures graft, find components • Makes stent planning sketch	• Makes things ready for operation • Fetch 2 rEVAR packets from shelf • Flowchart for OR nurse	• Fetch lead aprons & other gears • Make pressure injector ready • Scrub sterile • Flowchart for Endo-radiographers	• Make the OR ready for operation according to instructions • Book blood products • BAC test

Briefing in the OR
- Patient checklist
- See CT scanning images
- Go through the treatment plan
- Do through the stent-graft sketch



When & How to treat ??



Isselbacher EM, Preventza O, Hamilton Black J 3rd, Augoustides JG, Beck AW, Bolen MA, Braverman AC, Bray BE, Brown-Zimmerman MM, Chen EP, Collins TJ, DeAnda A Jr, Fanola CL, Girardi LN, Hicks CW, Hui DS, Schuyler Jones W, Kalahasti V, Kim KM, Milewicz DM, Oderich GS, Ogbechie L, Promes SB, Gyang Ross E, Schermerhorn ML, Singleton Times S, Tseng EE, Wang GJ, Woo YJ. 2022 ACC/AHA Guideline for the Diagnosis and Management of Aortic Disease: A Report of the American Heart Association/American College of Cardiology Joint Committee on Clinical Practice Guidelines. Circulation. 2022 Dec 13;146(24):e334-e482. doi: 10.1161/CIR.0000000000001106. Epub 2022 Nov 2. PMID: 36322642; PMCID: PMC9876736.

When & How to treat -simplified

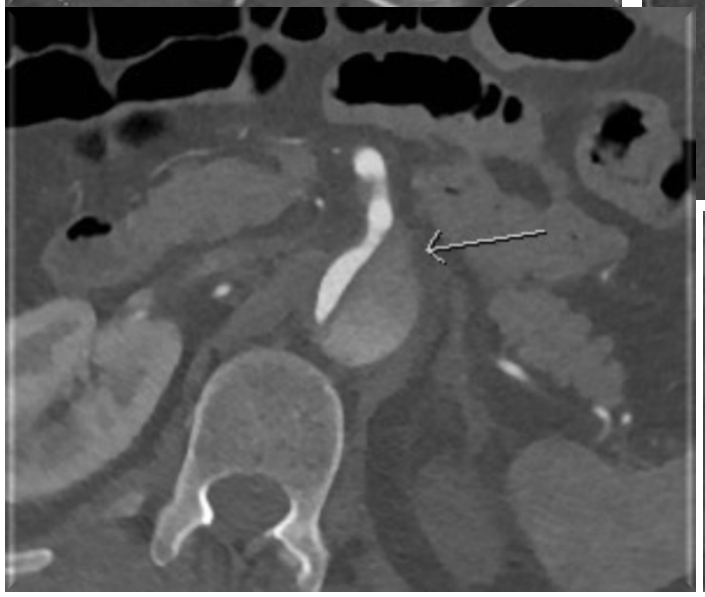
A-dissection – Immediate Open Surgical

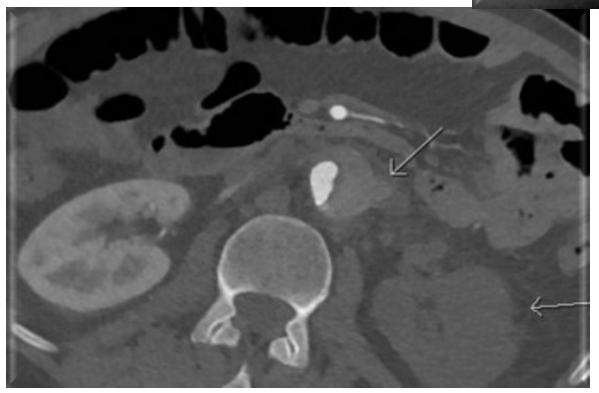
B-dissection – Uncomplicated – Medical

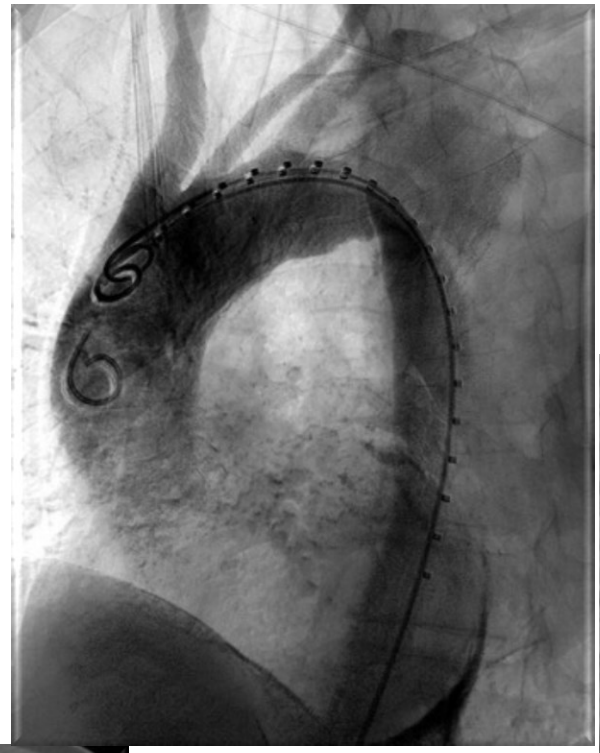
B-dissection – Complicated – Endovascular

B-dissection – When is it Complicated ?

1. Rupture
2. Impending rupture
3. **Size** > 6cm (male) or > 5.5cm (female) in thoracic aorta; >5.5cm (male) or >5 cm (female) in abdominal aorta
4. Rapid increase in size (~ >5-10mm increase within weeks or a few months)
5. Compromizing vital /visceral arteries
6. Symptomatic – Pain





