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Penetrating Atherosclerotic Ulcer

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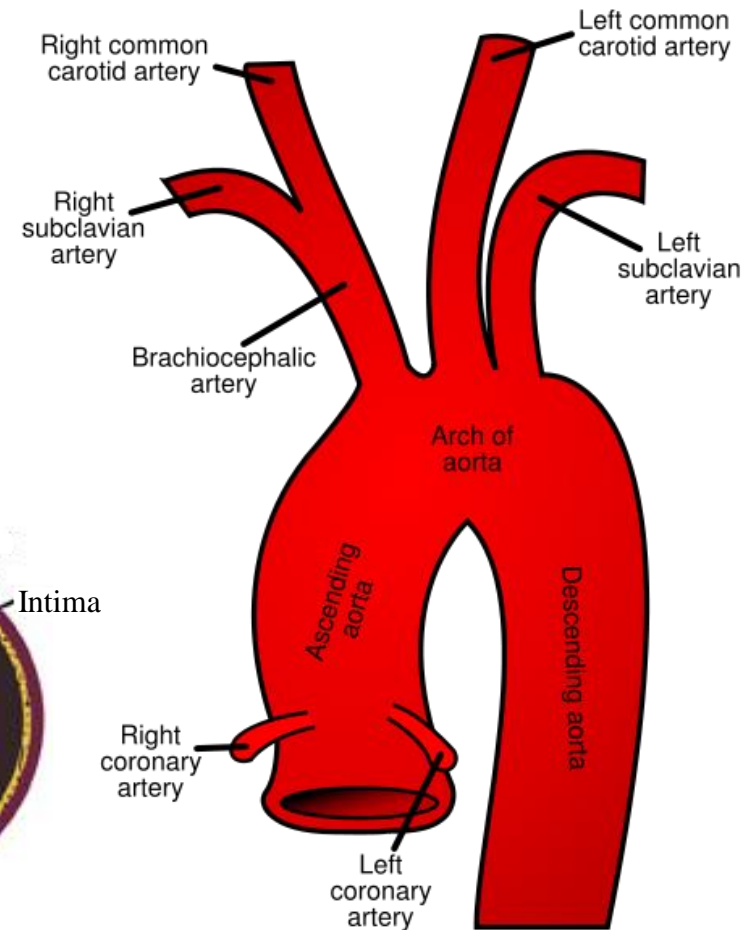
Outline

- Introduction to Penetrating Atherosclerotic Ulcers
- Radiographic Features
- Treatment and Prognosis
- Patient Presentation
- Summary
- References
- Acknowledgements

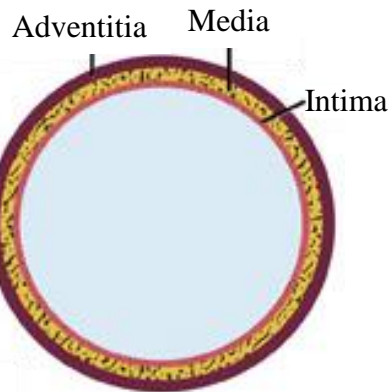


Acute Aortic Syndrome

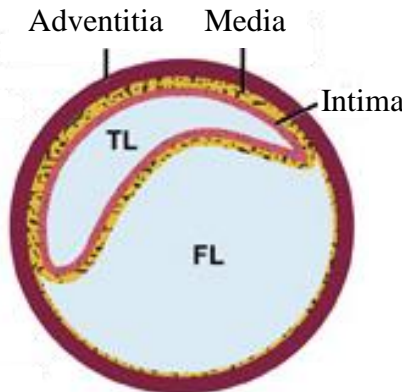
- Causes of Acute Aortic Syndrome
 - Aortic Dissection
 - Intramural Hematoma
 - Traumatic Transection
 - Penetrating Atherosclerotic Ulcer (~5-15%)



