UCDAVIS HEALTH SYSTEM

A HEALTHIER WORLD THROUGH BOLD INNOVATION

Endovascular Management of Complicated Type B Dissection When and How?

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Disclosure Statement of Financial Interest

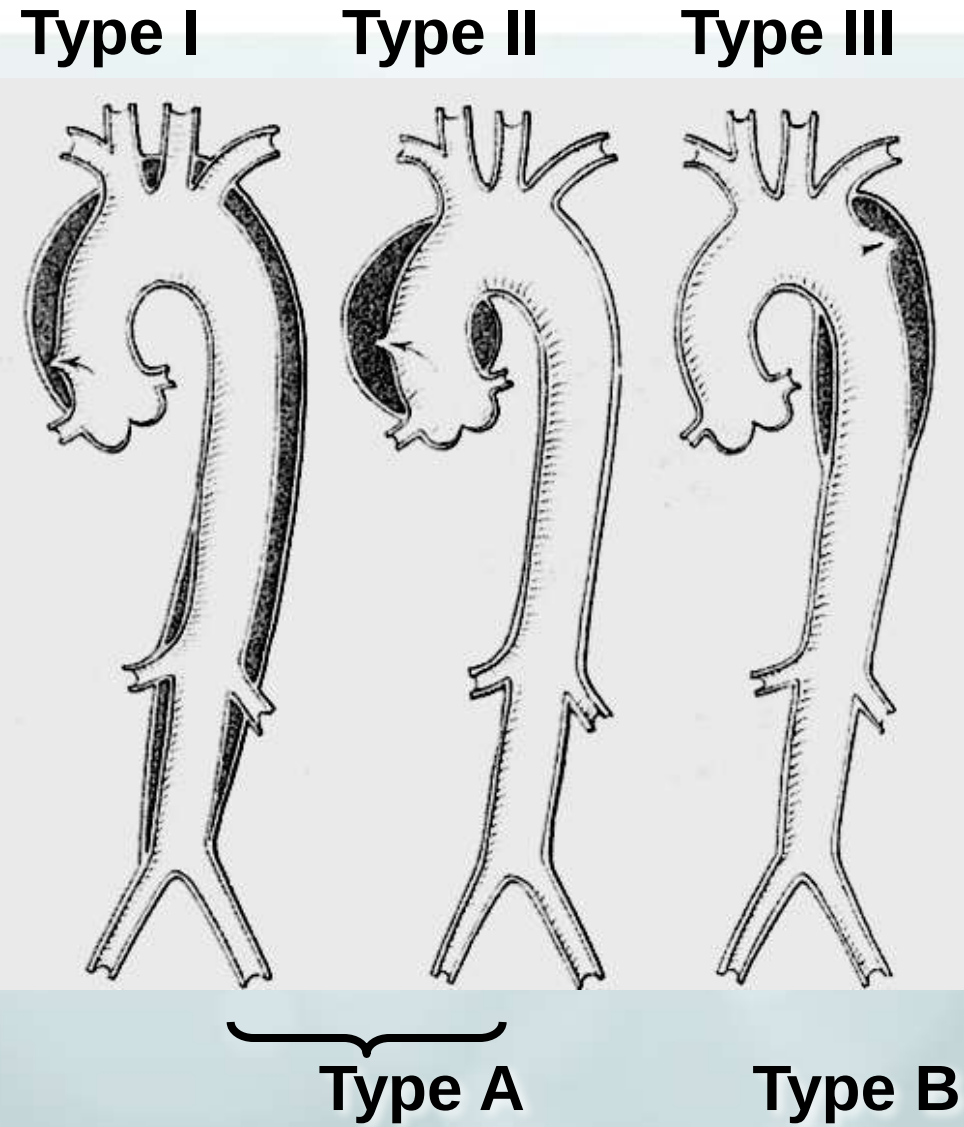
- Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

Affiliation/Financial Relationship	Company
Consulting Fees/Honoraria	Boston Scientific, Medtronic, Abbott, Covidien, Bard Peripheral Vascular, Volcano
Research Support	Atrium Medical, WL Gore
Scientific Advisory board/stock options	AngioScore, Angioslide, NexGen, Reflow, Endoluminal Sciences, Syntervention

Board Member VIVA Physicians

Aortic Dissection - Classification

- DeBakey
  - Type I
  - Type II
  - Type III
- Stanford
  - Type A
  - Type B



Aortic Dissection - Classification

Duration

- Acute (< 2 weeks after symptom onset)
- Sub-acute (> 2 weeks and < 6 weeks)
- Chronic (> 6 weeks after diagnosis)

Classification of Type B Dissection

- Uncomplicated
- Complicated
  - Associated with rupture
  - Associated with malperfusion
    - Kidneys
    - Viscera
    - Lower Extremities

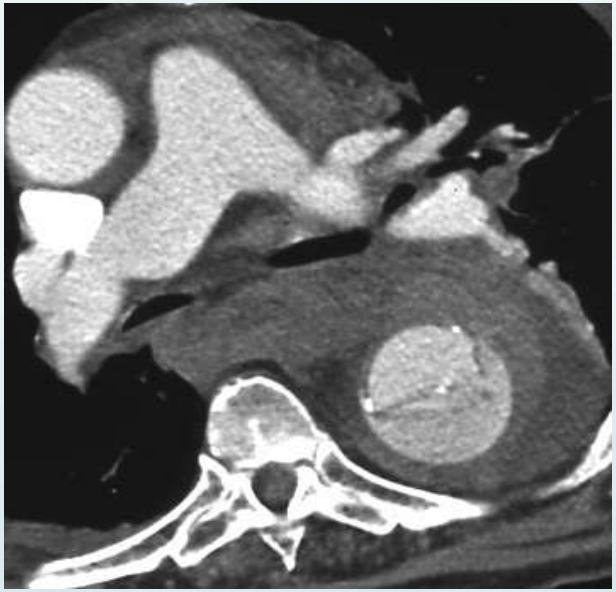
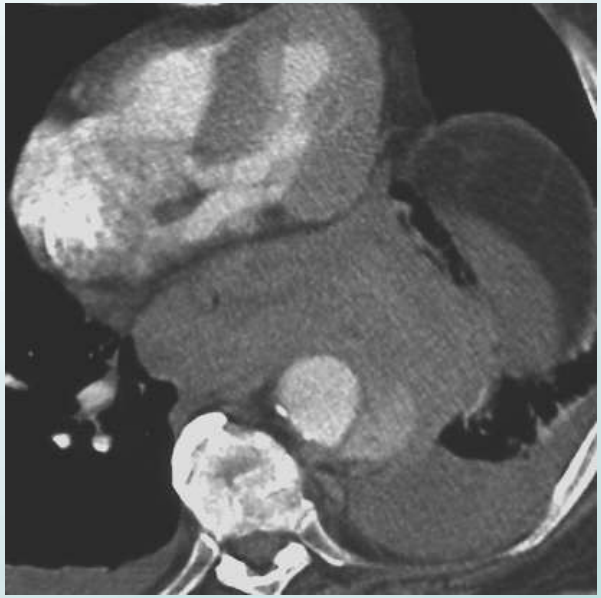
Other Poor Prognostic Factors

- Continued chest/back pain
- Uncontrolled HTN
- > 40 mm trans-aortic diameter at diagnosis
- > 22 mm false lumen diameter at initial diagnosis
- Proximal intimal tear > 10 mm; 12 mm; 15 mm
- Partial false lumen thrombosis
- False lumen diastolic BP > True lumen diastolic BP

Complicated Type B Dissection

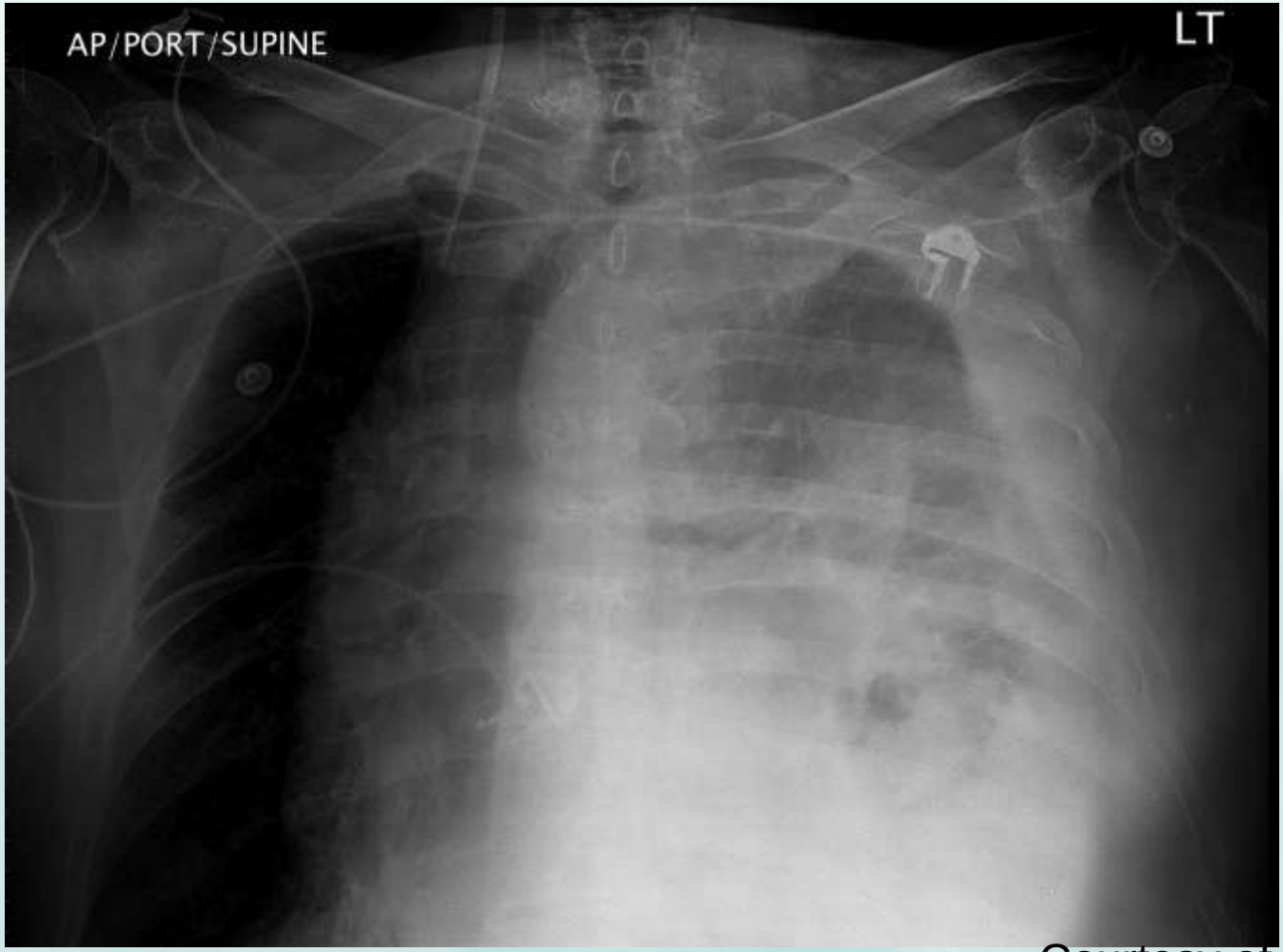
- Urgent Intervention warranted
- Options are:
  - Open repair +/- CPB
  - Fenestration +/- stenting
  - TEVAR
- TEVAR has emerged as the treatment of choice in complicated Type B Dissections