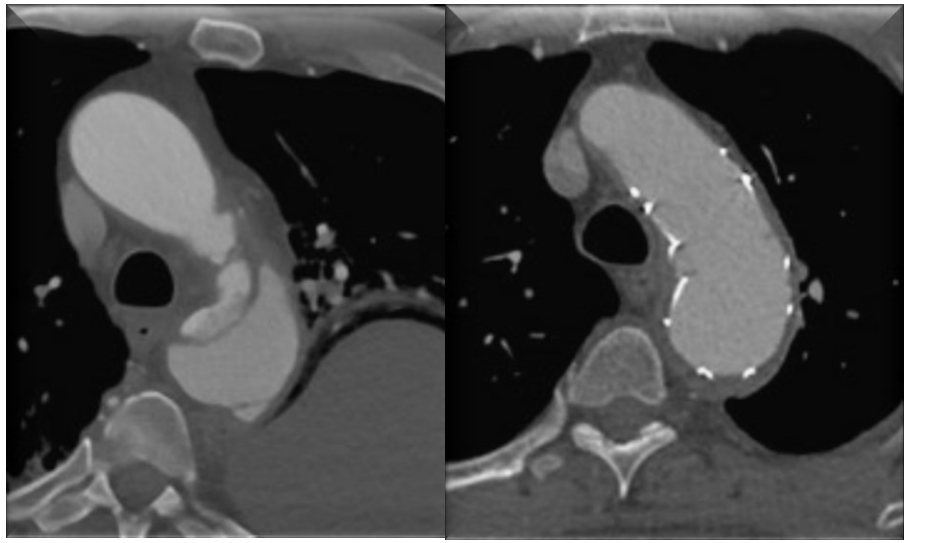


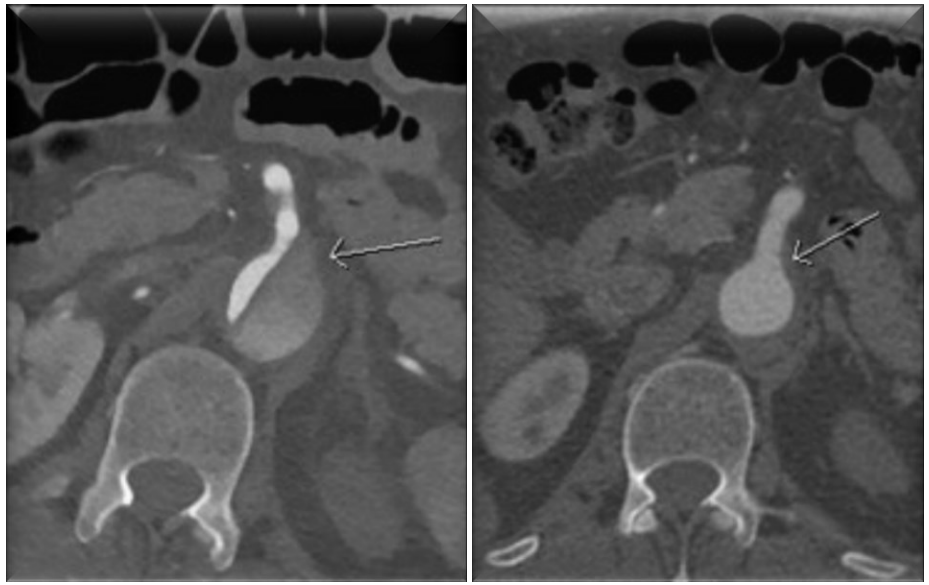
Type –B dissection with rupture and visceral artery compromise

Goal:

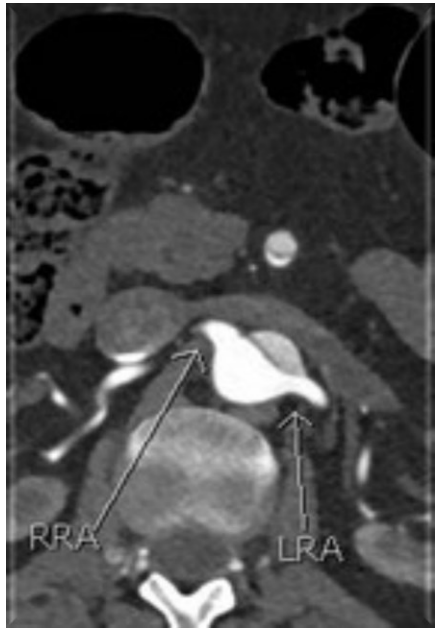
- Block entry/re-entry
- Increase True-lumen dimension
- Restore perfusion

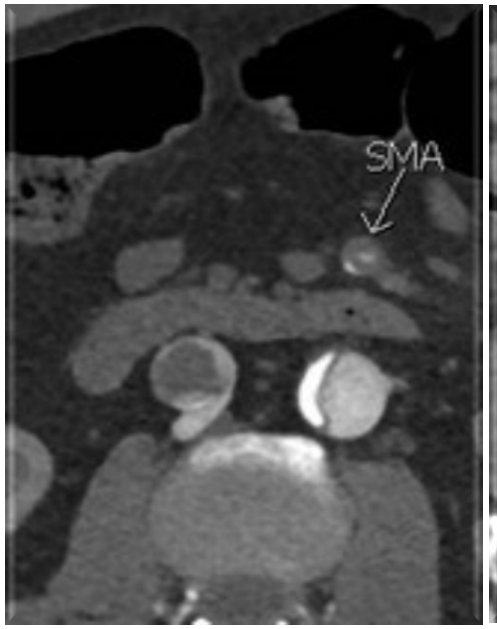
[redacted]

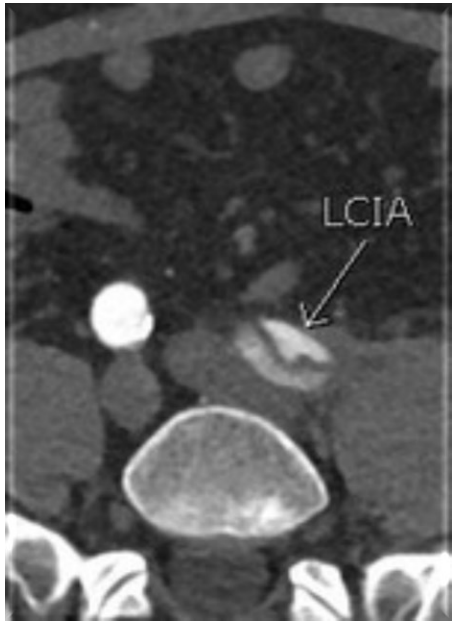


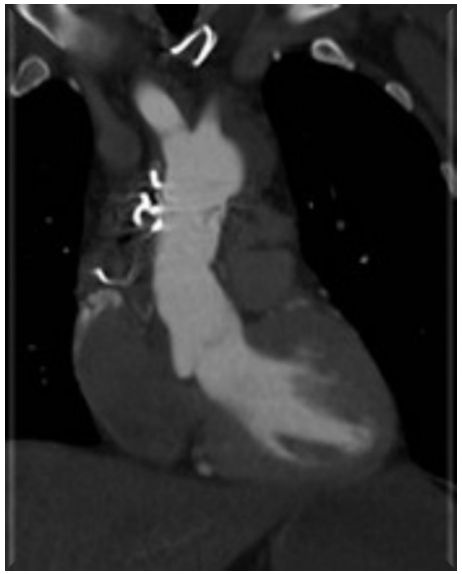


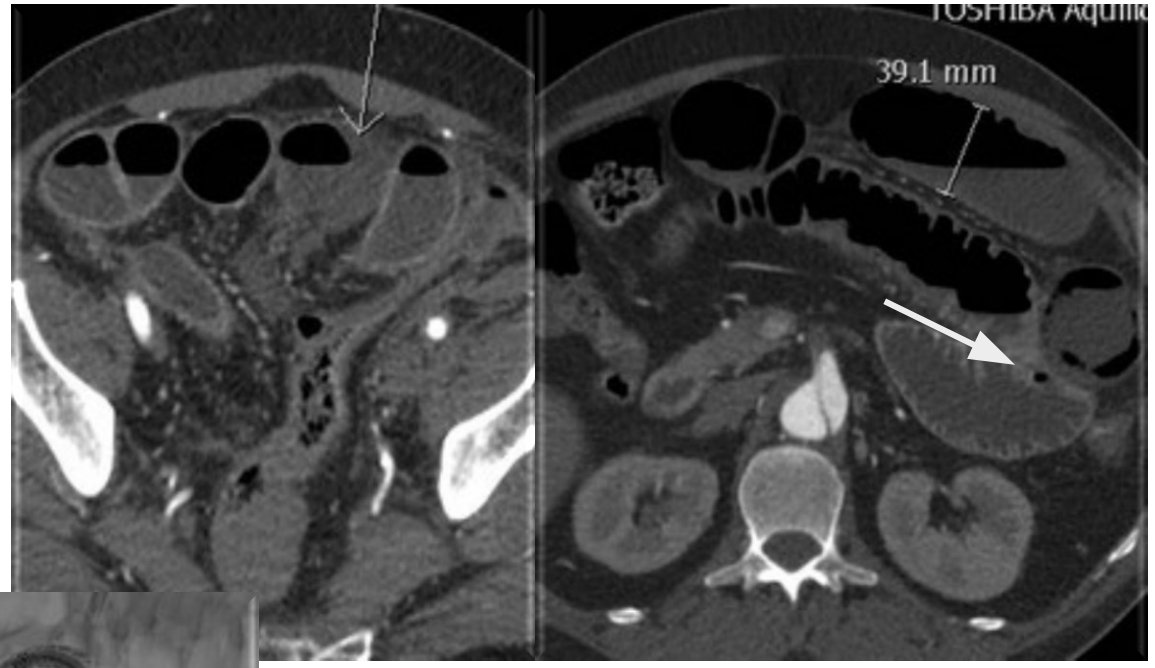
Type –A dissection with rupture and visceral artery compromise