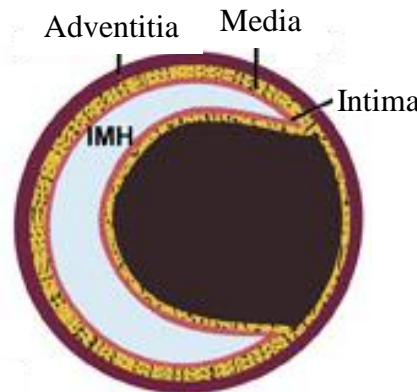
From Cedars-Sinai



Normal



Aortic Dissection

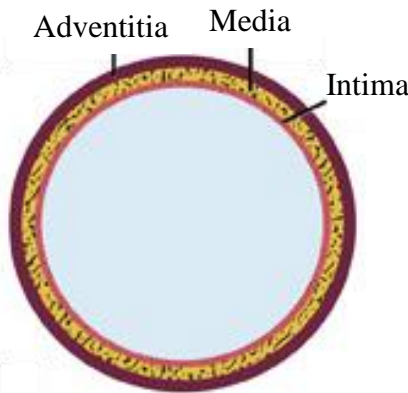


Intramural Hematoma

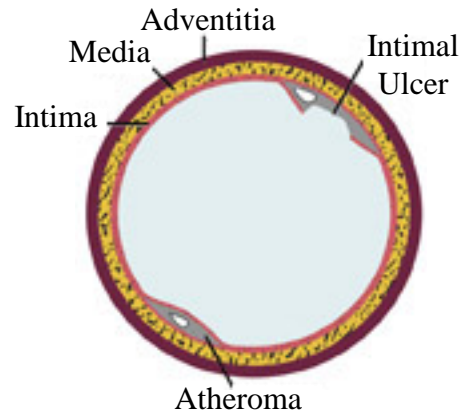


Penetrating Atherosclerotic Ulcer (PAU): Pathology

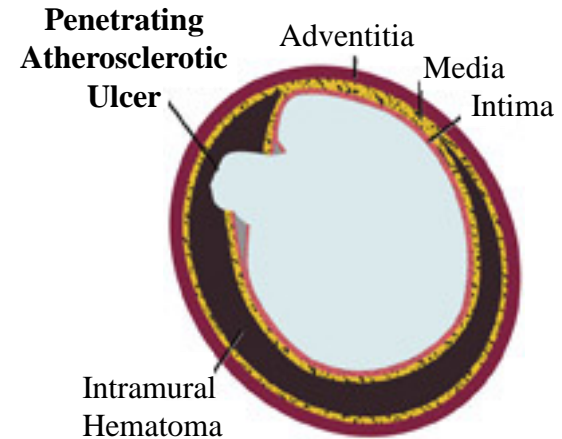
- An ulcerating atherosclerotic lesion that penetrates the intima and progresses into the media



Normal



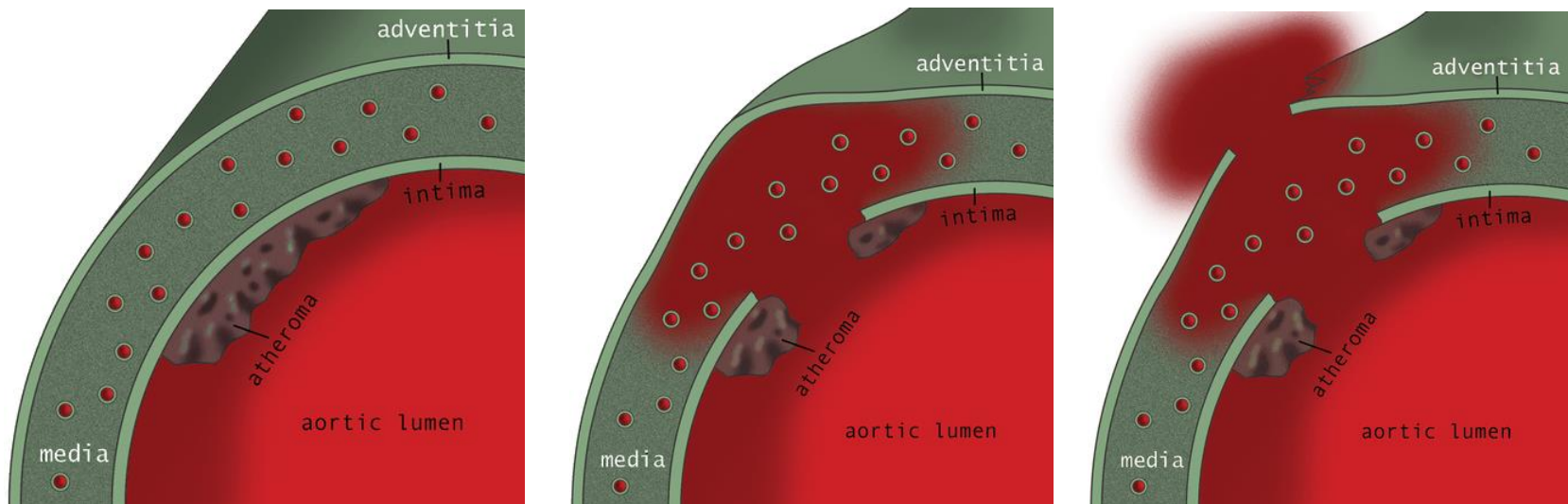
Atheromatous Ulcer



Penetrating Atherosclerotic Ulcer

Complications of PAU

- Conflicting reports about the natural history of PAU.
- Erosion into the vasa vasorum may lead to IMH formation and possibly dissection.
- Adventitial erosion may cause aneurysm formation or rupture.
- Rupture has been reported in up to 42% of cases.
- Most patients have a poor prognosis because of generalized atherosclerosis leading to diffuse organ failure.