84-year-old man with acute back pain and shock @ 18:00

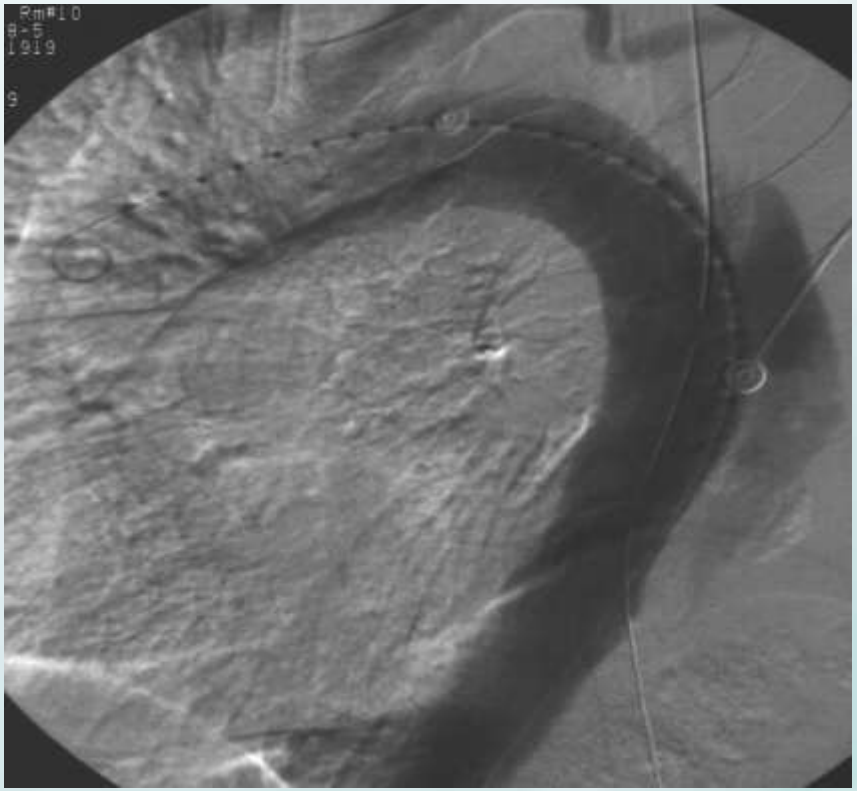
Courtesy of Mike Dake

Chest radiograph @ 20:14 after helicopter transfer



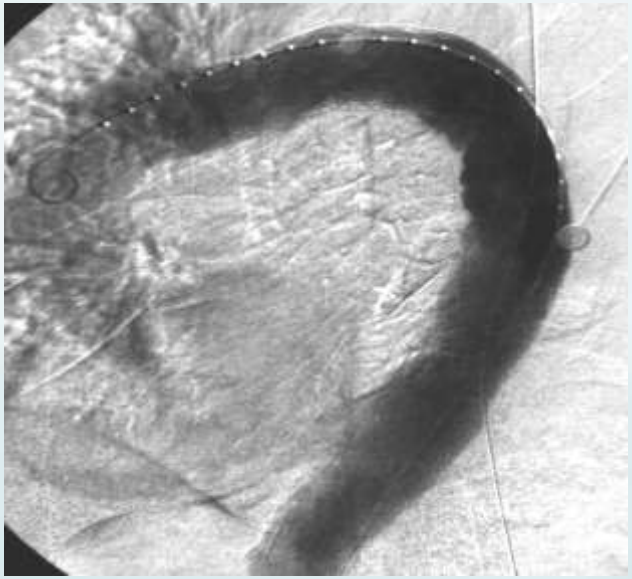
Courtesy of Mike Dake

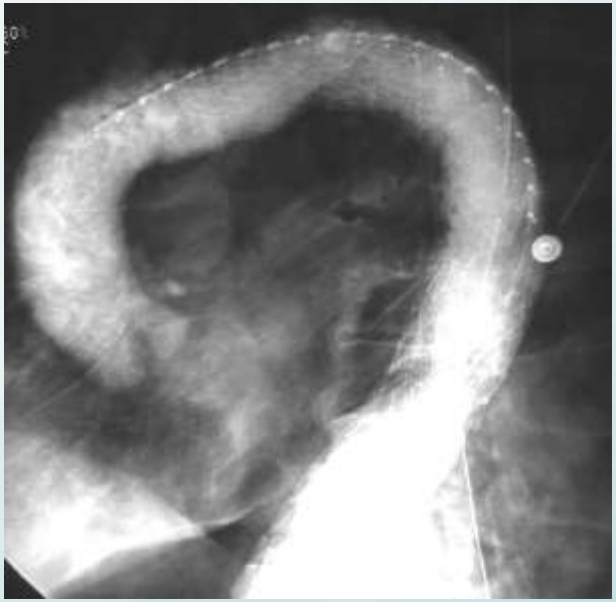
Initial Aortogram



Courtesy of Mike Dake

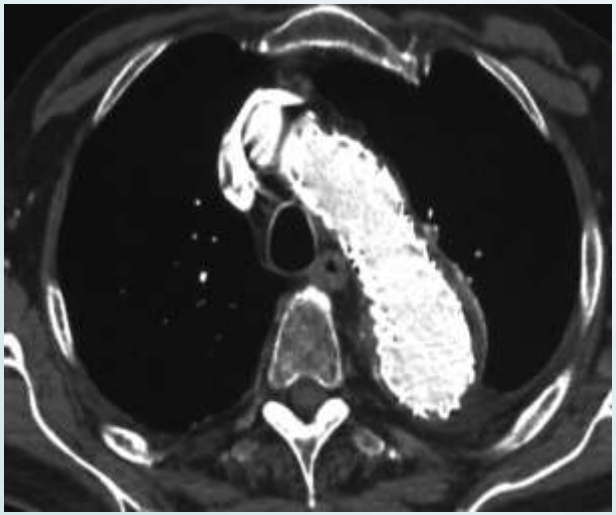
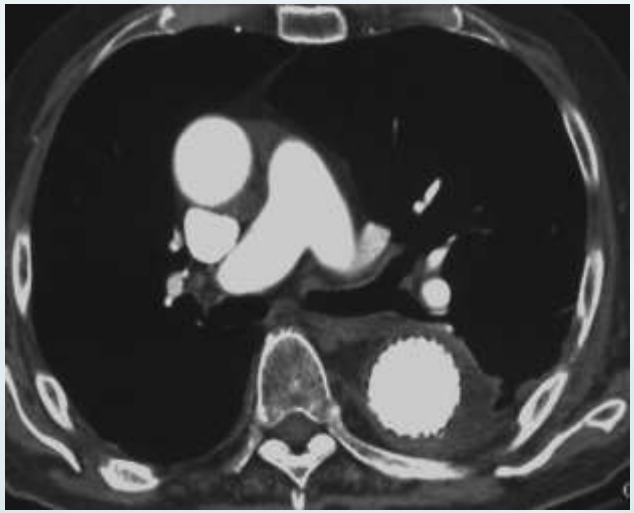
Stent-Graft Placement @ 20:43





Courtesy of Mike Dake

Follow-up @ 6 weeks


Courtesy of Mike Dake

Goals of Endovascular Therapy

- Cover the proximal intimal tear
- Reduce flow into the false lumen
- Prop open the true lumen
- Reduce/prevent dynamic obstruction of the visceral, renal, or lower extremity arteries
- Lead to favorable remodeling of the thoracic aorta
- Prevent late aneurysmal degeneration/rupture

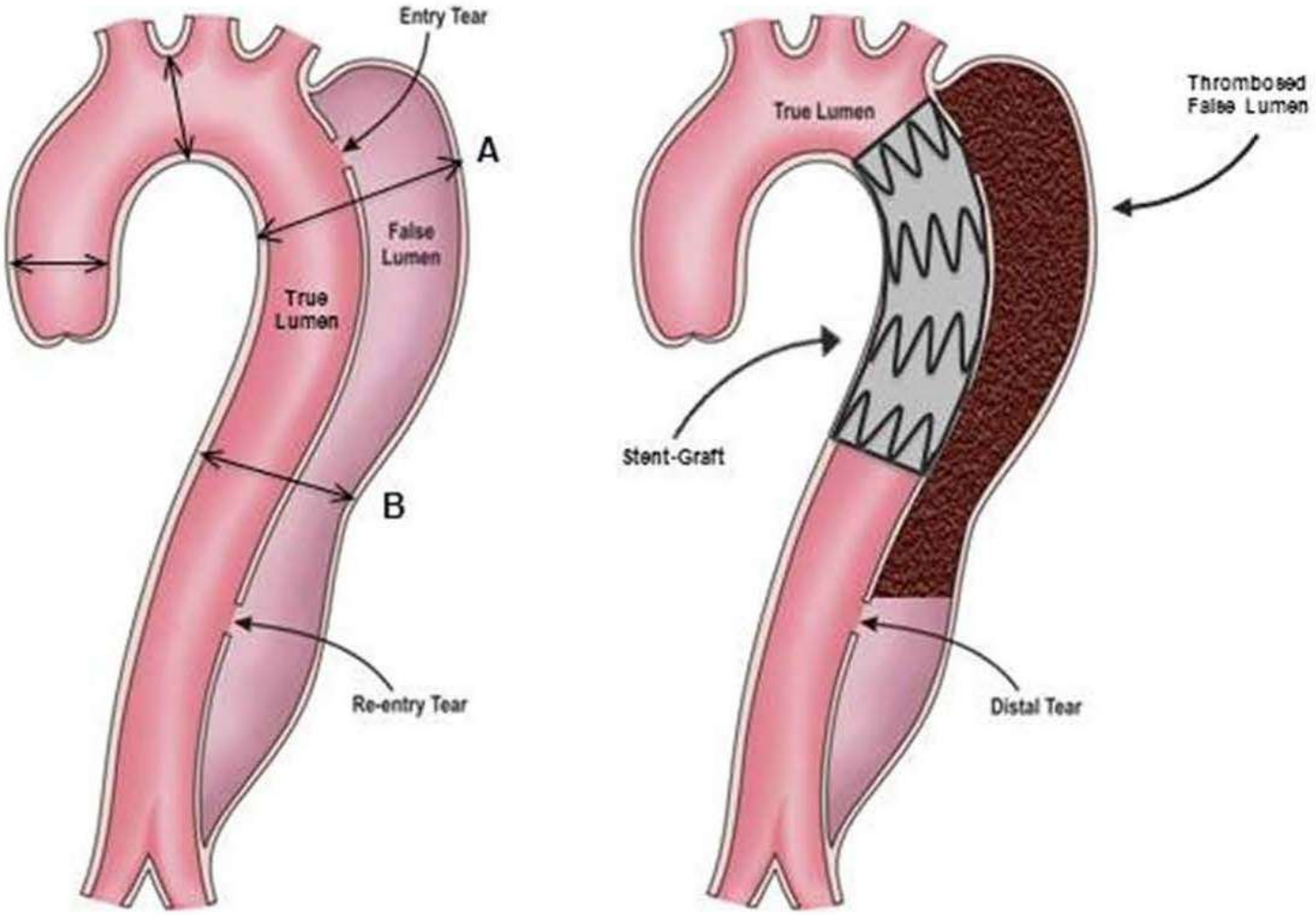


Figure 1. Illustration demonstrating typical features of type B dissection with flow in both the true and the expanded false lumen resulting from a major proximal entry tear (**left**). An endoprosthesis is placed to scaffold the dissected aorta and to seal the entry to the false lumen resulting in reconstruction of the true lumen with subsequent false lumen thrombosis (**right**). Aortic dimensions were defined at the level of the maximum aortic diameter (**A**), and at the hiatus (**B**), and followed over time.

CT F/U of Acute Type B

20 mo

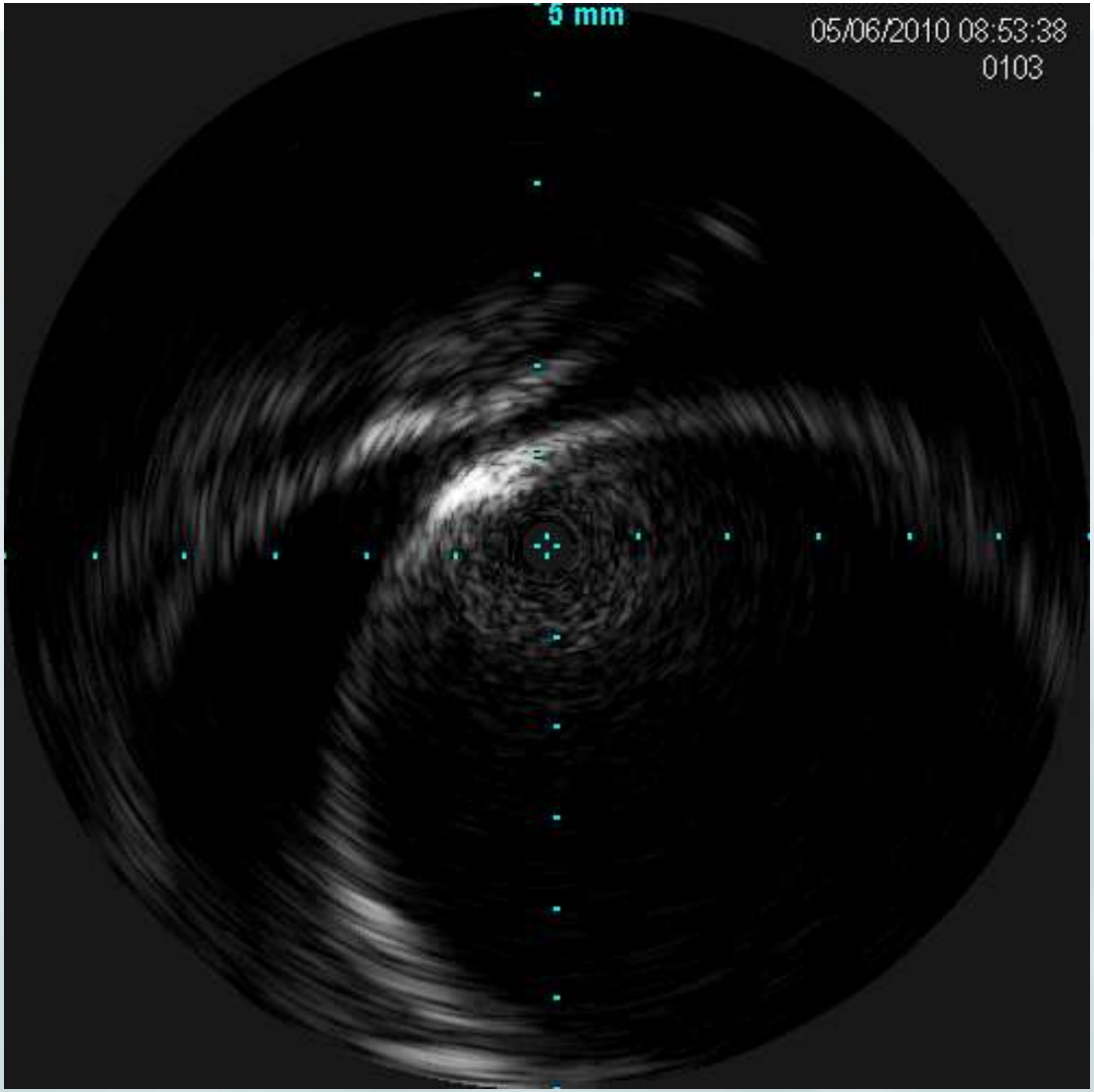
7.5 yr

10.5 yr

Technique

- Bilateral femoral access
- Spinal drain to reduce the risk of spinal cord ischemia
- IVUS guidance (8.2 Fr Volcano PV catheter or 8 Fr BSC catheter)
  - Confirm wire position in true lumen
  - Evaluate origin of visceral and renal branches (true vs. false lumen)
  - Document adequacy of result
- Stent just distal to left subclavian artery (in most cases)
- Do not post-dilate (except in some cases of chronic dissection)