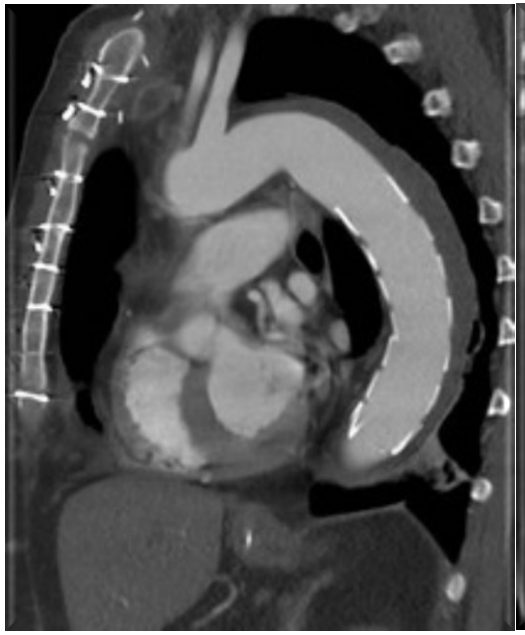









39.1 mm



European Journal of Vascular and Endovascular Surgery
Volume 48, Issue 3, September 2014, Pages 285-291

Endovascular Repair of Acute Uncomplicated Aortic Type B Dissection Promotes Aortic Remodelling: 1 Year Results of the ADSORB Trial

J. Brunkwall [a], P. Kasprzak [b], E. Verhoeven [c], R. Heijmen [d], P. Taylor [d]
ADSORB Trialists[e]

the ADSORB trial, 61 patients with uncomplicated type B dissection were randomized to best medical treatment alone or to endovascular stent grafting

primary outcome

favored the endovascular therapy

Randomized Controlled Trial > Circulation. 2009 Dec 22;120(25):2519-28.
doi: 10.1161/CIRCULATIONAHA.109.886408. Epub 2009 Dec 7.

Randomized comparison of strategies for type B aortic dissection: the INvestigation of STEnt Grafts in Aortic Dissection (INSTEAD) trial

Christoph A Nienaber [1], Hervé Rousseau, Holger Eggebrecht, Stephan Kische, Rossella Fattori, Tim C Rehders, Günther Kundt, Dierk Scheinert, Martin Czerny, Tilo Kleinfeldt, Burkhart Zipfel, Louis Labrousse, Hüseyin Ince; INSTEAD Trial

uncomplicated type B dissections

endovascular medical optimal medical therapy alone. did not show a difference

also similar between groups.

VIRTUE Investigators. Mid-term outcomes and aortic remodelling after thoracic endovascular aortic repair for acute, subacute and chronic aortic dissection: the VIRTUE Registry. Eur J Vasc Endovasc Surg. 2014;48(4):363–71.

Zipfel B, Czerny M, Funovics M, et al. Endovascular treatment of patients with types A and B thoracic aortic dissection using Relay thoracic stent-grafts: results from the RESTORE patient registry. J Endovasc Ther. 2011;18(2):131–43.

•• Lombardi JV, Gleason TG, Panneton JM, et al. STABLE II clinical trial on endovascular treatment of acute, complicated type B aortic dissection with a composite device design. J Vasc Surg. 2020;71(4):1077–87. **Device trial investigating the application of dissection specific hybrid TEVAR devices for acute TBAD.**

TEVAR in Type B **complicated** dissection

8% perioperative mortality
survival rate of 84–88% at 1–2 years

20% reintervention at 30 days, mostly due to false lumen growth on imaging, development of a malperfusion syndrome, or retrograde dissection

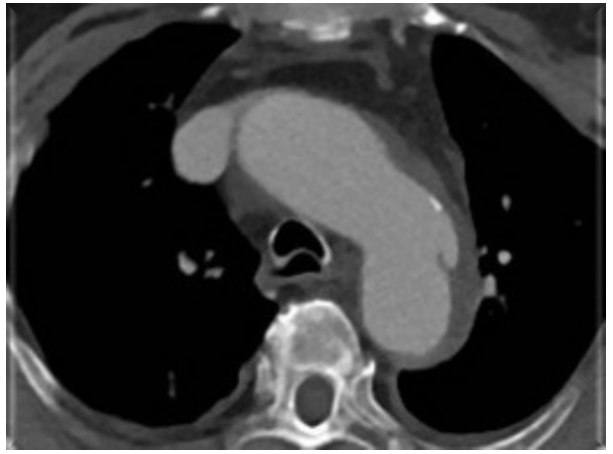
Composite device design (covered stent graft and bare metal stent) with partial or complete false lumen thrombosis seen in 100% of the stent grafted segments and 97.7% of the bare mental stented segments at 1 year

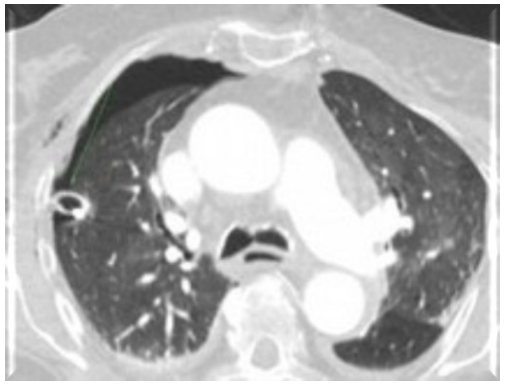
unclear if TEVAR is superior to open surgery
however, the morbidity reduction associated with TEVAR has been demonstrated for emergent operations, as well as for older, more frail patients

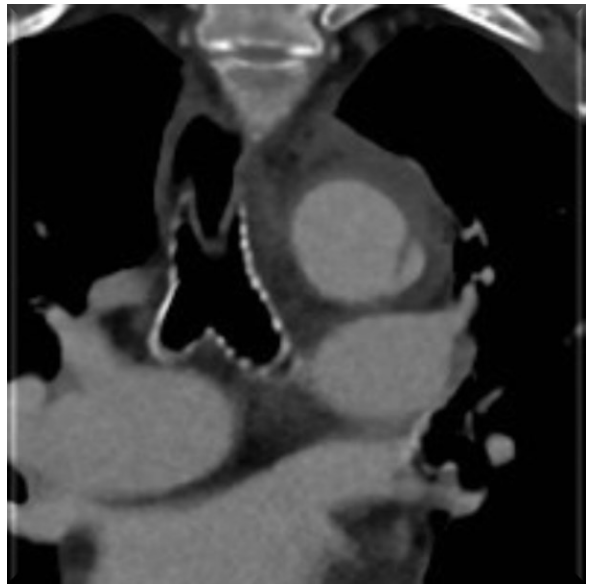
Trauma - Aorta

86 yr old lady after road traffic accident

Full-thickness aortic lesion







JMV-Journal de Médecine Vasculaire
Volume 45, Issue 5, September 2020, Pages 254-259

Original article

Endovascular repair of traumatic aortic isthmic rupture: Early and mid-term results

M. Ben Hammamia [a], M. Ben Mrad [a], J. Ziadi [a], B. Derbel [a], R. Miri [a], E. Ben Abdelaziz [a], Z. Daoud [a], N. Krarti [a], M.A. Koubaa [a], M. Tarzi [a], Y. Khadhar [a], A. Lagha [a], F. Ghedira [a], S. Ben Omrane [a], T. Kalfat [a], I. Bounawes [b], R. Denguir [a]

The **procedural success rate was 100%.**

The average length of stay was 6 days (range 4–10).