Clinical Presentation

- Acute intense chest pain (~75%)
- Asymptomatic incidental diagnosis (~25%)
- Usually presents in elderly individuals with advanced atherosclerosis (vs. aortic dissection)
- Multiple risk factors and co-morbidities
 - Hypertension: 85%
 - Coronary Artery Disease: 61%
 - Abdominal or Thoracic Aortic Aneurysm: 53%
 - Chronic renal insufficiency: 31%
 - Peripheral Arterial Occlusive Disease: 17%
 - Cerebral Vascular Accident: 12%



ACR Appropriateness Criteria for Acute Chest Pain

Clinical Condition: Acute Chest Pain — Suspected Aortic Dissection

Radiologic Procedure	Rating	Comments	<u>RRL</u> [*]
X-ray chest	9	This procedure should be performed if readily available at the bedside and if it does not cause delay in obtaining a CT or MRI scan. Alternative causes of chest pain may be discovered. This is not the definitive test for aortic dissection.	⊕
CTA chest and abdomen with contrast	9	This procedure is recommended as the definitive test in most patients with suspicion of aortic dissection.	⊕ ⊕ ⊕ ⊕
MRA chest and abdomen without and with contrast	8	This procedure is an alternative to CTA for contraindication to CT (iodinated contrast), multiple prior chest CTA for similar symptoms, and in patients showing no signs of hemodynamic instability. Scanner availability and local expertise limit widespread use, as there is potential for delay in diagnosis. See statement regarding contrast in text under “Anticipated Exceptions.”	○
US echocardiography transesophageal	8	Consider this procedure if a skilled operator is readily available.	○
MRA chest and abdomen without contrast	7	This procedure is an alternative to CTA for patients with contraindication to both iodinated and gadolinium contrast agents, such as in patients with renal failure, patients with multiple prior chest CTA for similar symptoms, and in patients showing no signs of hemodynamic instability. Scanner availability and local expertise limit widespread use, as there is potential for delay in diagnosis.	○