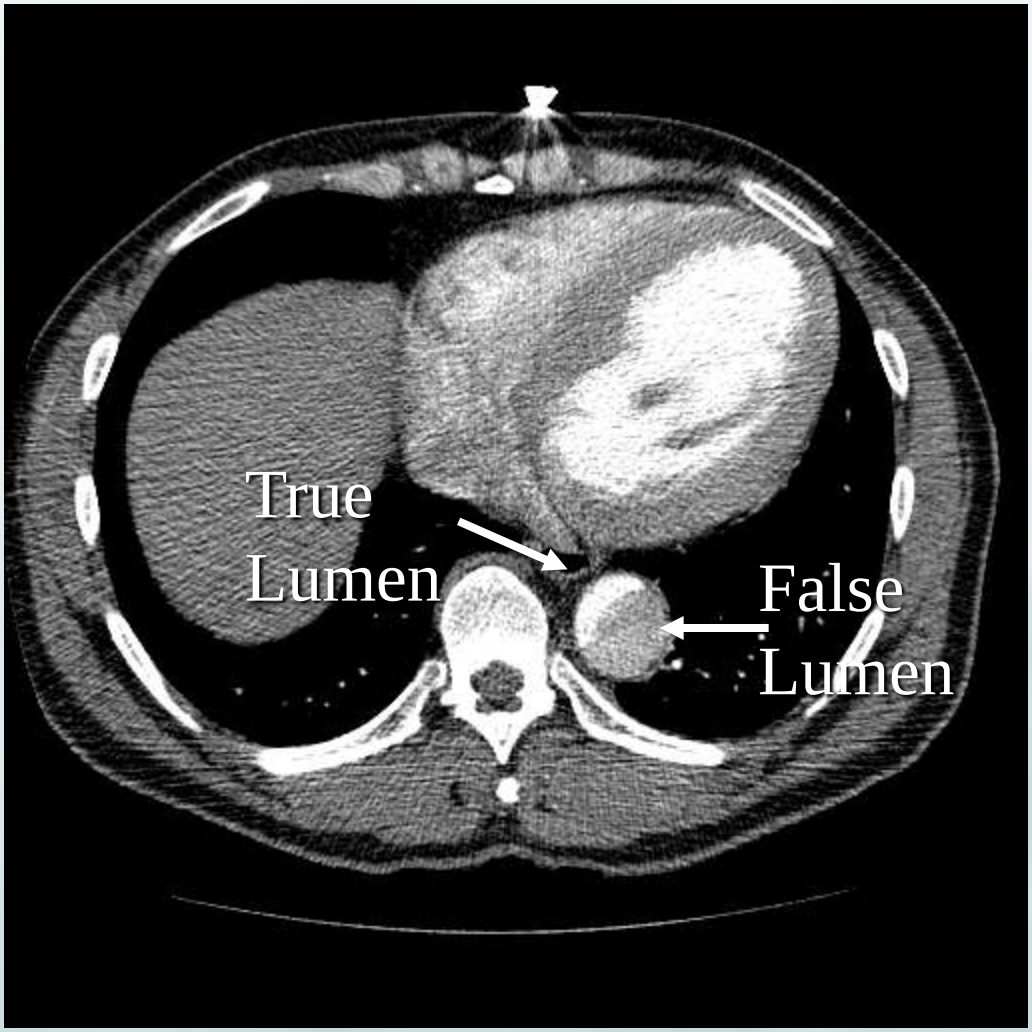
Pre-TEVAR IVUS



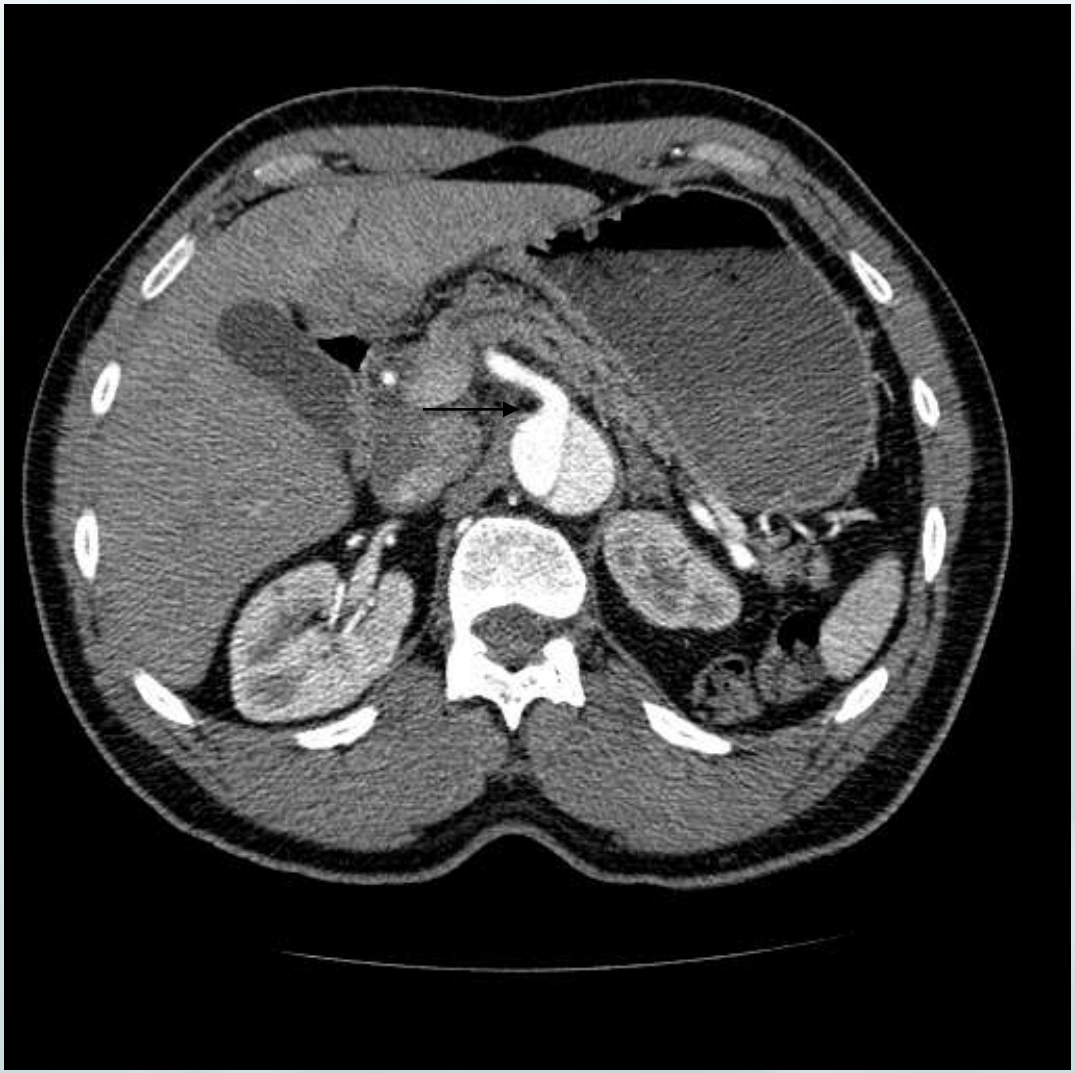
Case

- 57 yo male with history of untreated HTN presented with sudden onset sharp chest pain radiating to back
- VS: BP 213/107, HR 81, RR 16
- CT Chest – Type B dissection
  - Initially treated medically
  - He subsequently developed abdominal pain and diarrhea