The mean follow-up period was 40.41 months (range 6.5–96).

No endoleak was diagnosed and no re-intervention was performed

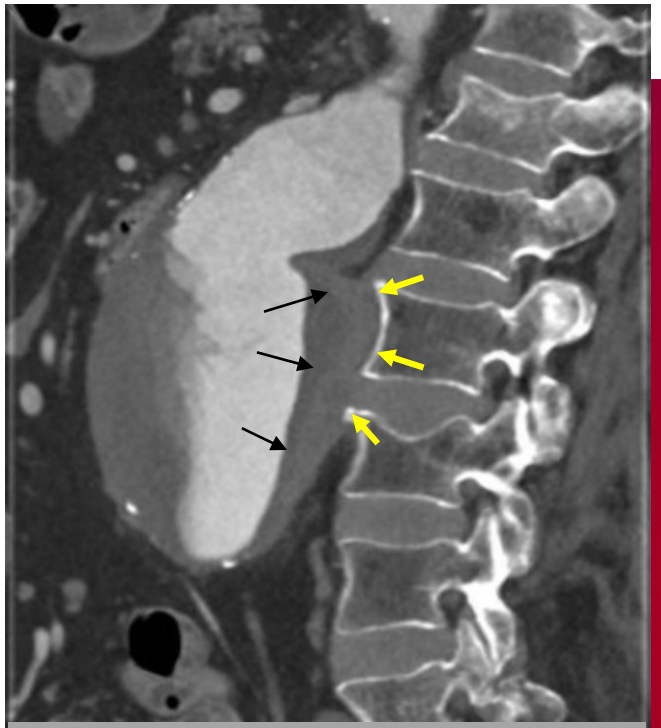
At one month and during the follow-up, **mortality** and **paraplegia** rates were both **0%**.

The average systolic pressure in the right arm was 110 mmHg (range 100–160) while the left systolic pressure was 100 mmHg (range 90–110).

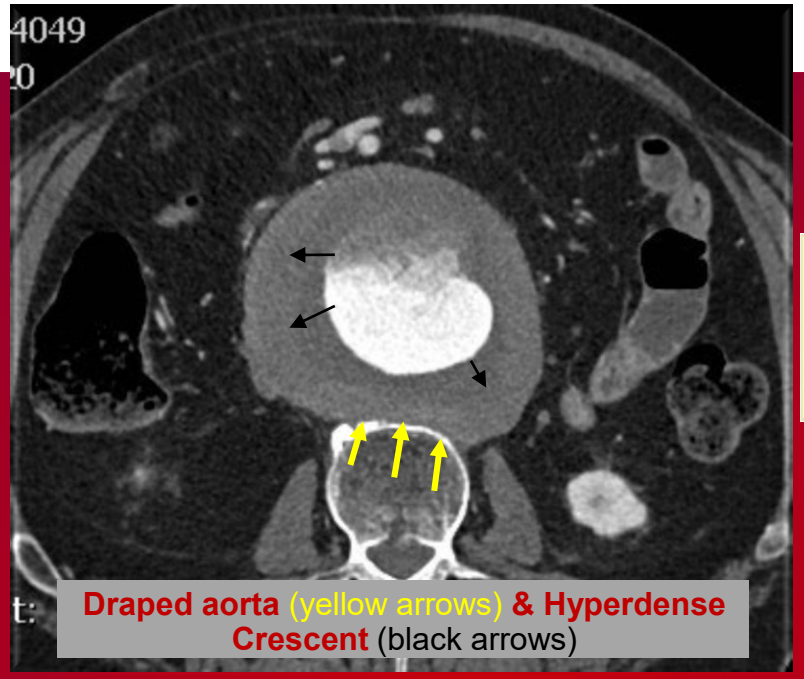
No patients reported arm claudication during follow-up.

did not perform any subclavian artery bypass.

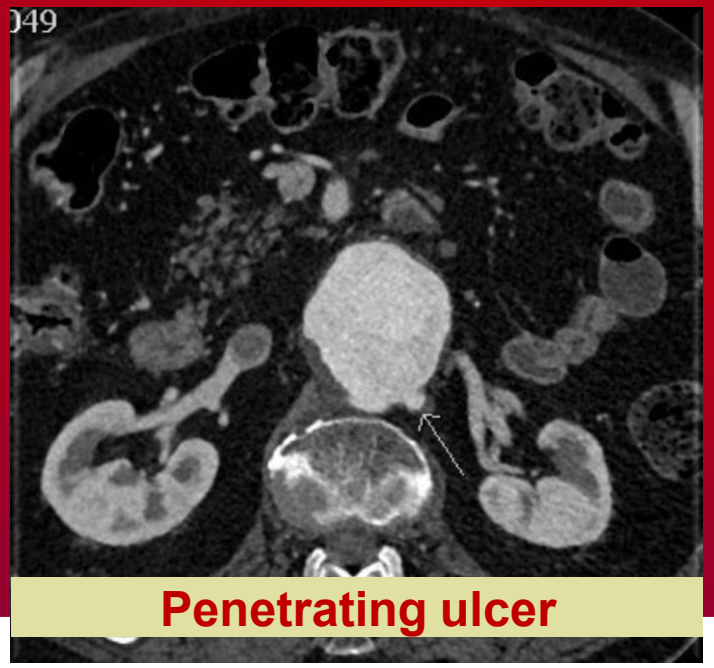
Before the storm – Impending Rupture



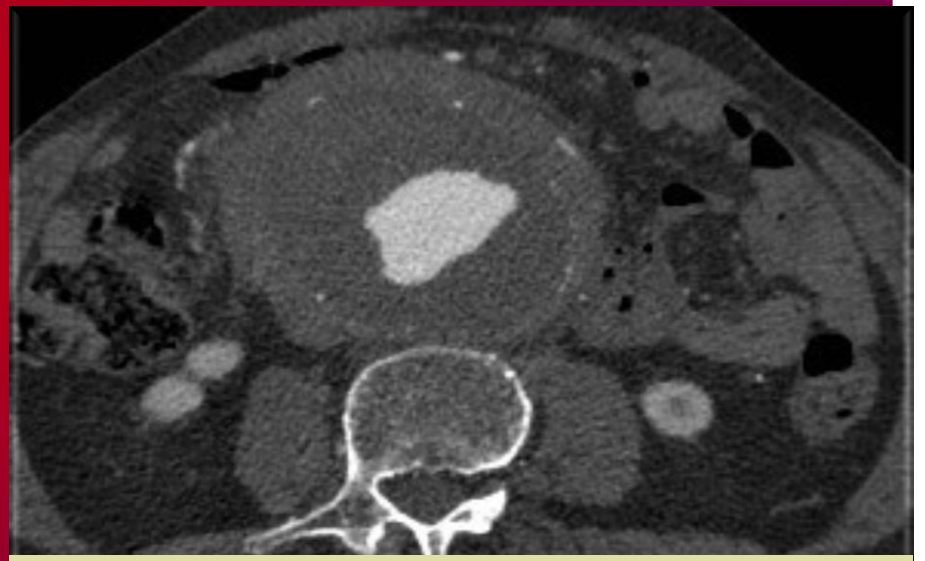
Draped aorta (yellow arrows) & Hyperdense Crescent (black arrows)