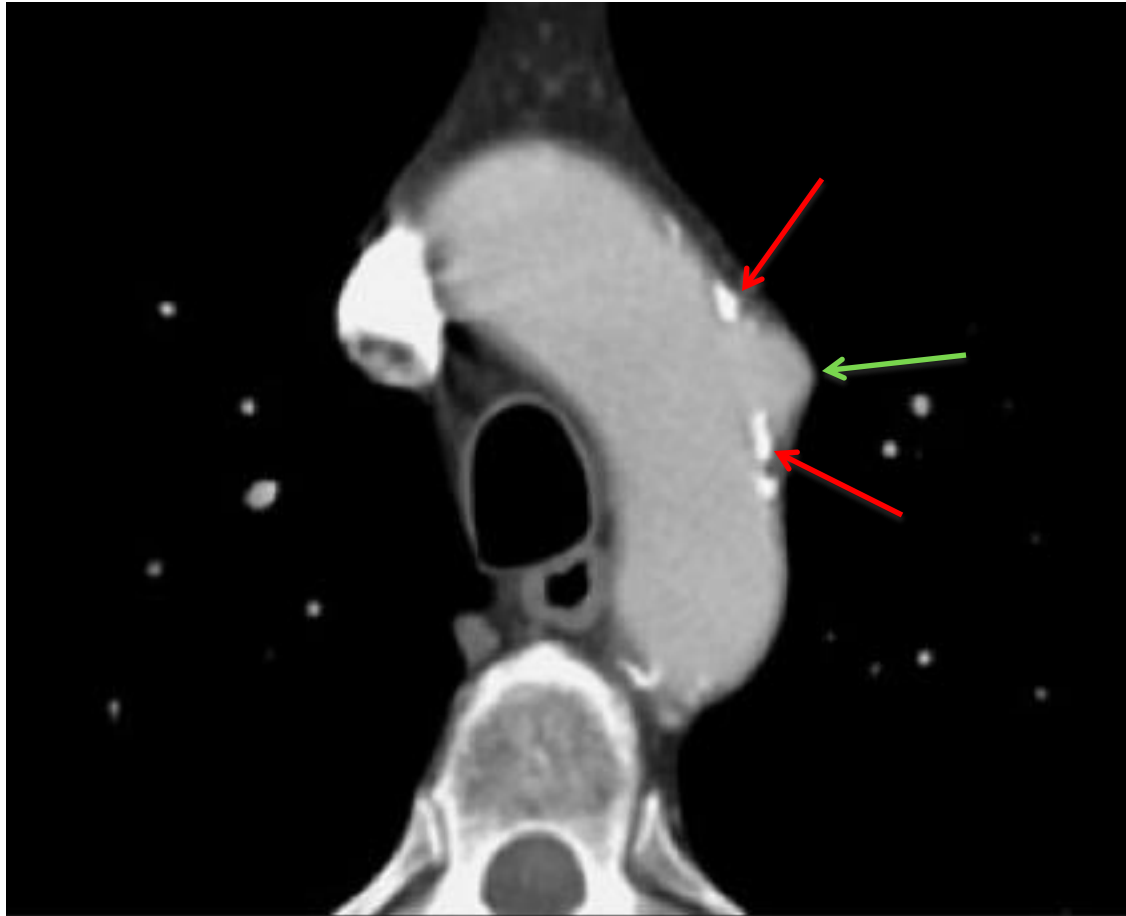


Radiographic Features

- CT and MRI: Localized craterlike outpouching of the aorta, often with jagged edges, in the absence of an intimal flap or false lumen
 - Often signs of extensive atherosclerosis
 - Usually found in the descending part of the thoracic aorta
 - Associated pleural effusion correlates with clinical instability
 - Increasing maximum diameter and depth of ulcer indicates progression



Example of PAU



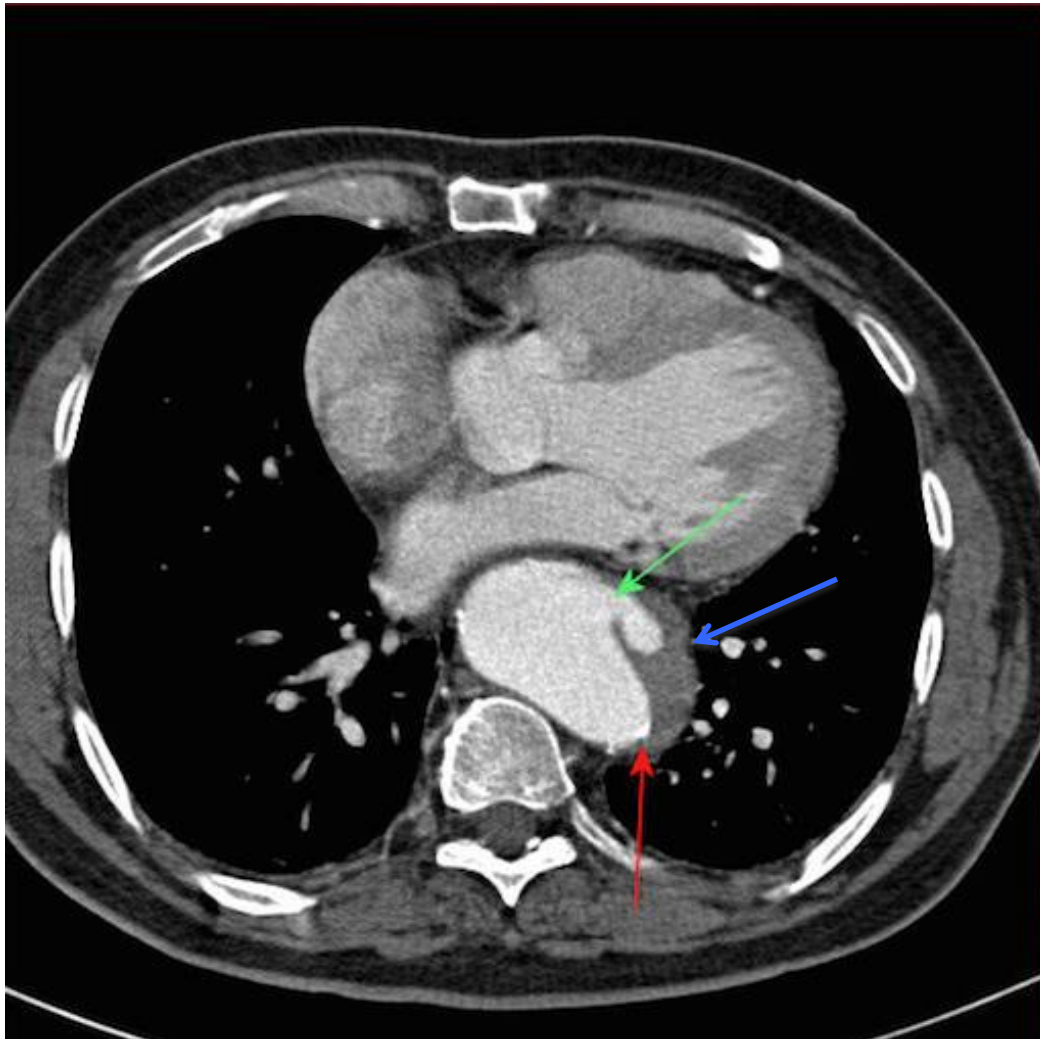
- Illustration of **PAU**: focal outpouchings of contrast, separating extensive **intimal calcifications**