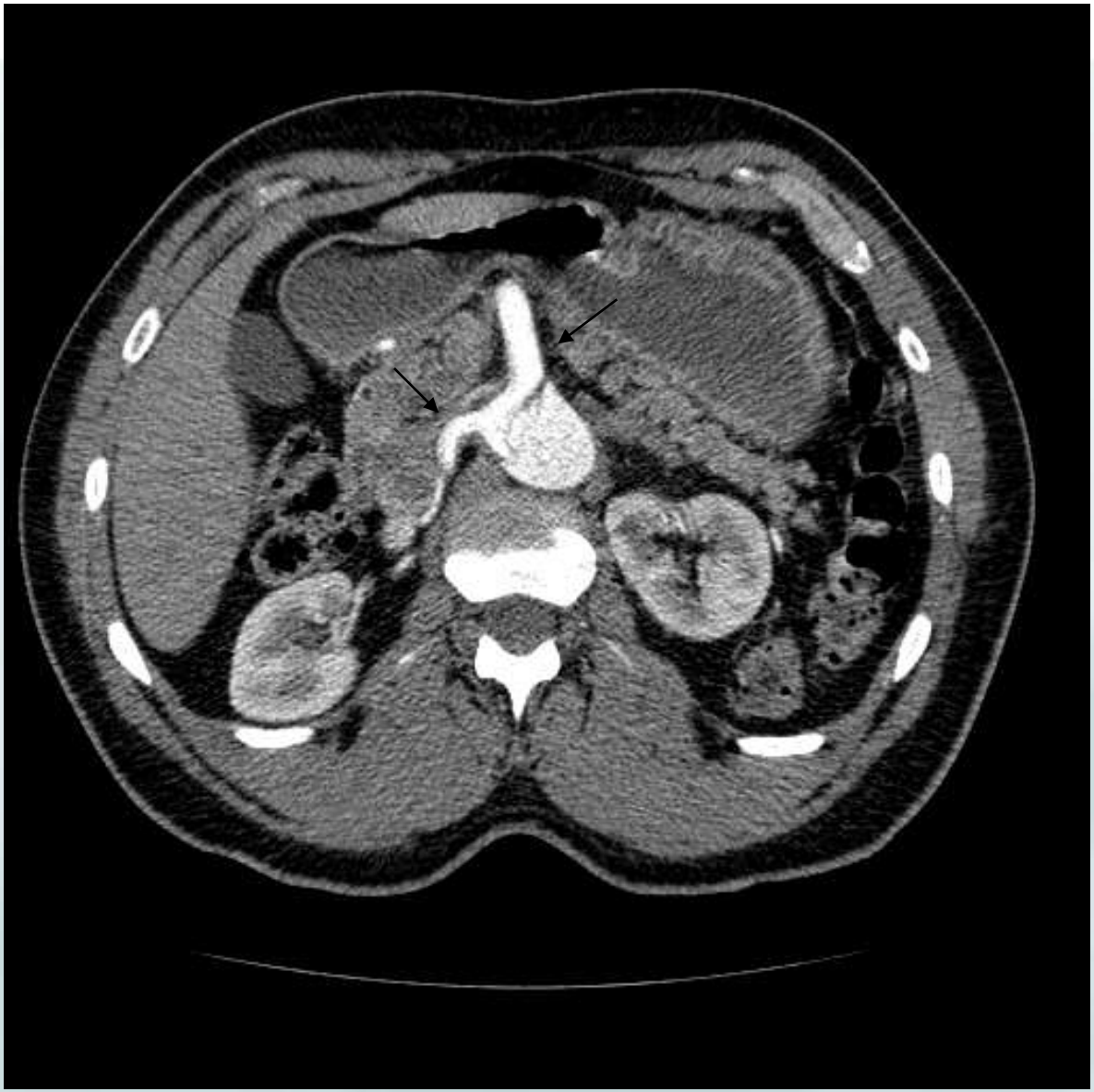
Initial CT



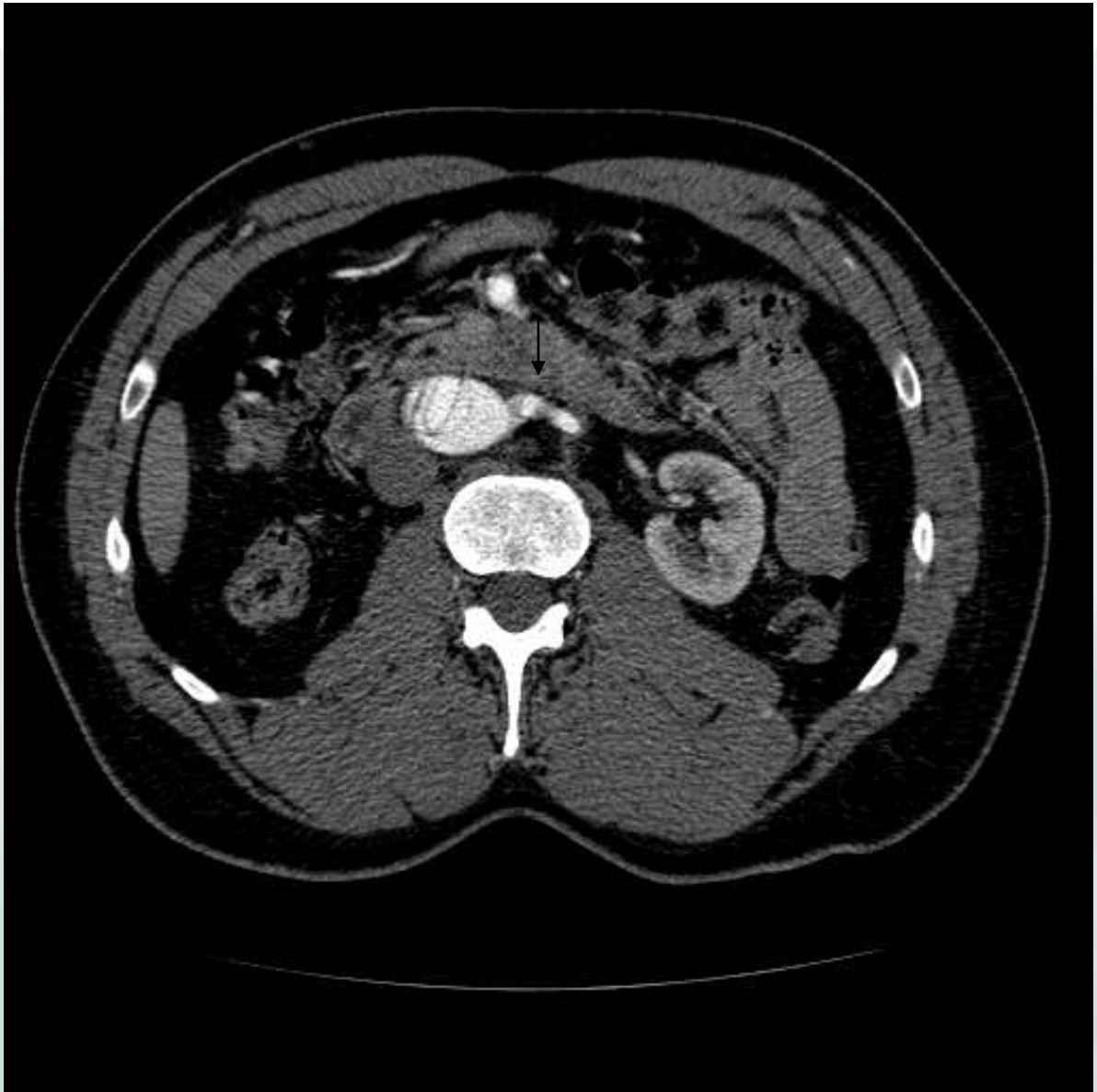
Celiac Artery off the True Lumen



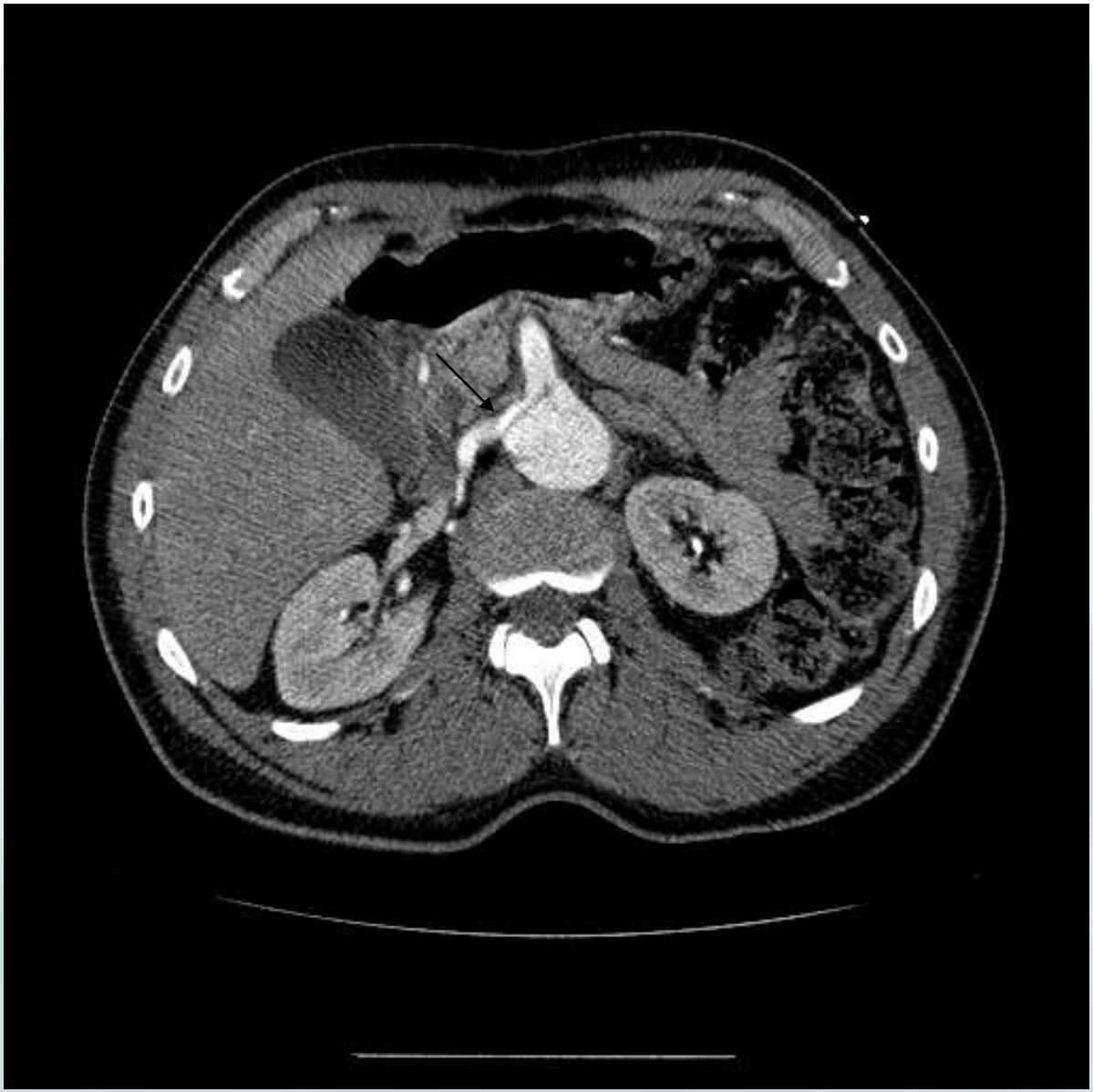
SMA and Right Renal off True Lumen



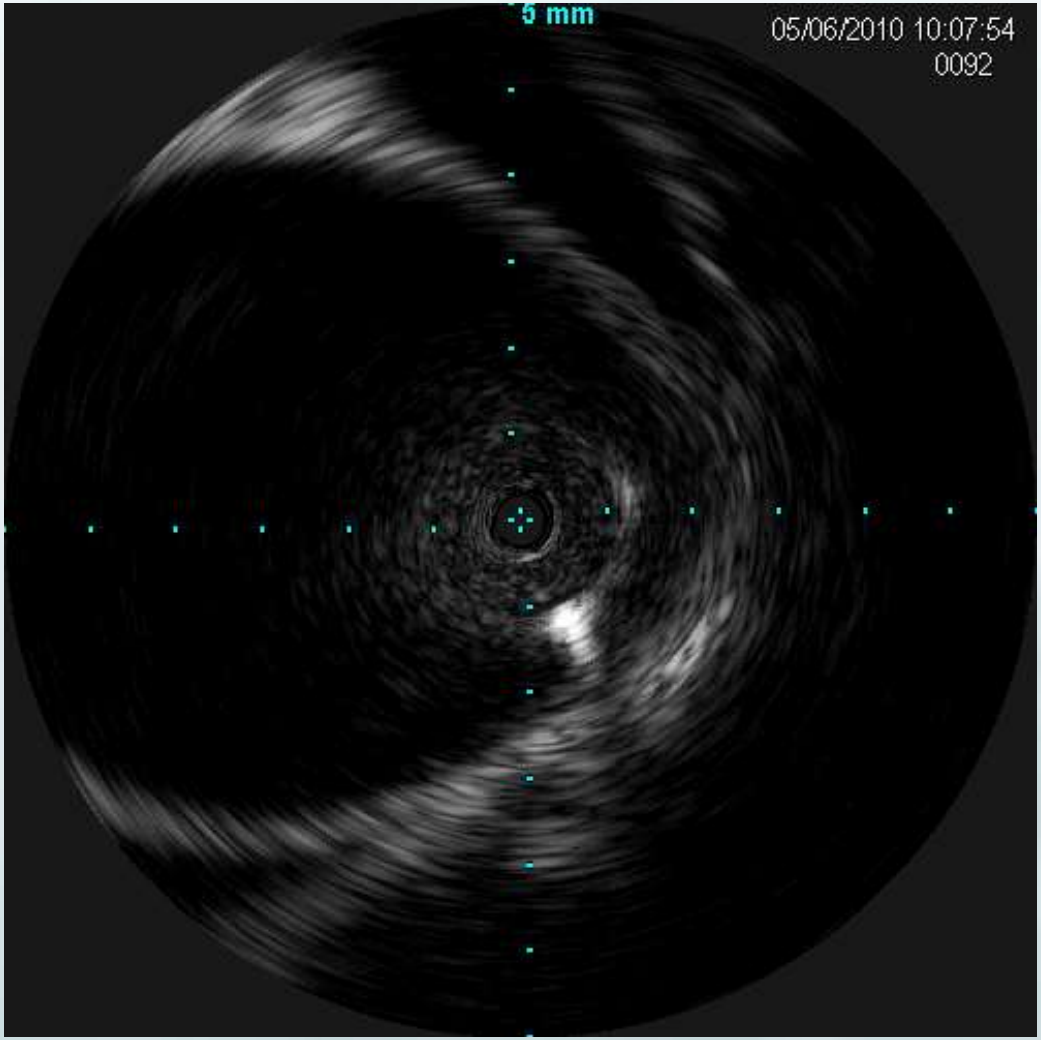
Left Renal Artery off the False Lumen



Diminution of True Lumen on f/u CT



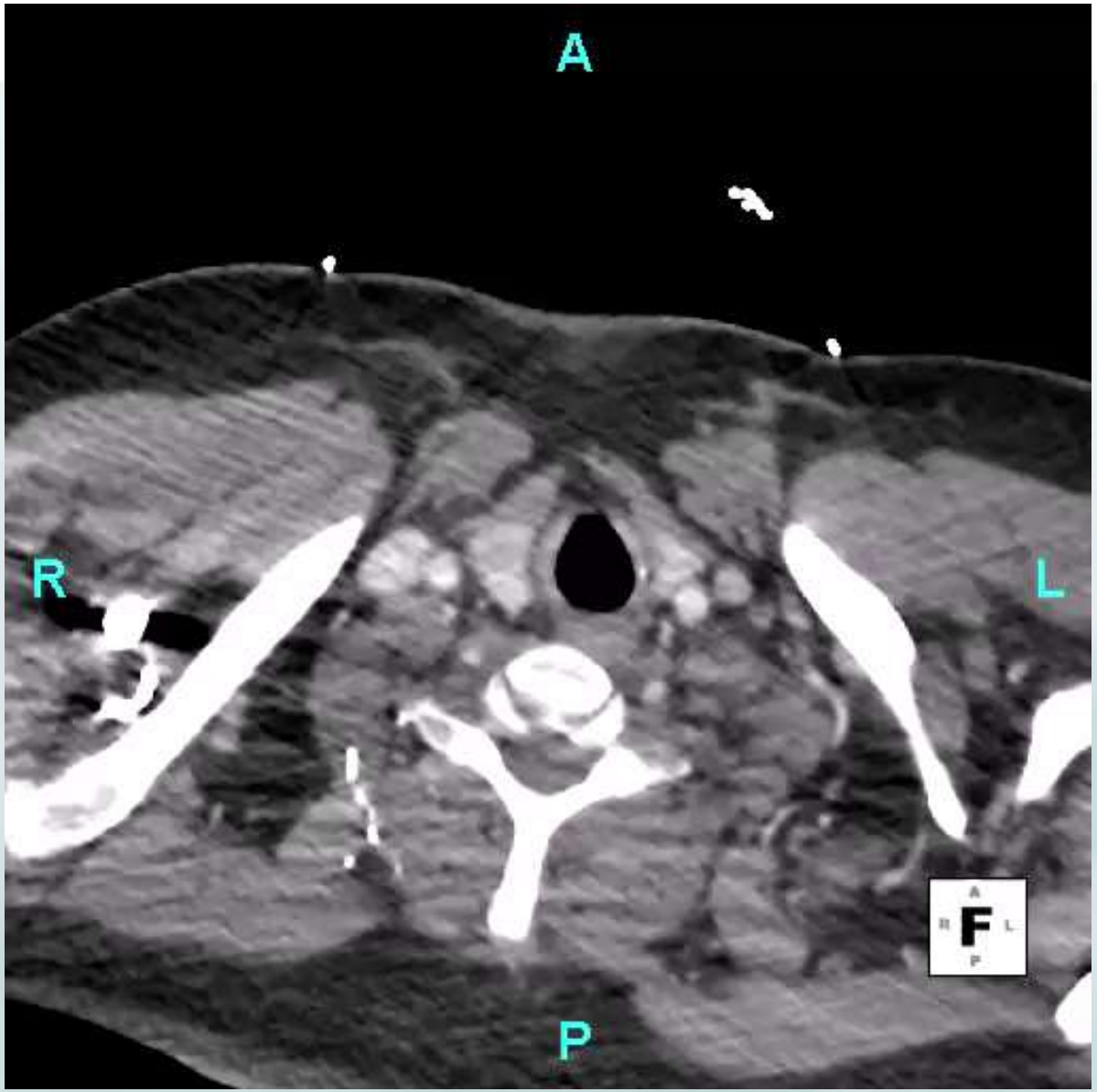
Post-TEVAR IVUS

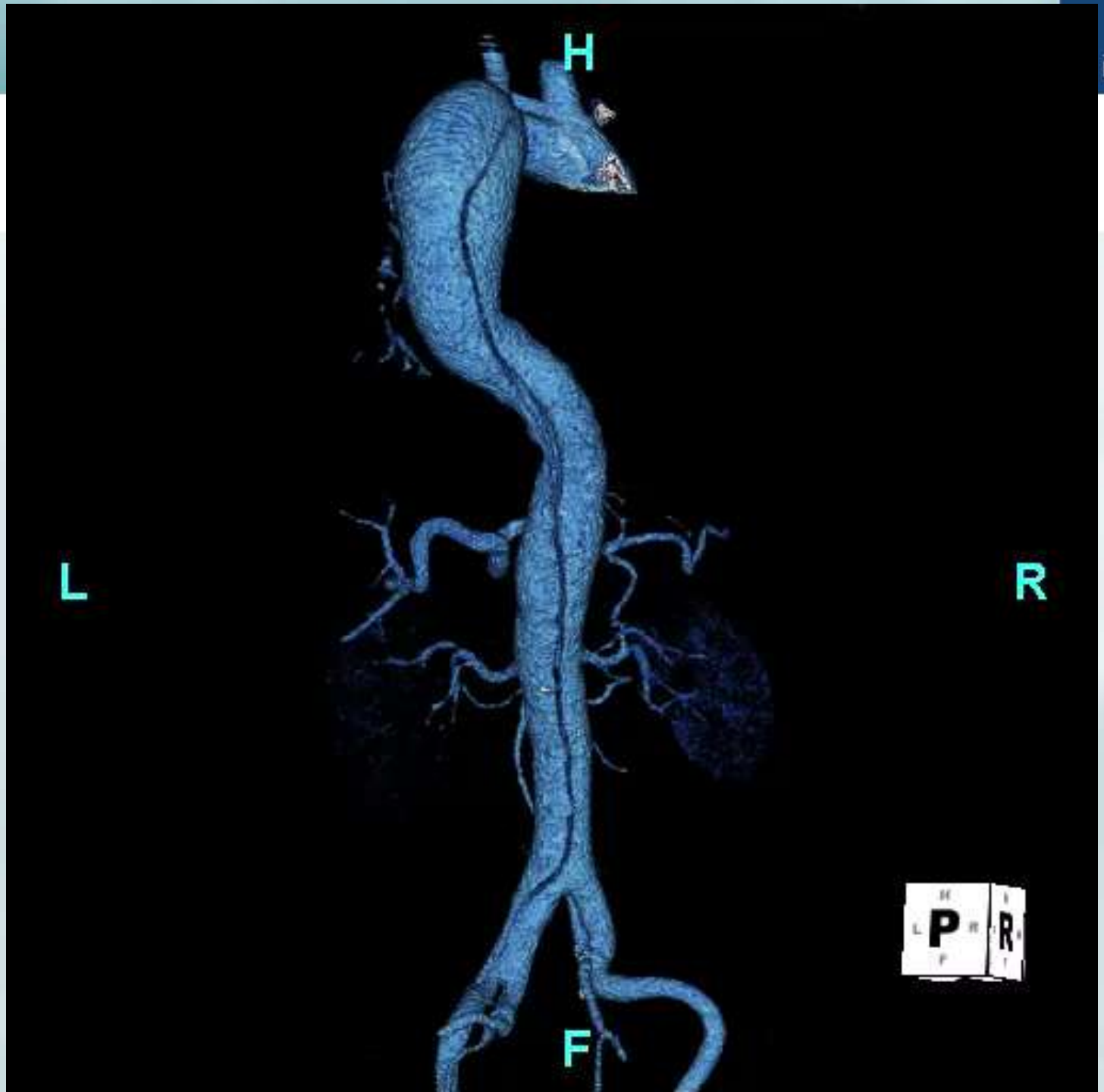