Draped aorta (yellow arrows) & Hyperdense Crescent (black arrows)

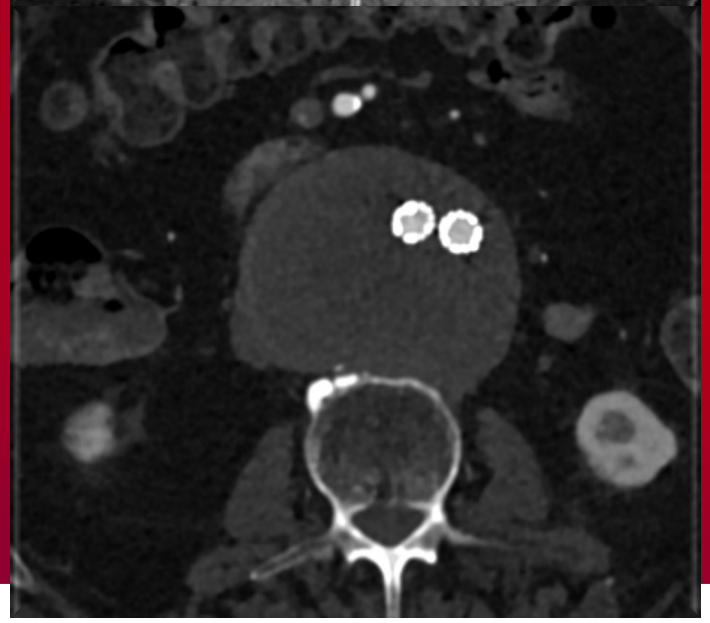


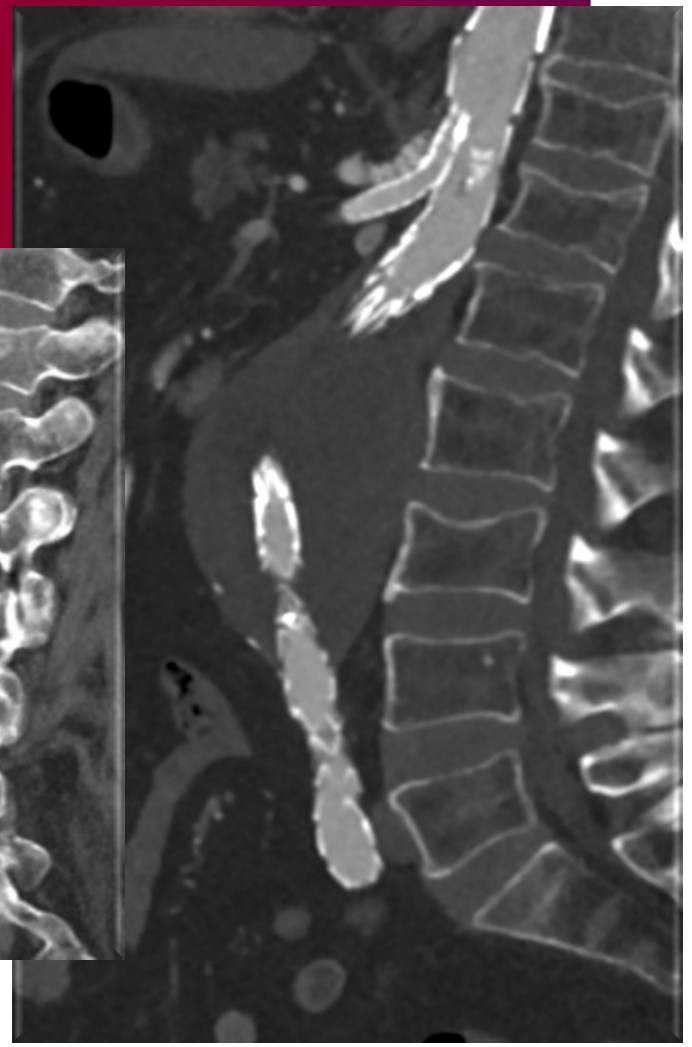
Penetrating ulcer



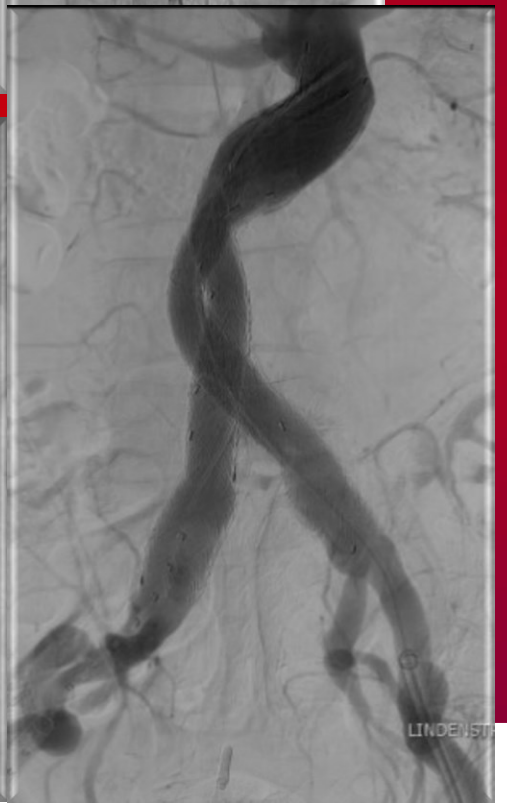
Significant contour irregularity and soft tissue reaction