Differential Diagnosis of “Ulcer-like” Aortic Lesions

- Life Threatening (Symptomatic)
 - Penetrating atherosclerotic ulcer with intramural hematoma (Acute)
- Incidental Findings (Asymptomatic)
 - Ulcerated plaque: atherosclerotic ulcer confined to the thickened intima
 - “Chronic Ulcer” = healed PAU, reendothelialized, no hematoma
 - Asymmetric aneurysm with irregular thrombus

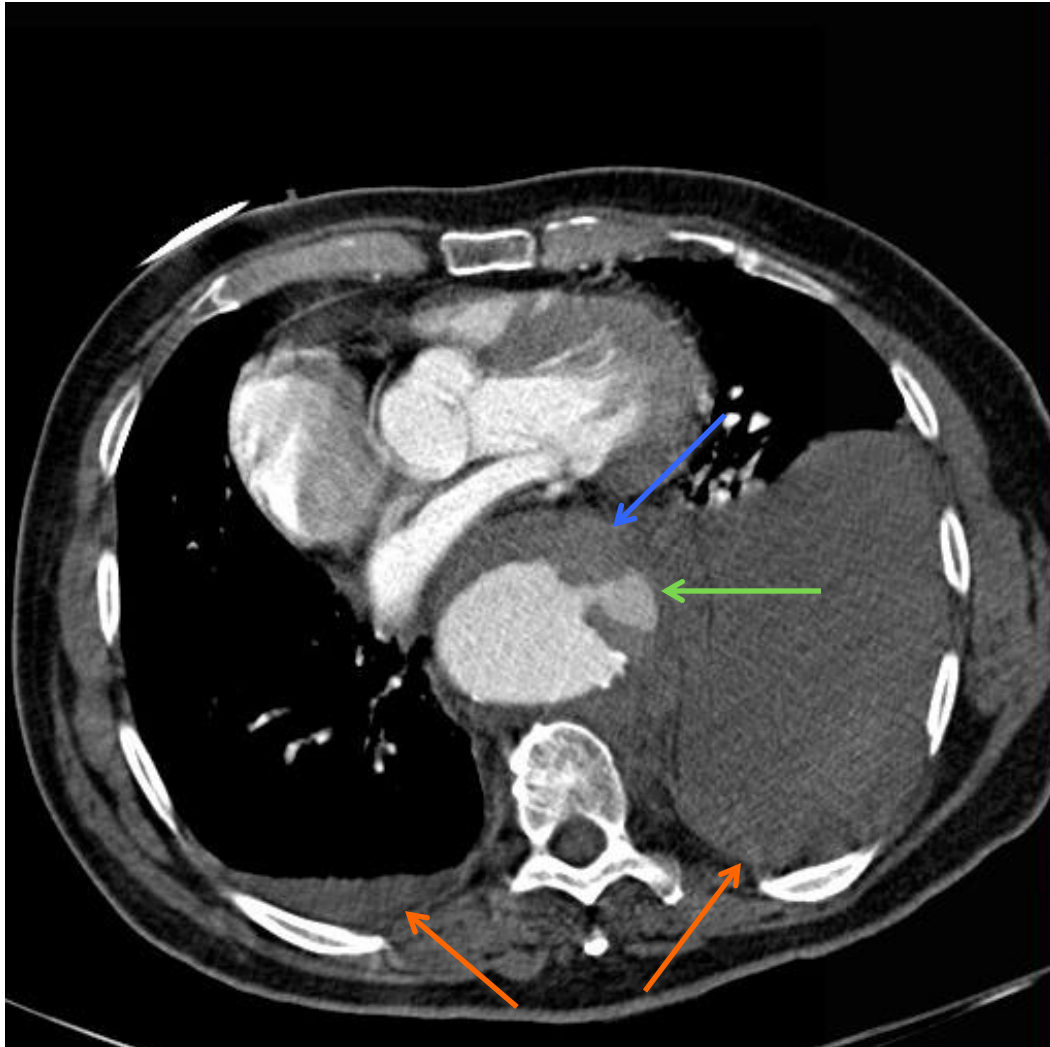
PAU with Intramural Hematoma



Patient presents with acute chest pain

- PAU with focal protrusion of contrast from the aortic lumen