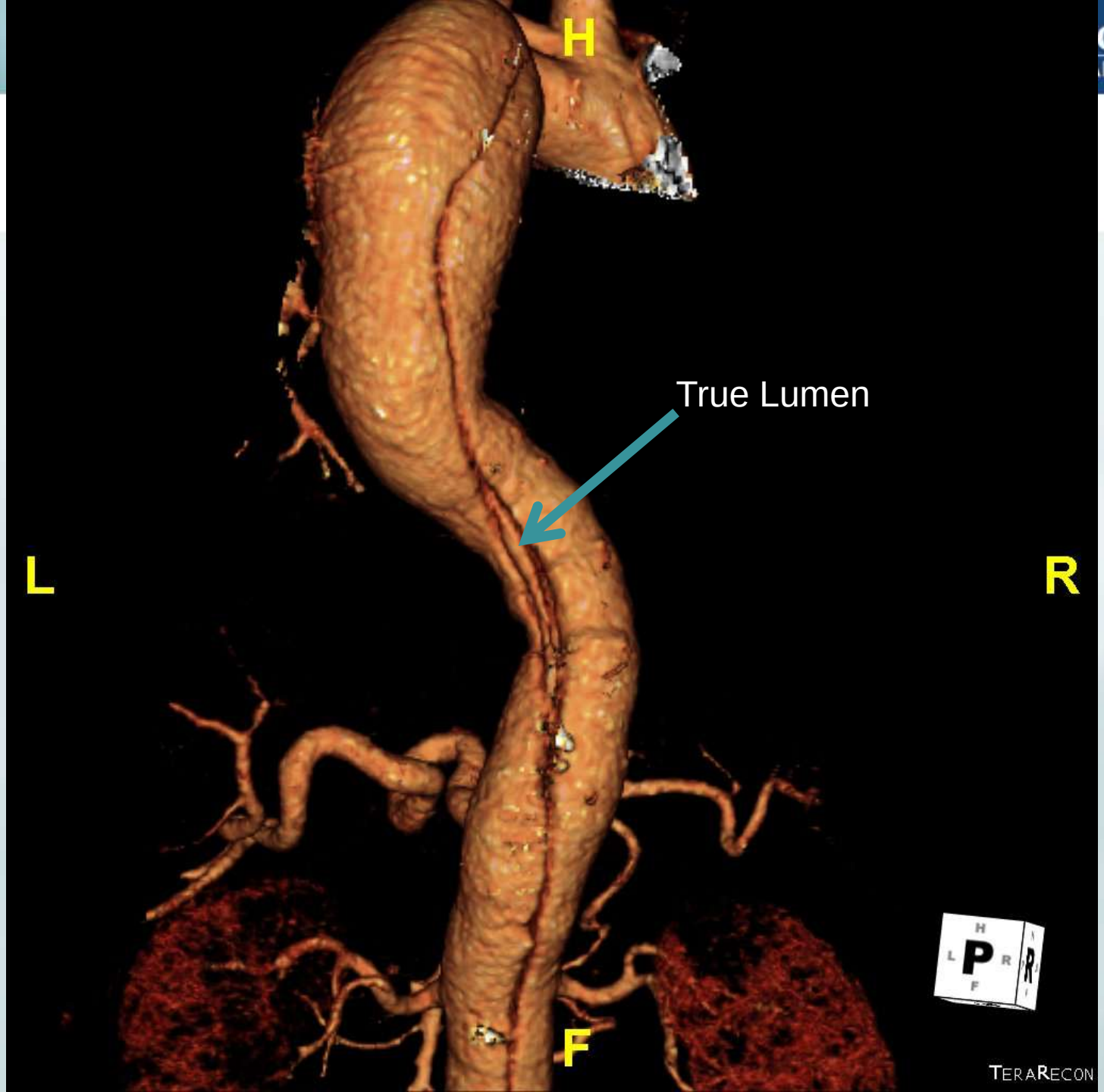
Case History:

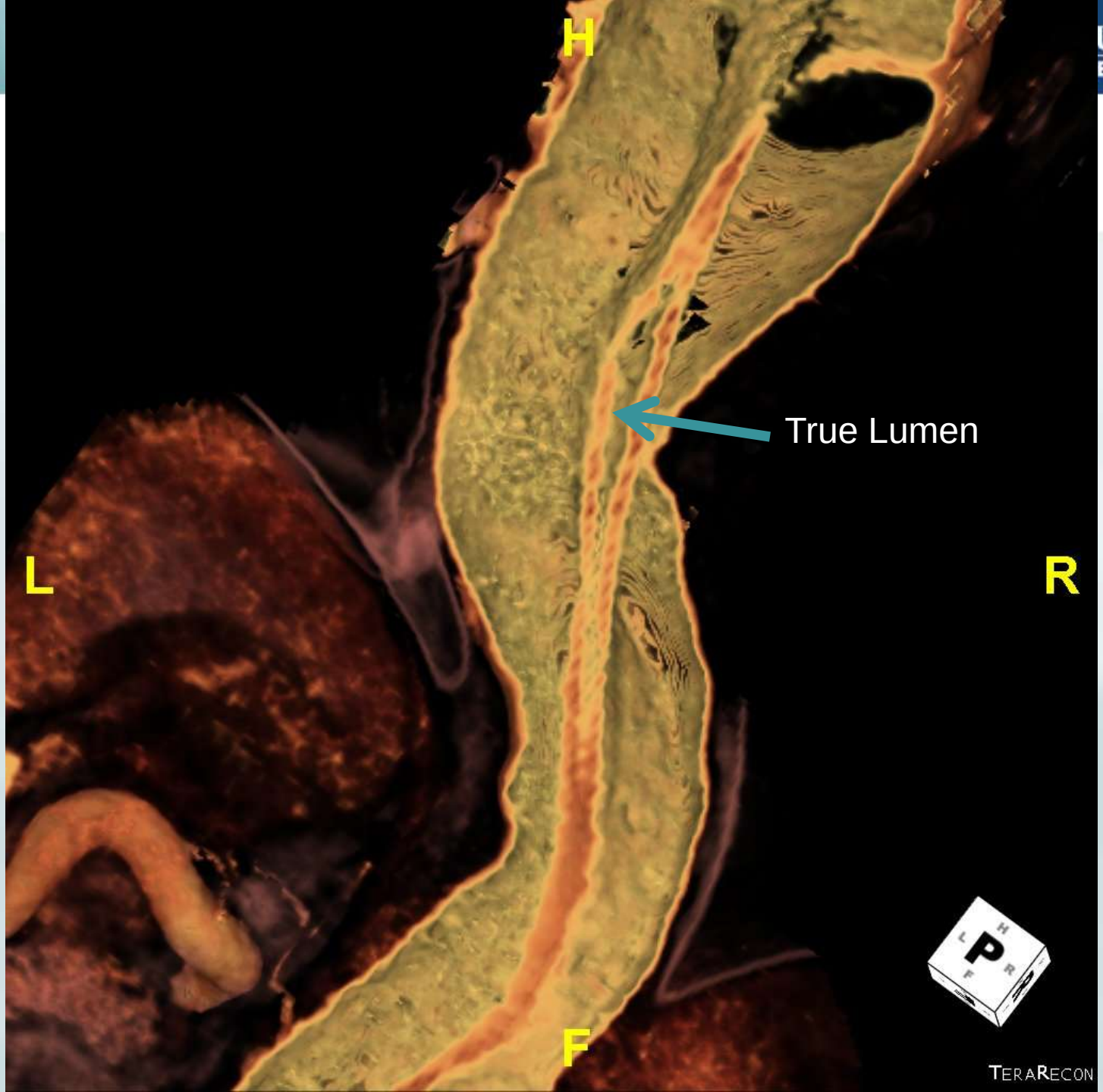
- 56M with history of spina bifida, myelofibrosis and chronic Type B dissection p/w uncontrollable HTN and aneurysmal degeneration of thoracic aorta.
  - Dissection first diagnosed in 2009.
- Treated with regimen including clonidine, hydralazine, lisinopril, labetolol.
- SBP routinely 160-170 mm Hg, chest pain daily.