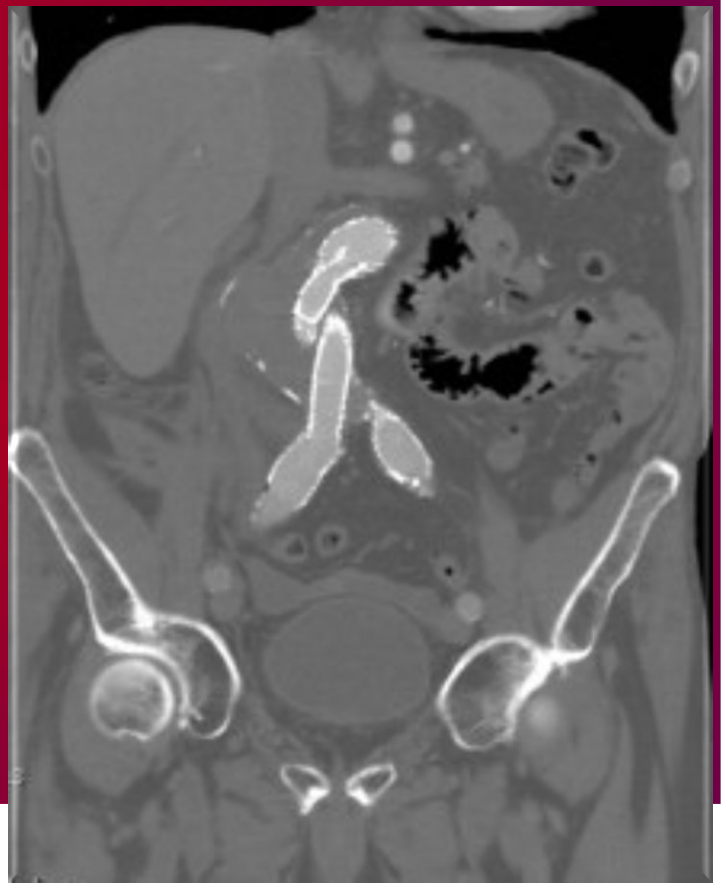
Pre- and Post- TEVAR



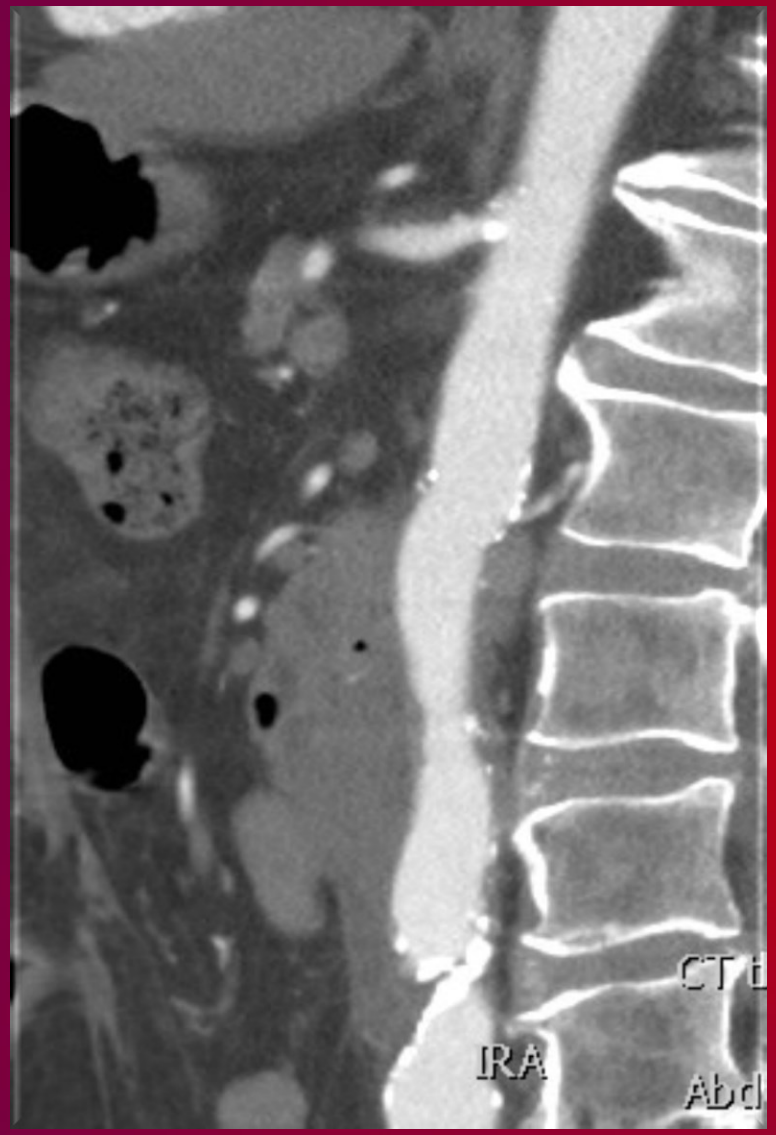


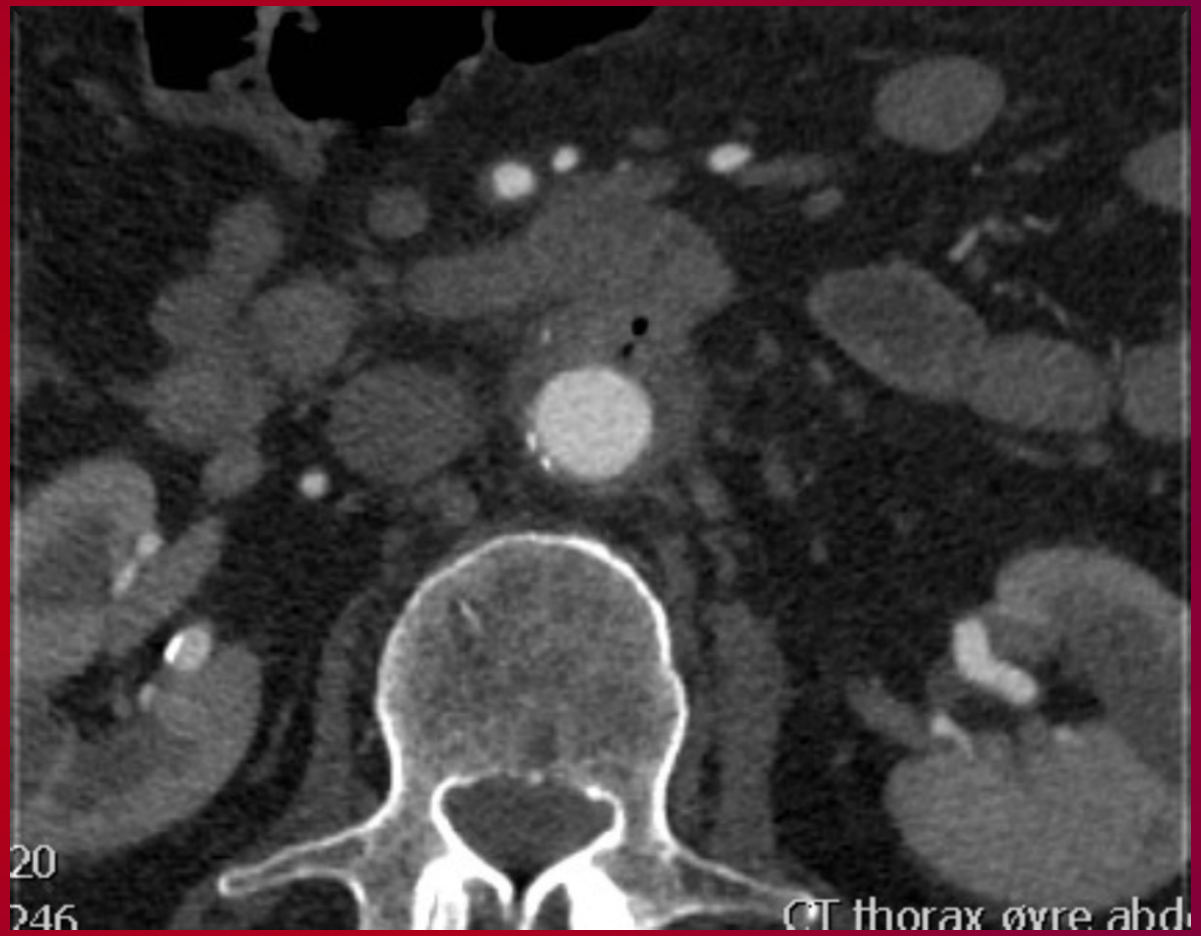
When the Storm has arrived – Rupture REVAR