- This contrast lies beyond the calcified intima
- The aortic wall is thickened adjacent to the ulcer due to accompanying intramural hematoma

PAU with Aortic Rupture



Same patient, 24 hours later, following another episode of acute chest pain with new onset hypotension

- **Ulcer** has expanded
- **Intramural hematoma** has increased in thickness and extent
- New **bilateral hemothoraces** indicating acute aortic leak

Patient died shortly after this scan.



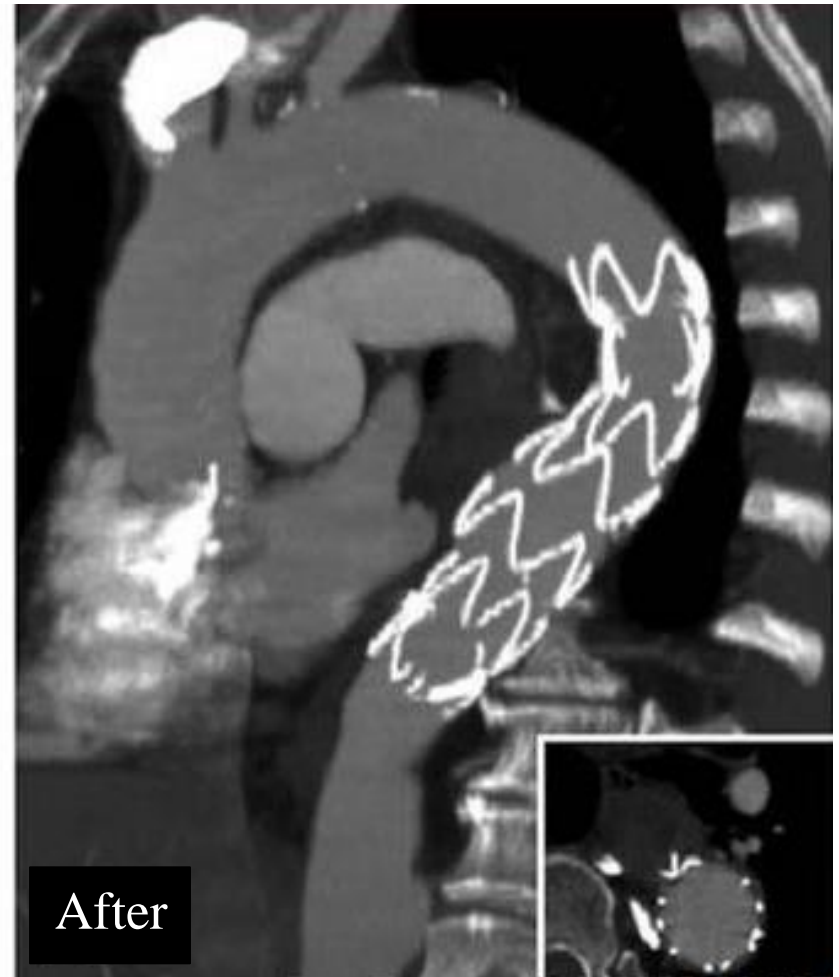
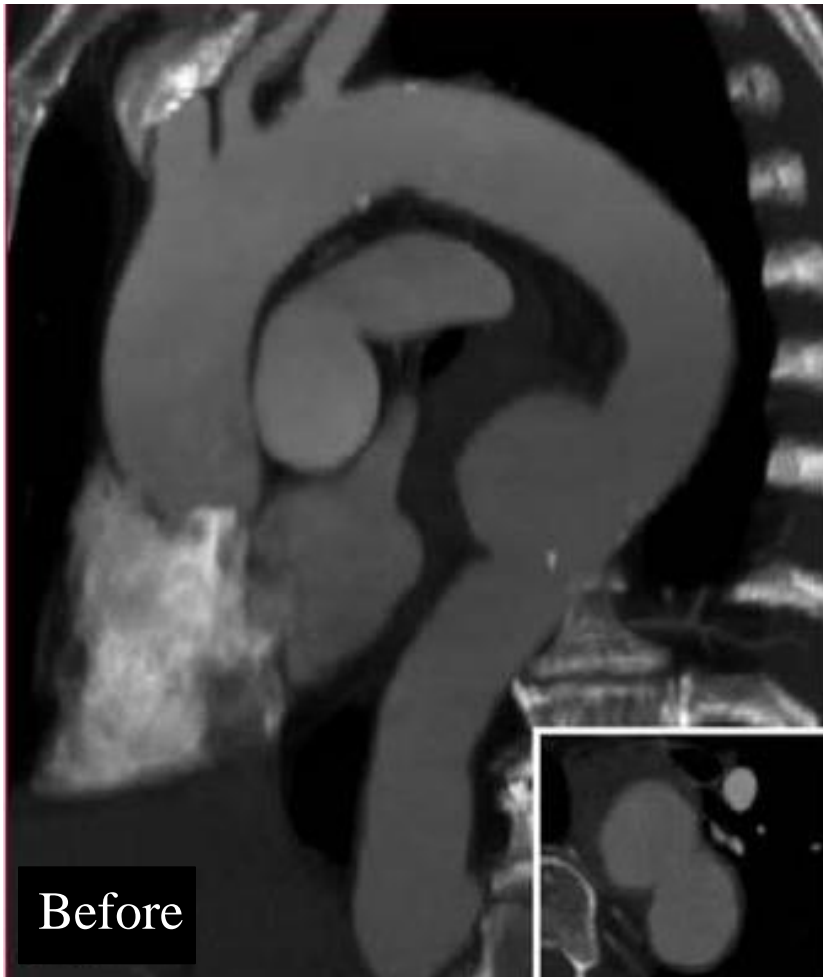
Treatment and Prognosis