CT Scan

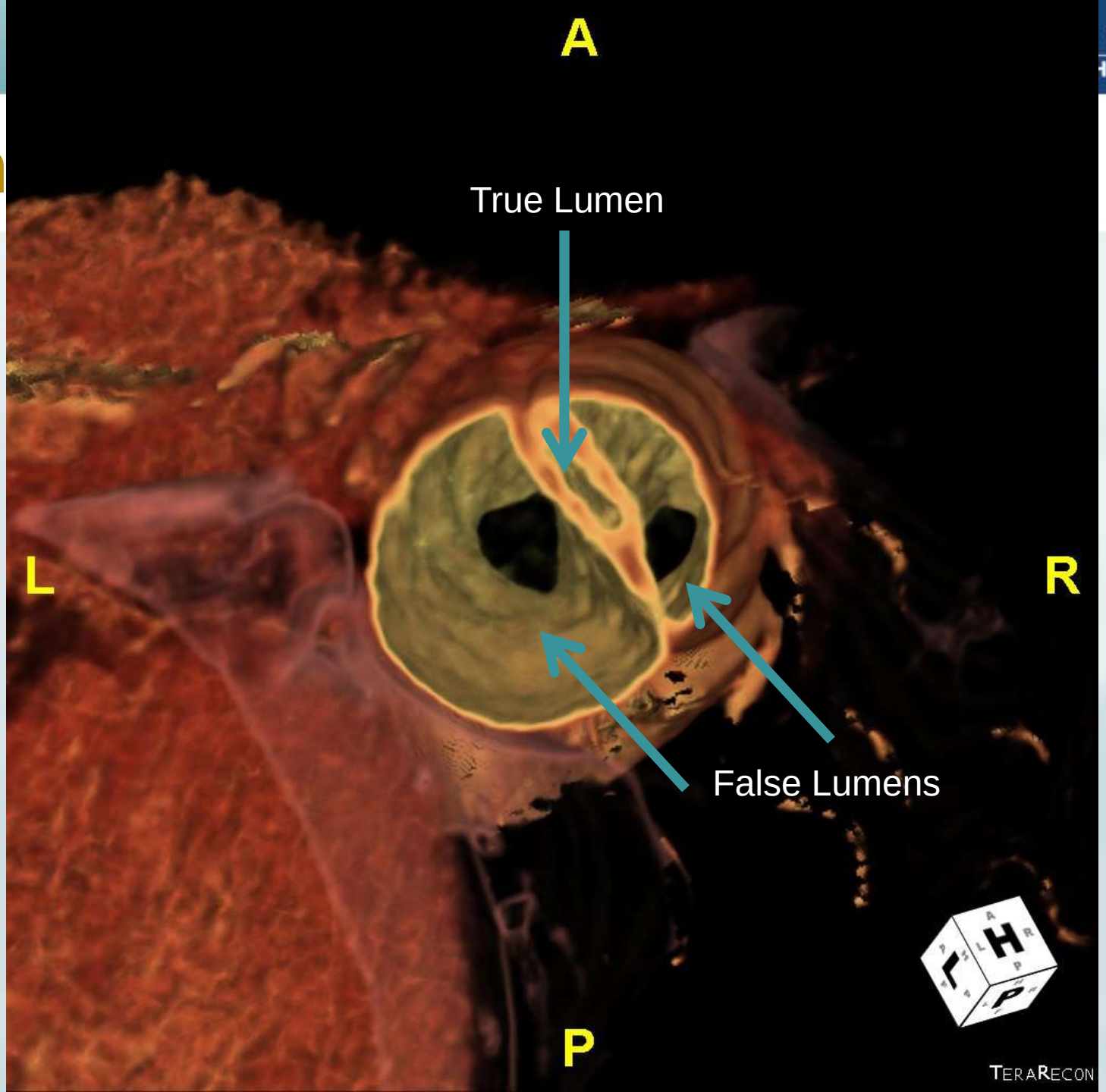


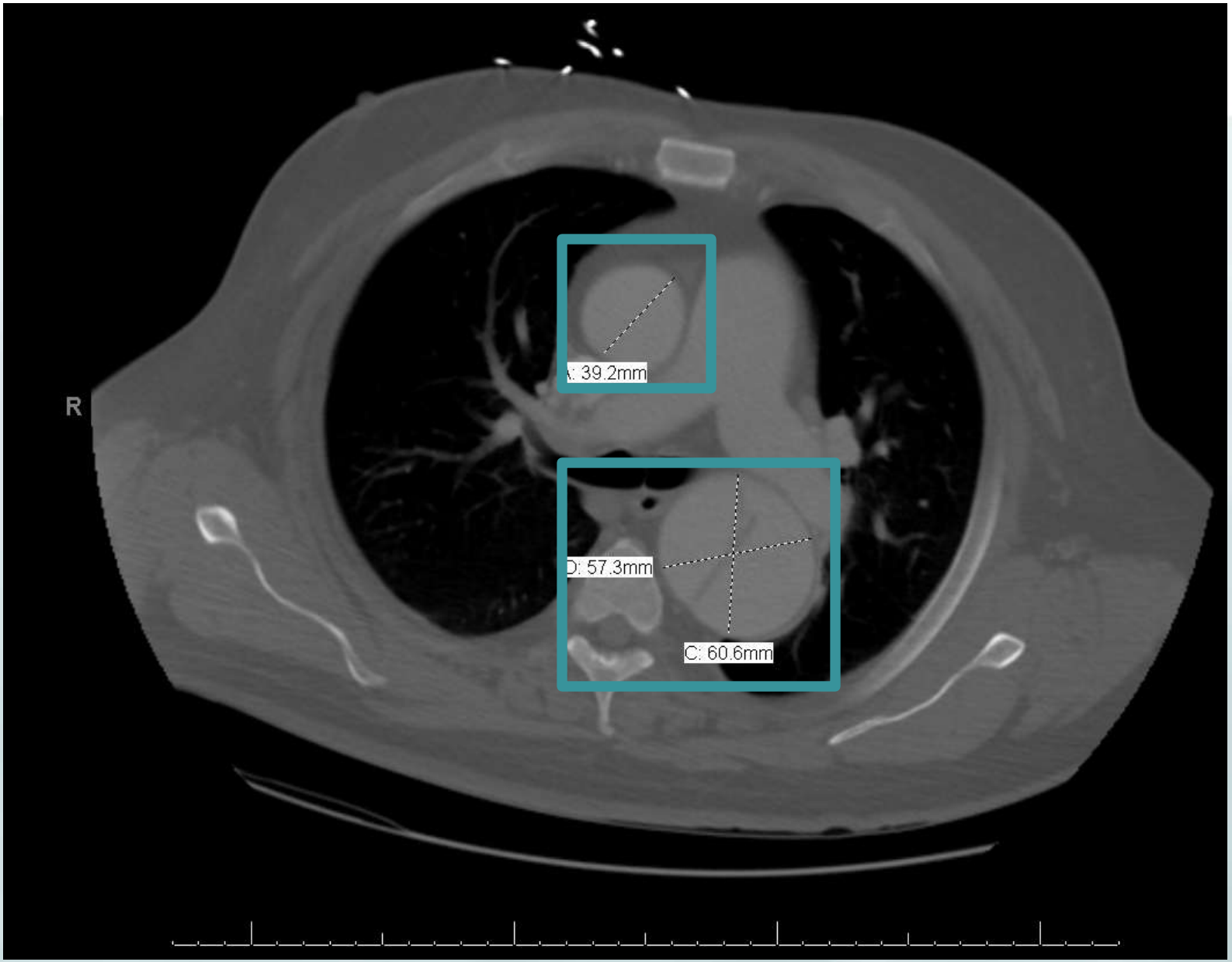

H
L
R
F
P
R


H
True Lumen
L
R
F
TeraRecon


H
True Lumen
L
R
F
TeraRecon

In

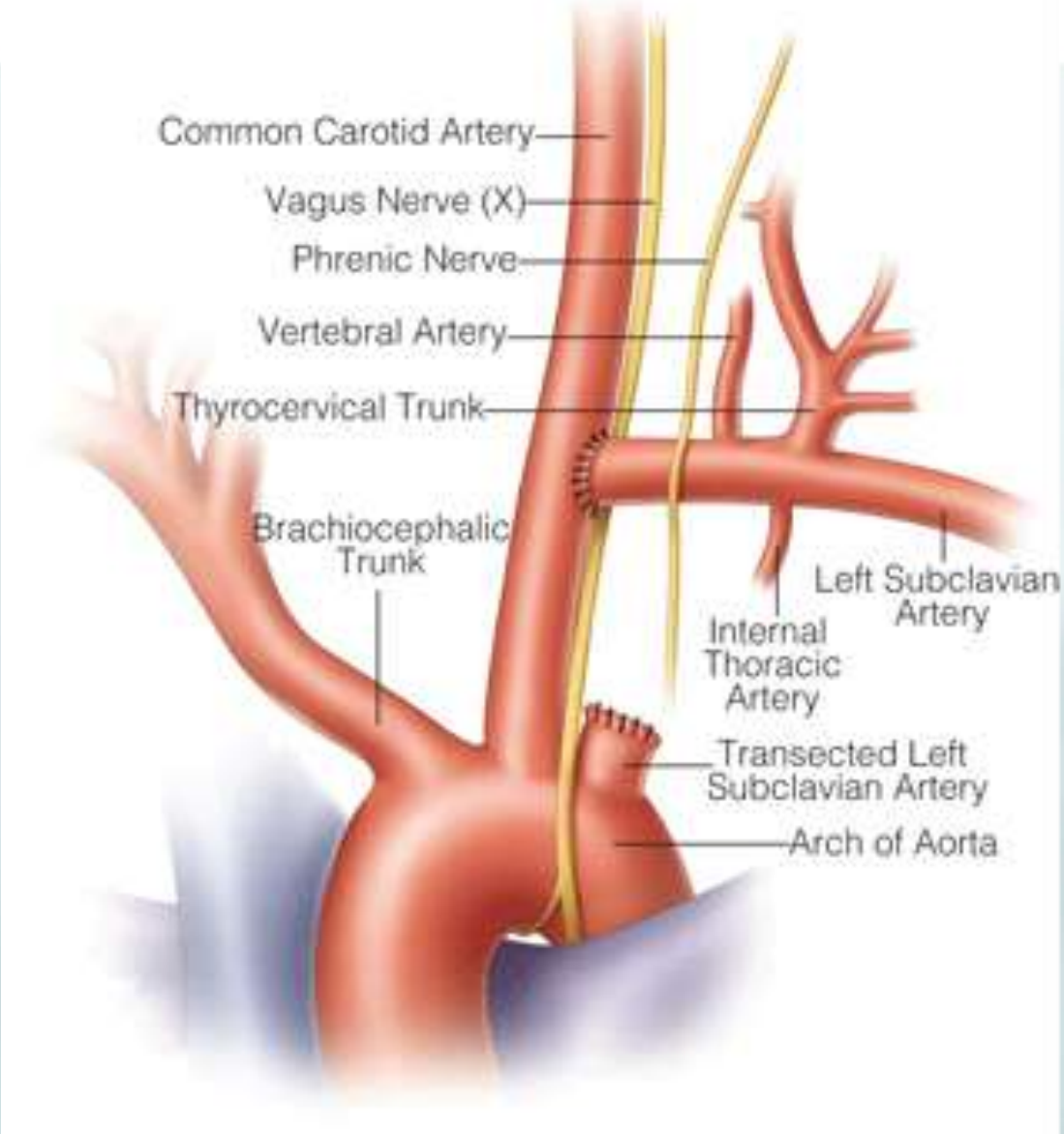



R
: 39.2mm
D: 57.3mm
C: 60.6mm

Indications for Intervention in Type B Dissection

- Rupture
- Malperfusion
  - Mesenteric Ischemia
  - Renal Failure
  - Lower extremity ischemia
  - Stroke
- Persistent or Recurrent Pain
- Aneurysmal degeneration