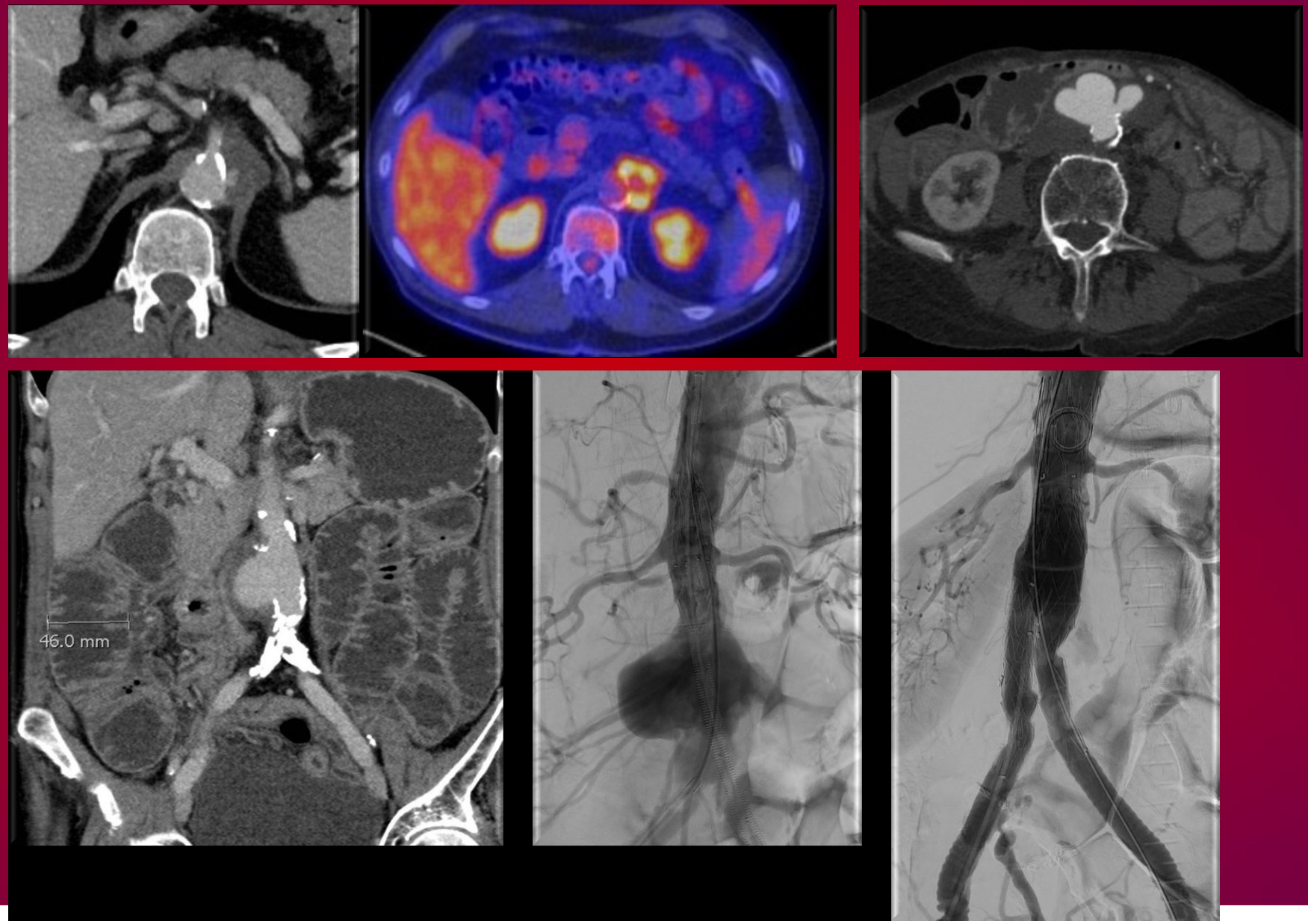


Direct sign of rupture

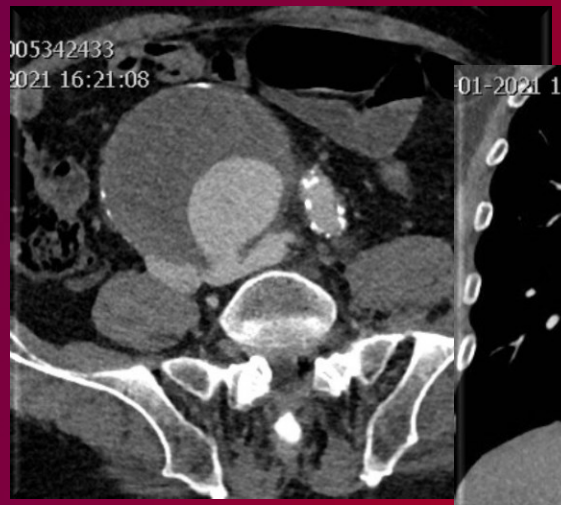


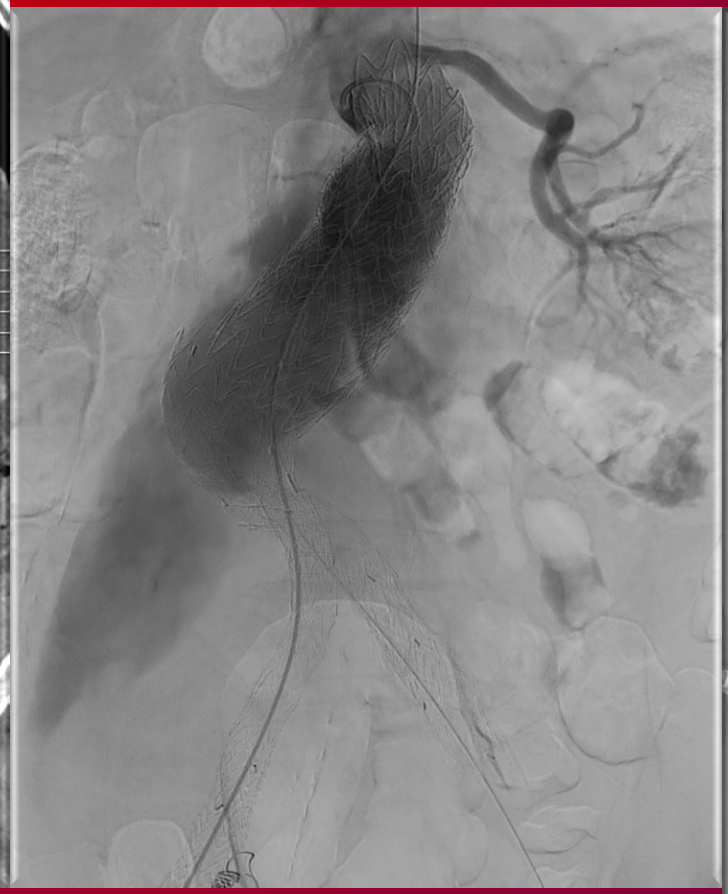


Mycotic Aneurysm

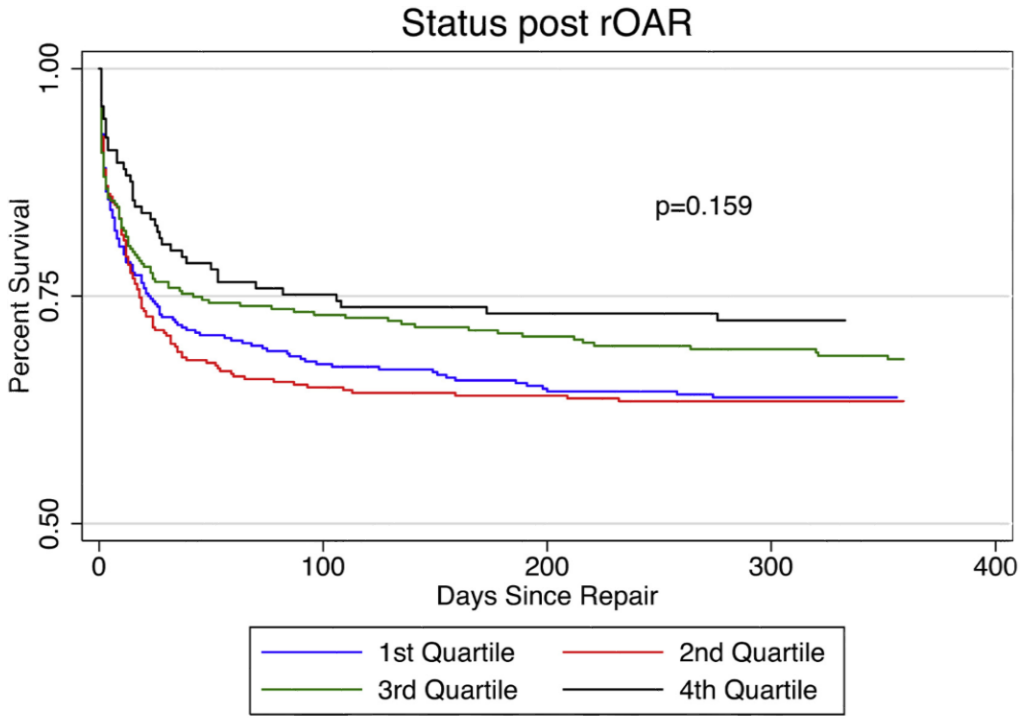


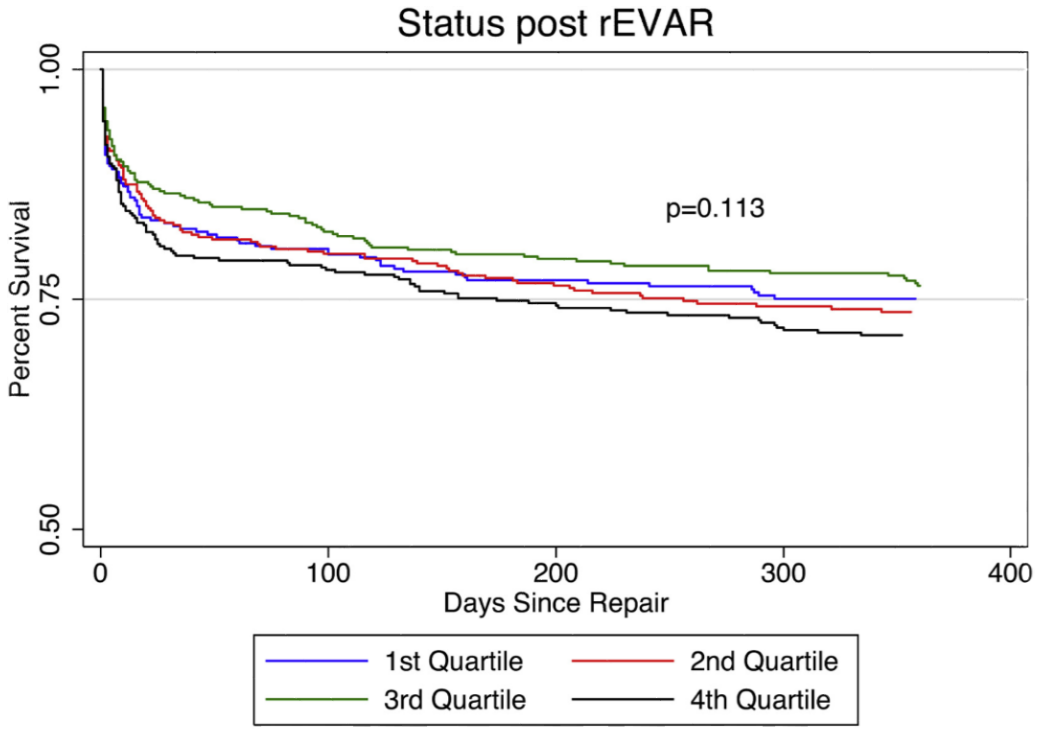
Aorto-caval fistula - Direct Sign of Rupture





Direct Sign of Rupture





ELSEVIER

Journal of Vascular Surgery
Volume 71, Issue 4, April 2020, Pages 1148-1161

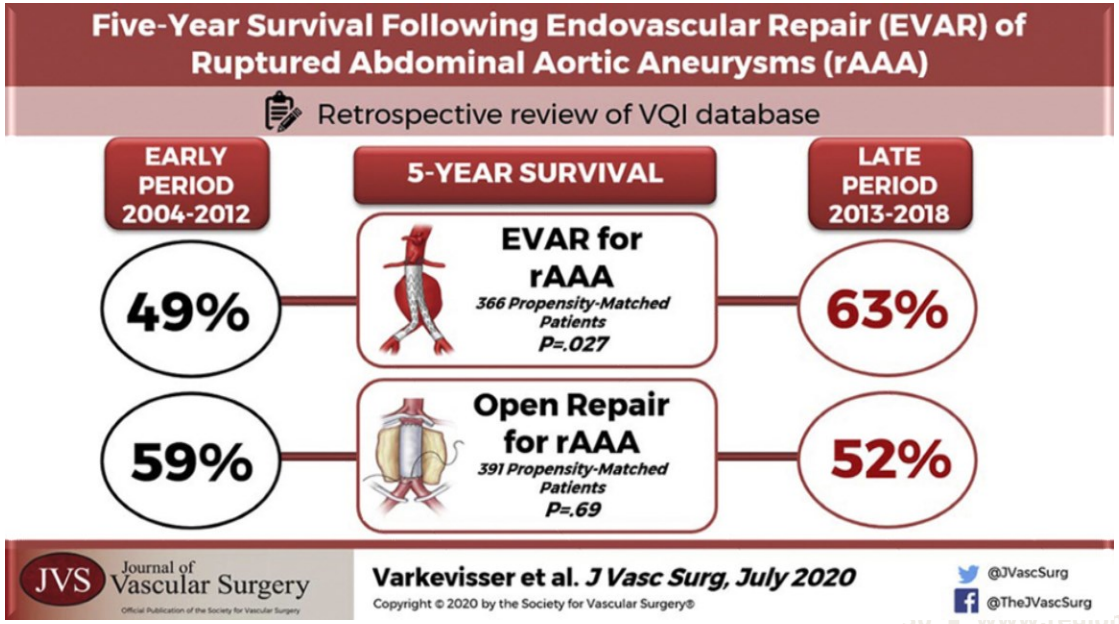
Clinical research study

Abdominal aortic and iliac artery aneurysms

Outcomes after ruptured abdominal aortic aneurysm repair in the era of centralized care

Presented as an oral presentation at the 2018 Vascular Annual Meeting of the Society for Vascular Surgery, Boston, Mass, June 20-23, 2018.

Erin K. Greenleaf MD [a], Christopher S. Hollenbeak PhD [a b c], Faisal Aziz MD, DFSVS, FACS [a]



FROM DREAM TO REALITY

Thanks for your attention