- Treatment
 - Type A (rare): endovascular stent grafting or surgical repair
 - Type B: Small, stable, uncomplicated: conservative with f/u
 - Leaking/rupture, growing, continuous symptoms: endovascular stent grafting or surgical repair
- Prognosis
 - Rupture of thoracic PAU ~21%-47%
 - Perioperative mortality from 7.1% to 25%, neurologic deficit up to 28.6% of cases
 - Stent-graft low perioperative morbidity and mortality (19% and 12%, respectively)

Demers et al., Ann Thorac Surg 2004;77:81-86



Thoracic Stent-Grafting for PAU



From Kische S et al., *Stent-Graft Repair in Acute and Chronic Diseases of the Thoracic Aorta*. *Rev Esp Cardiol*. 2008; 61: 1070-86.



Our Patient: Presentation

- 82M with history of complete heart block requiring pacemaker who presents to the Emergency Department following a fall from 14 feet down the stairs onto his back.
- PMH: Sick sinus syndrome s/p pacemaker, Bladder cancer s/p TURBT, Hypertension, Depression, Anxiety, Rheumatoid Arthritis, Melanoma, Memory Loss
- Meds: Citalopram started a few days before this event. Aspirin, Methotrexate, Lorazepam, Vitamin D, Ascorbic Acid, Folic Acid, Cyanocobalamin, and Fish Oil.



Our Patient: H&P

- He ambulates with a walker
- PE: HR: 90, BP: 180, RR: 19, O2: 99%
- “No obvious deformities”
- Lungs: clear to auscultation bilaterally
- Cardiac: regular rate and rhythm, normal S1 and S2, no murmurs, rubs, or gallops
- Vasc.: palpable pulses in both lower extremities
- Abd.: soft, non-tender, non-distended, bowel sounds present, no rebound tenderness, no organomegaly
- Ext.: abrasion on L shin, multiple back abrasions