Carotid-Subclavian Transposition

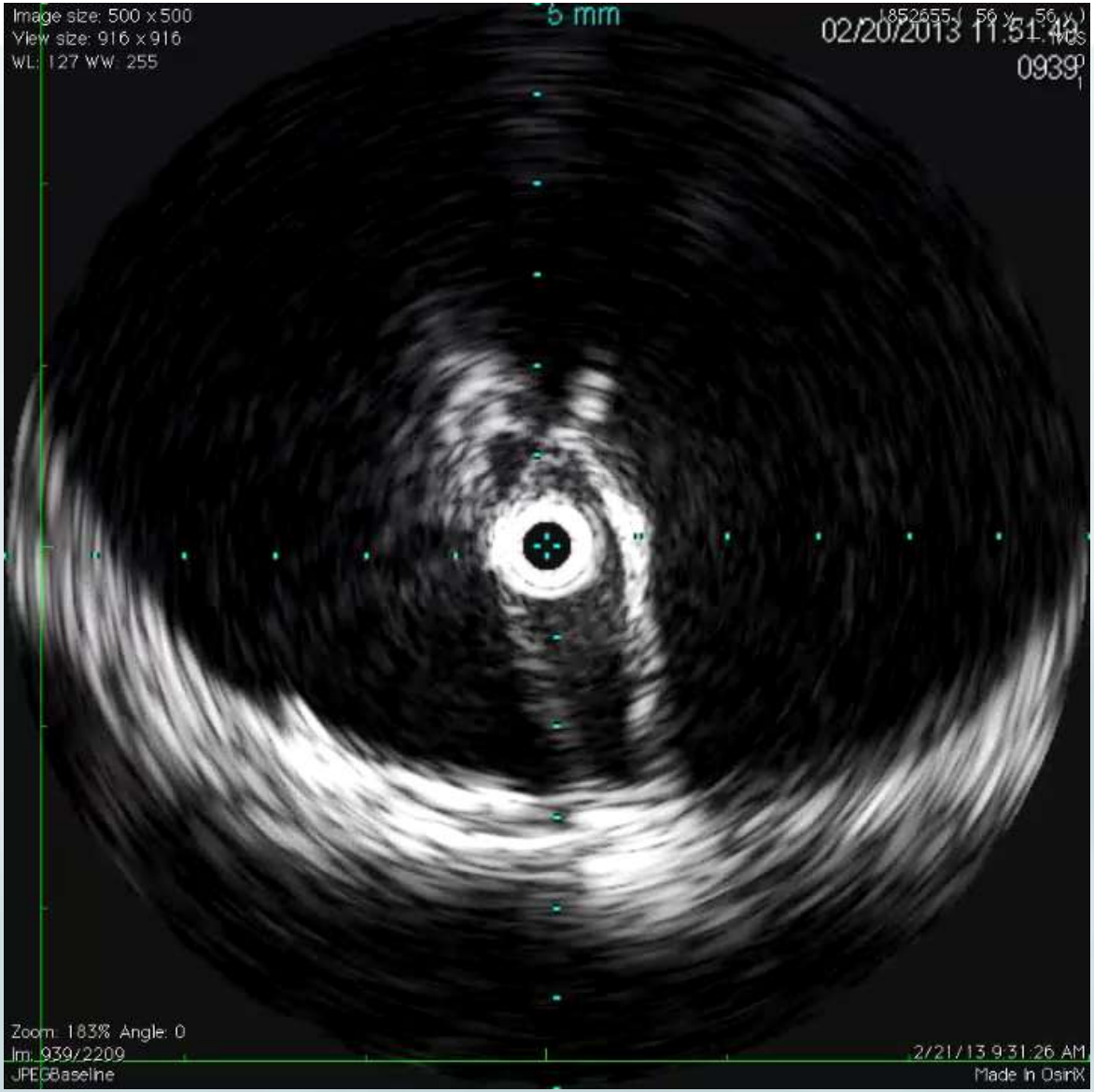


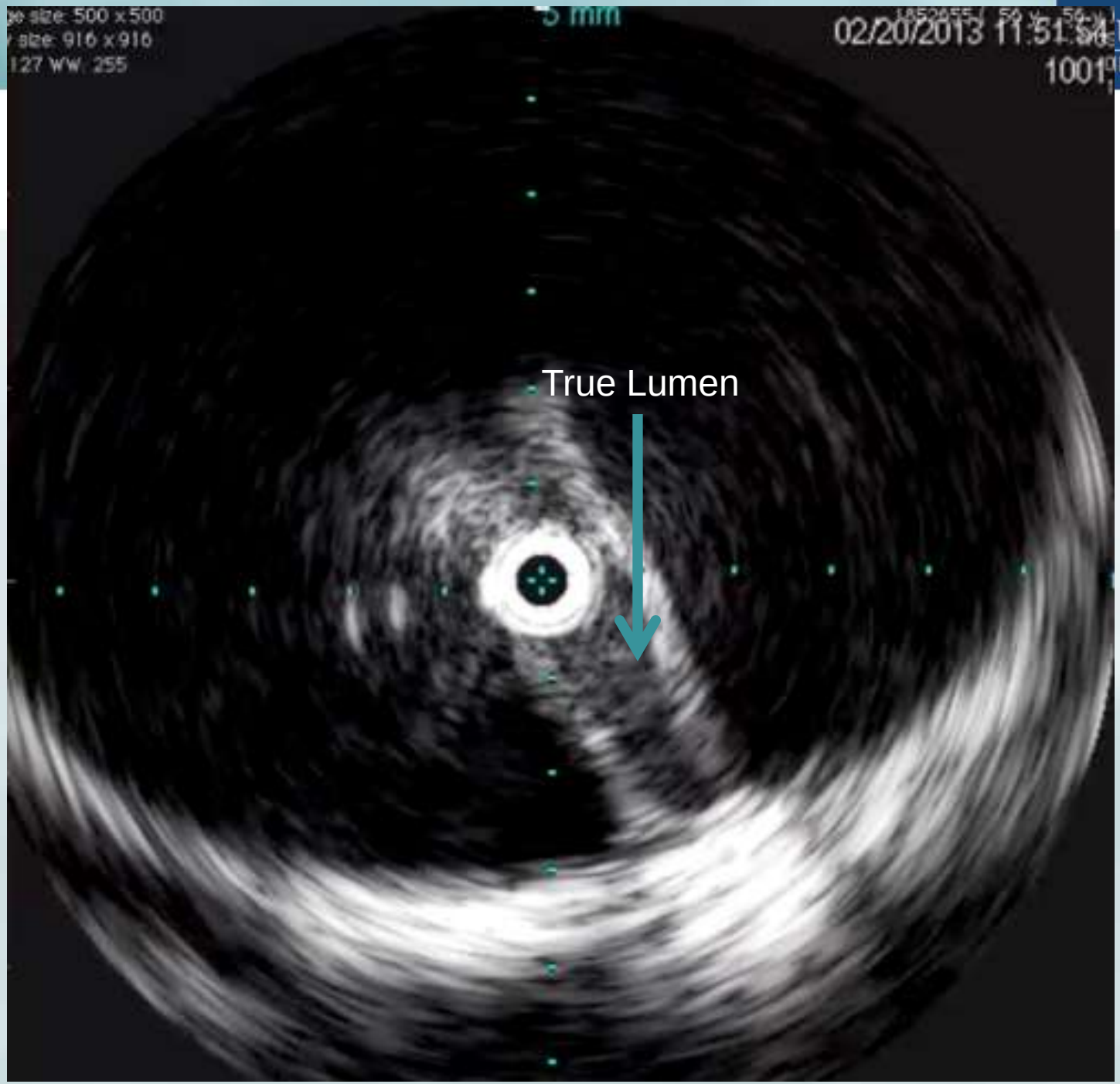
TEVAR Procedure

- Maintaining true lumen crucial.
  - Goal is to exclude aneurysmal segment.
  - Eventual thrombosis of false lumen.
  - Celiac and SMA derive from true lumen.

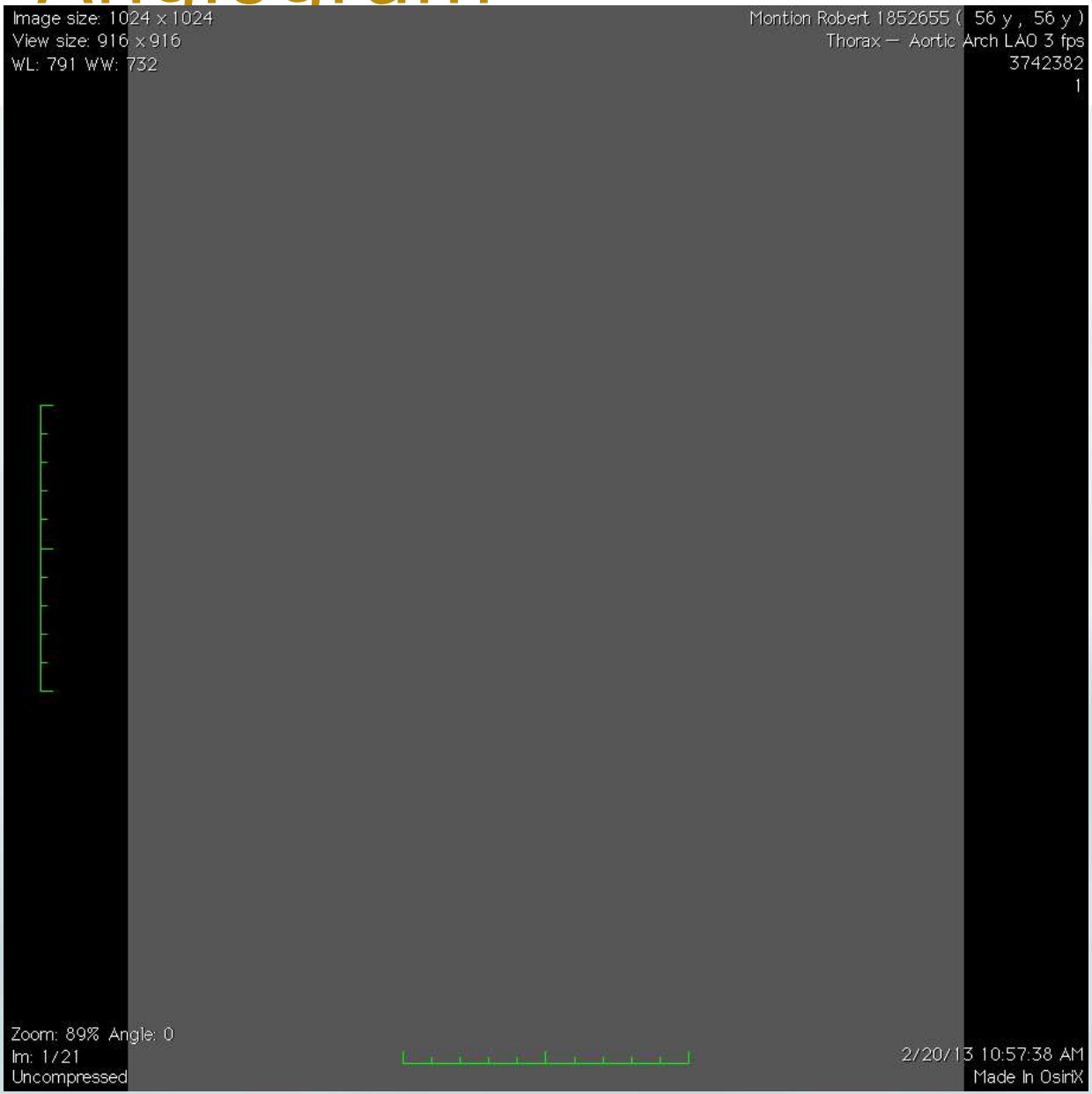
Plan: Use IVUS guidance to verify true lumen wire location and assist with sizing.

IVUS Guidance in True Lumen

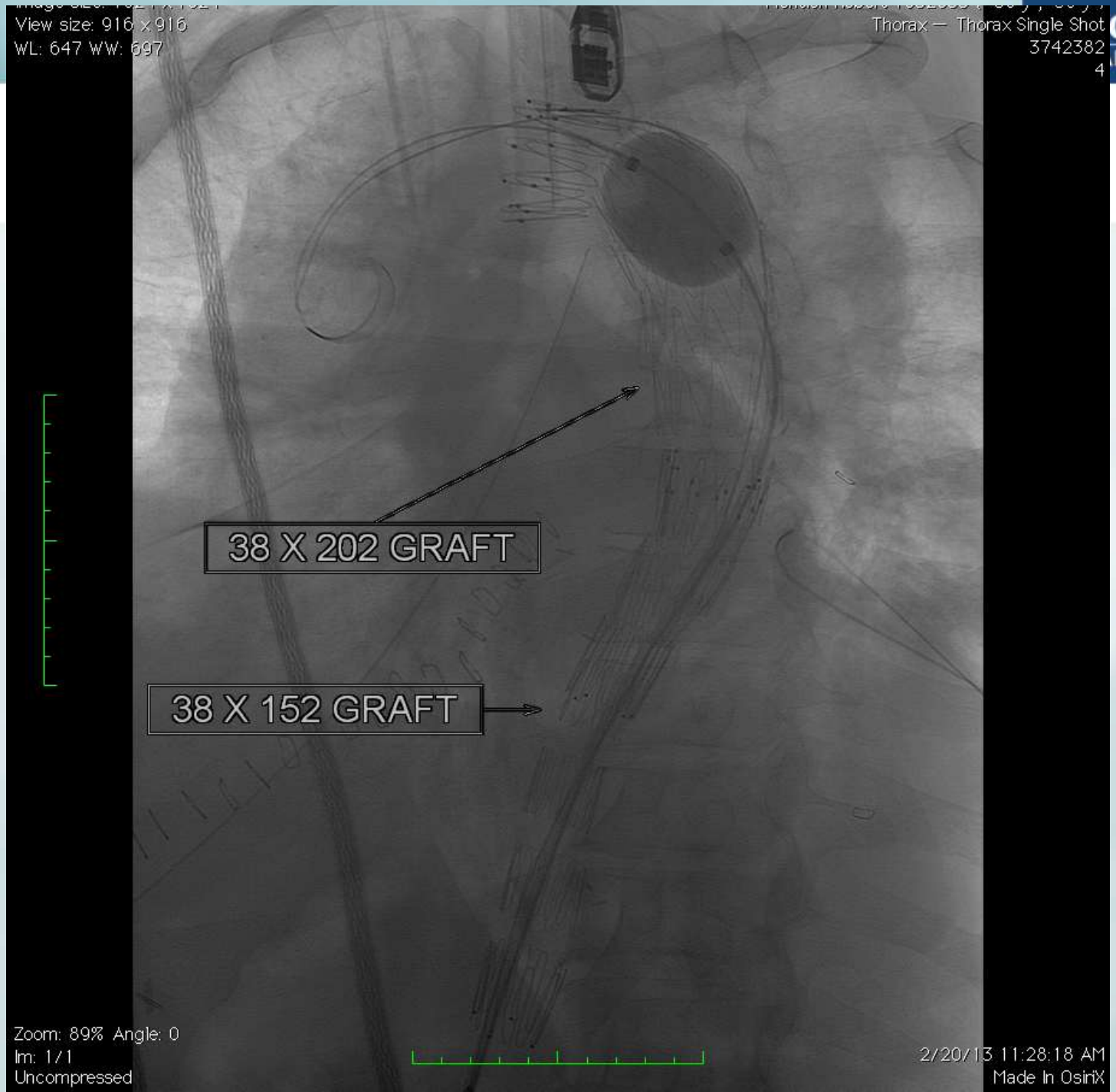



size: 500 x 500
size: 916 x 916
127 WW: 255
5 mm
02/20/2013 11:51:54
1001
True Lumen

Initial Angiogram




Transposition
False Lumen


View size: 916 x 916
WL: 647 WW: 697
Thorax — Thorax Single Shot
3742382
4
38 X 202 GRAFT
38 X 152 GRAFT
Zoom: 89% Angle: 0
Im: 1/1
Uncompressed
2/20/13 11:28:18 AM
Made In OsiriX


FD 19.0 inch
View size: 1075 x 916
WL: 509 WW: 683
View size: 916 x 916
WL: 509 WW: 683
Thorax — Thorax Single Shot
3742382
10
Zoom: 105% Angle: 0
Im: 1/1
Uncompressed
Zoom: 89% Angle: 0
Im: 1/1
Uncompressed
2/20/13 11:32:07 AM
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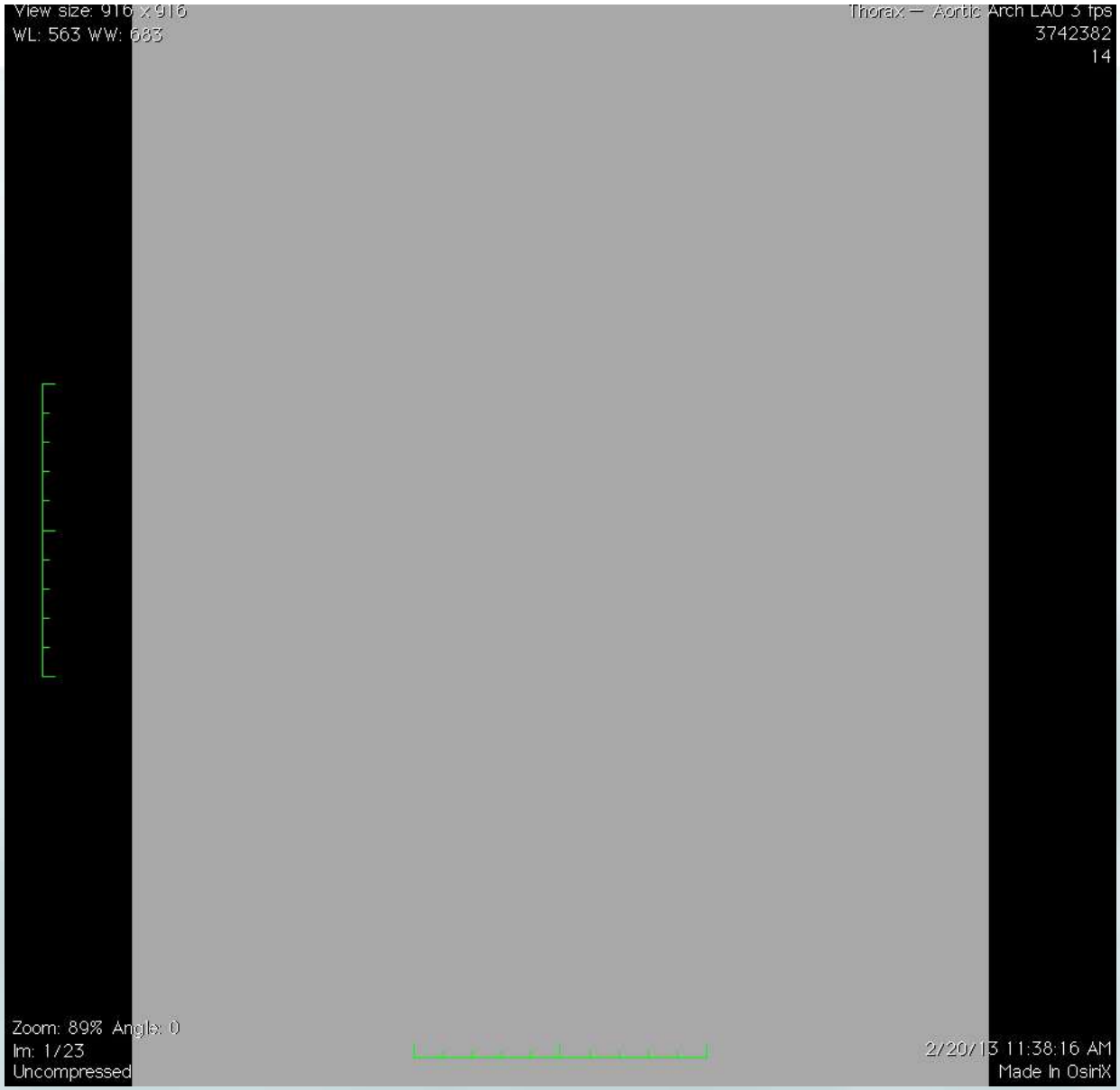
After Post Dilation