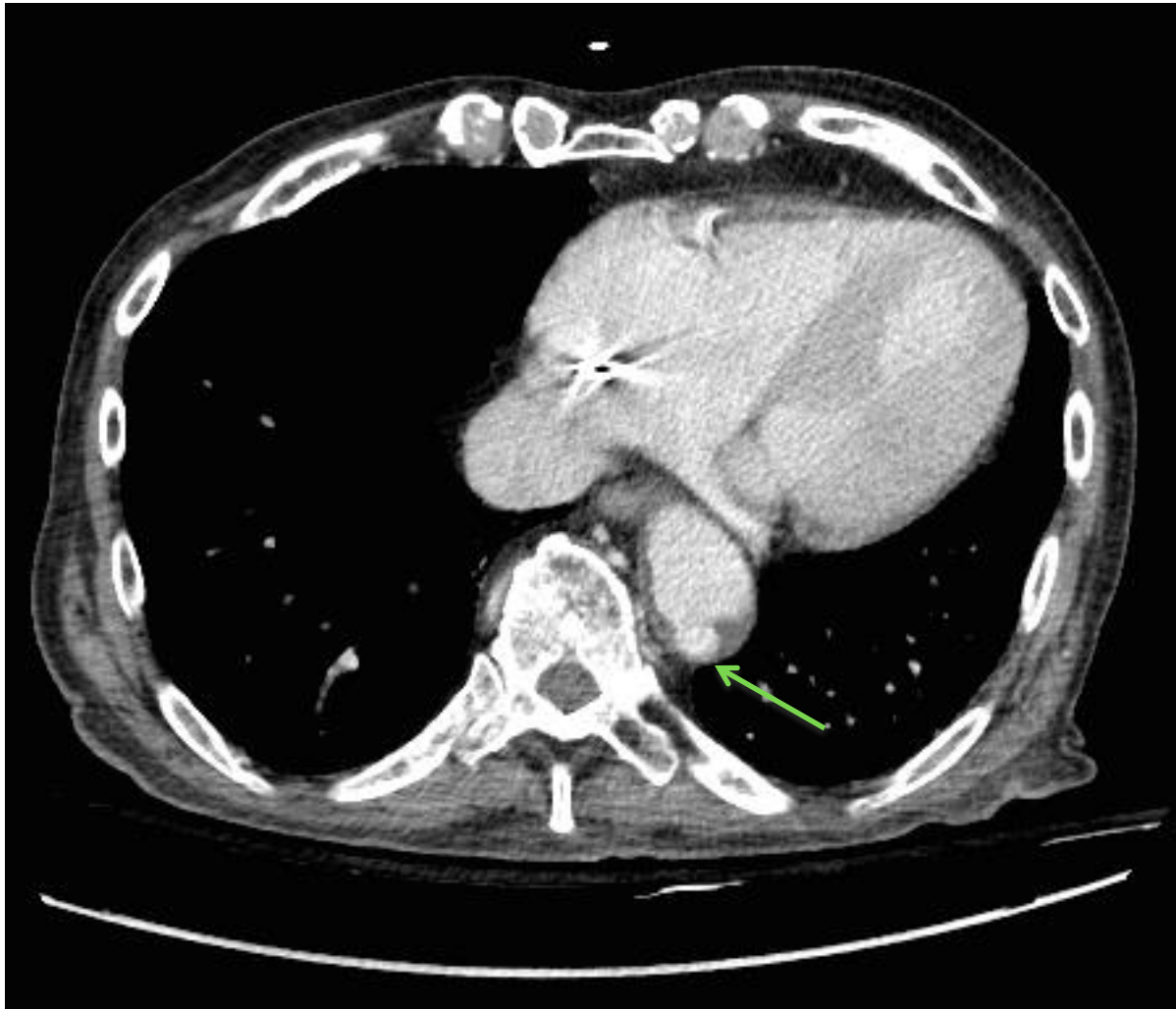


Differential Diagnosis for Fall in Elderly Patients

- Visual impairment
- Peripheral sensory neuropathy
- Cerebrovascular accident
- Transient ischemic attack
- Joint instability
- Medication effects
- Mechanical mobility
- Substance abuse
- Syncope
- Orthostatic hypotension



Our Patient's CT Imaging





Our Patient's Discharge Summary

- This was most likely a mechanical fall, as patient has had multiple recent mechanical falls according to his family
- He did not take any medications for hypertension at home
- He was started on 2.5 mg amlodipine and he became normotensive
 - Antihypertensive drugs have been associated with an increased risk of falling (OR 1.24, 95% 1.01-1.50)



Key Points for a Clinician

- PAU can stay stable, but they may also progress to aortic dissection, pseudoaneurysm formation and spontaneous aortic rupture
- Type A vs. Type B
- Single vs. Multiple
- PAU associated with intramural hematoma
 - Acute and life threatening
- PAU with no intramural hematoma
 - Likely chronic ulcer



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Acknowledgements

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