View size: 916 x 916
WL: 605 WW: 406
LAO 37°
CAUD 2°
FD 19.0 inch
Thorax — Aortic Arch LAO 3 fps
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14
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Im: 1/1
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2/20/13 11:38:22 AM
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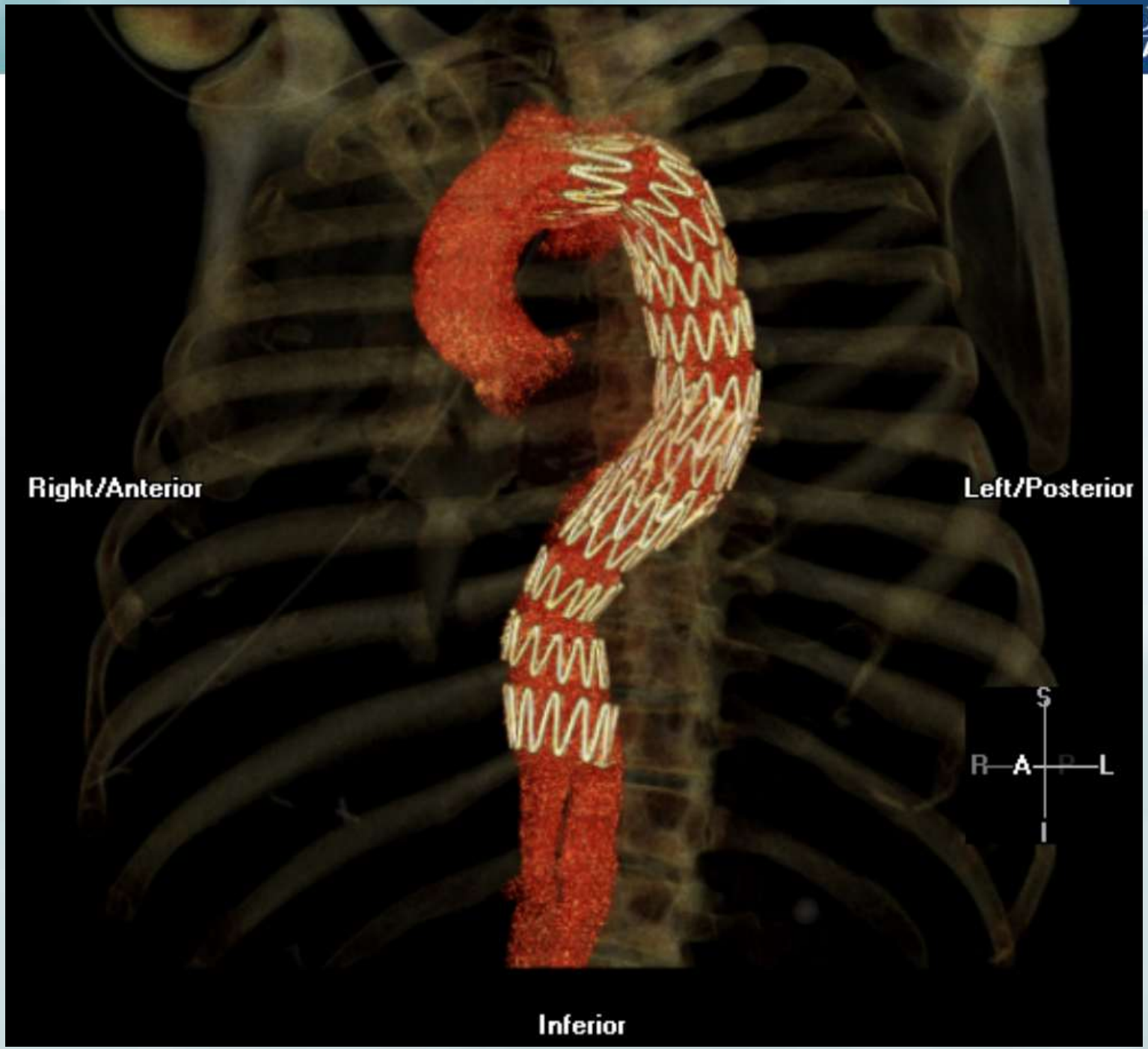
Right/Anterior
Left/Posterior
S
R
A
P
L
I
Inferior

Comparison of Treatment Options for Complicated Acute Type B Dissection

An IRAD Report

N=571 acute type B

	Open Surgery	Endovascular
n	59 (11.5%)	66 (12.8%)
CVA	4 (9.1%)	2 (3.4%)
Coma	2 (4.5%)	1 (1.7%)
Spinal cord ischemia	3 (6.8%)	2 (3.4%)
Myocardial ischemia	1 (2.6%)	1 (1.7%)
Acute renal failure	8 (19.0%)	4 (6.9%)
Mes isch/infarction	2 (5.0%)	4 (6.9%)
Limb ischemia	2 (5.0%)	2 (3.4%)
Any of above compl	16 (40.0%)	11 (20.8%)
Mortality	20 (33.0%)	7 (10.6%)

After propensity and multivariable adjustment, open surgical repair was associated with an independent increased risk of in-hospital mortality (odds ratio 3.41, p=0.05)

J Am Coll Cardiol Interv 2008;1:395-402

Open and endovascular repair of type B aortic dissection in the Nationwide Inpatient Sample

Teviah Sachs, MD, Frank Pomposelli, MD, Robert Hagberg, MD, Allen Hamdan, MD, Mark Wyers, MD, Kristina Giles, MD, and Marc Schermerhorn, MD, *Boston, Mass*

Background: The use of stent grafts and mortality of stent graft repair of type B thoracic aortic dissection (T_BAD) is not well defined. We sought to determine national estimates for the use and mortality of thoracic endovascular aortic repair (TEVAR) for T_BAD in the United States.

Methods: Records of the Nationwide Inpatient Sample (NIS) database between 2005 and 2007 were examined. *International Classification of Diseases, 9th edition* (ICD-9) diagnosis codes were used to select patients who underwent open or TEVAR with a stent graft for a diagnosis of thoracic aortic dissection or thoracoabdominal aortic dissection. We excluded patients with a diagnosis code for aortic aneurysm and those with procedure codes for cardioplegia or for operations on heart vessels or valves, which were considered type A dissections (T_AAD). The remaining patients were considered as T_BAD. We compared demographics and comorbidities, as well as adjusted complications and mortality rates, between patients undergoing TEVAR vs open repair.

Results: We identified an estimated 10,466 repairs for dissection of the thoracic or thoracoabdominal aorta (open, 8659; TEVAR, 1818). Of these, 464 had a diagnosis of aortic aneurysm, and 5002 patients were considered T_AAD. Of nonaneurysmal dissections, 5000 repairs were considered T_BAD (open, 3619; TEVAR, 1381). The endovascular patients were older and had greater comorbidities, although only cardiac disease, renal failure, hypertension, and peripheral vascular disease were statistically significant. In-hospital mortality was 19% for open repair vs 10.6% for TEVAR (odds ratio [OR], 2.24; 95% confidence interval [CI], 1.36-3.67; $P < .01$). In-hospital mortality was significantly higher with open repairs coded as emergent admissions (20.1% vs 13.1%; $P = .03$), but did not reach statistical significance for elective admissions (12.3% vs 4.8%; $P = .09$). Cardiac complications (12.4% vs 4.9%, $P < .01$), respiratory complications (7.7% vs 4.3%, $P = .02$), genitourinary complications (9.0% vs 2.5%, $P < .01$), hemorrhage (14.0% vs 2.8%, $P < .01$), and acute renal failure (32.1% vs 17.2%, $P < .01$) were more frequent in the open repair group. Median length of stay was greater in the open repair group (10.7 vs 8.3 days, $P < .01$).

Conclusion: For patients with a diagnosis of T_BAD who undergo repair, the endovascular approach is being used for older patients with greater comorbidities, yet has reduced morbidity and in-hospital mortality. The use of endovascular stent graft repair for type B thoracic aortic dissection merits further longitudinal analysis. (J Vasc Surg 2010;52:860-6.)

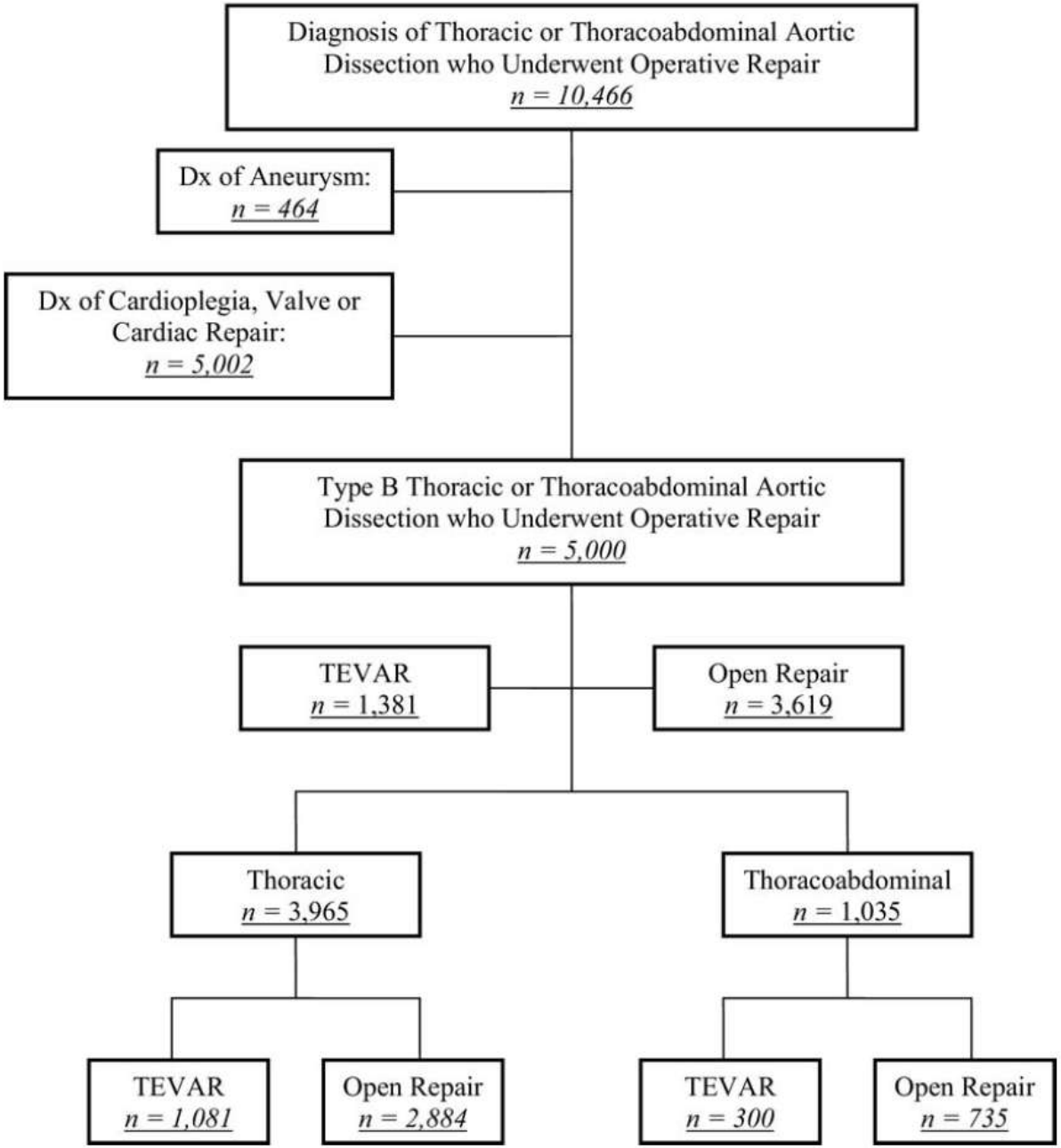

Fig 1. Algorithm describing exclusions and analysis cohorts.

Type B Dissections

	Open %	TEVAR %	P
Mortality	19	10	0.01
Cardiac	12	5	0.01
Hemorrhage	14	3	<0.01
ARF	32	17	<0.01
CVA	6	3	0.07

JVS, 2010, Sachs et al.

Summary

- Complicated Type B dissection is associated with high morbidity and mortality and intervention is warranted
- TEVAR has become the treatment of choice in the majority of cases
- Goals
  - Cover intimal tear
  - Thrombosis and remodeling of false lumen
  - Preservation of flow into renal, visceral and lower extremity arteries