**Background & Clinical Context**

Acute aortic syndrome:
- acute life-threatening abnormalities of aorta assoc. with intense chest or back pain, traditionally include:
  - Aortic dissection (AD), Intramural hematoma (IMH), Penetrating atherosclerotic ulcer (PAU)
- **RARE**: 2.6–3.5 /100k/yr in US
  - (440 /100k/yr for myocardial infarction)
- **LIFE THREATENING**
- **DIAGNOSIS/MANAGEMENT**: IMAGING BASED

**Acute Type–A Dissection**

- DSA: true / false lumen (DSA)
- CTA: primary intimal tear

**Classic Aortic Dissection**

- **PATHOLOGY**
  - diseased media ('cystic media necrosis')

- **PIT**: primary intimal tear
- **RET**: re-entry tear

**True versus False Lumen**

- normal
  - 'typical'
  - 'complex'
- intimal-intussusception

- TL collapse

* true lumen
**45 y/o man**

- Presented to OSH, progressive DOE; denied chest pain
  (urinary drug screen + for opiates and THC)
- TTE: LV-Dysfunction (EF 35-40%) and AI with questionable Type A dissection.
- Transferred for further evaluation and management.

**45 y/o man**

- 3 wks dyspnea, no ‘pain’
- On TTE: type A dissection

**Case**

**48 yo man**

- 3 mo. prior to this admission (outside facility):
  IMH of the asc. aorta (Type A) with pericardial fluid and tamponade.
- Treated by sternotomy and washout of pericardial space, but without aortic replacement.
- Presents with new onset neck pain, headache, and involuntary movements of left arm and left leg.
  Within 30 min of presentation, severely hypertensive (250 mmHg), excruciating back pain, new pulse deficit, with barely palpable pulses of left upper and right lower extremities.

**Case**

**48 yo man**

- Hx of crack cocaine use;
- Outside hx of type-A IMH which was evacuated, but not repaired

**Aortic dissection: Primary Intimal Tear (PIT)**

- Small PIT
- Circumferential PIT with ‘pseudonormal’ ascending aorta
**Clinical CASE**

- 62 year old man with hypercholesterolemia and hypertension;
- presents to the ER after squeezing chest pain in the morning, some back pain;
- ECG: dynamic T-wave inversion. ER physician requests CT before IV lysis (AT3 antagonist).

**Intramural Hematoma**

- Thrombosed channel within the media
- 'no communication between true and false lumen'!

**QUIZ**

*What are the small contrast opacities in aortic wall?*

A. primary intimal tear ?
B. endoleaks ?
C. fenestrations at side branch origins ?
D. penetrating atherosclerotic ulcers ?
E. this is no IMH
Intramural Hematoma

Traditional definition (as opposed to AD): blood within aortic media, absence of direct communication with true lumen (no tear, no dissection flap, no flow)

Modern view: communications often exist:
- isolated PIT (primary intimal tear) w/o flow
- small side-branch communications ('branch artery pseudoaneurysms' \(1\), 'natural fenestrations', 'puddles')

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Type A dissection/IMH?

75 y/o hypertensive man, acute chest pain, and left hemothorax

Explain opacification in the ascending aorta: Is this a type-A dissection or a type-A IMH? Where do you think could the primary intimal tear (PIT) be?

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Type A dissection/IMH?

75 y/o hypertensive man, acute chest pain, and left hemothorax

Treatment with descending ao. Stentgraft
**Aortic Dissection – Stanford Subclassification**

168 patients operated for acute dissections

<table>
<thead>
<tr>
<th>Stanford TYPE</th>
<th>TYPE A (n=139)</th>
<th>TYPE B (n=29)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subclass. -&gt; site of tear</td>
<td>Asc</td>
<td>Arch</td>
</tr>
<tr>
<td>TYPE A (n=139)</td>
<td>in 1/3rd of patients with Type A dissection, primary tear not in asc. aorta</td>
<td>4</td>
</tr>
<tr>
<td>TYPE B (n=29)</td>
<td>n/a</td>
<td>1</td>
</tr>
</tbody>
</table>


(*) arch in 10 of 11

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**Clinical Case**

83 y/o man with acute chest pain

**QUIZ**

**What is the aortic abnormality ?**

A. chronic atherosclerotic aneurysm  
   → routine follow-up / surveillance

B. type-B (descending aorta) intramural hematoma  
   → blood pressure / pain control

C. acute penetrating ulcer with IMH and pleural effusion  
   → consider stent grafting soon

D. acute PAU with IMH and rupture  
   → immediate stent-grafting)

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**Pathology**

Atherosclerotic ulcer

- Ulcerated plaque (confined to intima)
- May cause cholesterol embolism

Adventitia  
Media  
Intima
69 y/o man
chest/abd/pelv/lower extremity CTA
t/o embolism ('blue toe syndrome')
possible atherosclerotic ulcer (ulcerated plaque)

Pathology
Atherosclerotic ulcer
- ‘ulcerated plaque’ (confined to intima)
- may cause cholesterol embolism

Penetrating atherosclerotic ulcer (PAU)
- penetrates through internal elastic lamina into media, +/- hematoma formation

CT cannot resolve aortic wall layers → ‘Ulcer Like Lesions’
**Radiology (CT)**

CT cannot resolve aortic wall layers → 'Ulcer Like Lesions'

**NON-ACUTE ?**
- non-penetrating a.uIcer,
- chronic, healed PA ulcer,
- small aneurysm

**ACUTE ?**
penetrating atherosclerotic ulcer
1. IMH: always acute
2. Pain !!

72 y/o woman
chest pain: 20-Oct-05

**QUIZ**

What kind of lesion is seen in the aortic wall

A. acute penetrating atherosclerotic ulcer, rupture (consider stent-grafting)
B. cannot rule out small PAU, recommend follow up (treat if growing and/or symptomatic)
C. chronic atherosclerosis (leave alone)

83 y/o woman
shortness of breath, pleuritic chest pain → PE CT
Dec 2005

**Ulcer like lesion of the thoracic aorta**

72 y/o woman
chest pain: 20-Oct-05
f/u: 20-Dec-06 (stable, asymptomatic)

**QUIZ**

What is the nature of this ulcer-like lesion of the aorta?

A. acute penetrating atherosclerotic ulcer, (immediate stent-grafting)
B. not convinced this is acute, no typical pain (recommend non-contrast CT to look for IMH)
C. looks ‘chronic’, send patient home if asymptomatic (recommend follow up, or comparison with priors)
Ulcer like lesion of the thoracic aorta

Dec 2005
83 y/o woman
shortness of breath
pleuritic chest pain

CT of the Thoracic Aorta

Technical Case,
& a Rare Entity

CT of the Thoracic Aorta

A. pulsation artifact?
B. can't tell
C. definite aortic lesion?

CT of the Thoracic Aorta

CT of the Thoracic Aorta

60 yo man (h/x: hypertension)
Several days of achy, diffuse chest/back/neck pain
tt-Echo: aneurysmal dilatation of ascending aorta, no dissection

CT of the Thoracic Aorta

unenhanced MDCT: 2.5mm
**Classic Dissection**

**False lumen**
- within the media
- entry / exit tear

**Dissection Variant**

**Limited Intimal Tear**
- through intima into media
- 'bulging' of residual wall
- no false lumen / no flap
- linear filling defects from undermined edges

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**ESC Task force, European Heart Journal (2001)**

AHA/ACC/ATS/ACR [...] Guidelines, Circulation 2010

- class 1: classic dissection
- class 2: intramural haematoma
- class 3: discrete/subtle dissection ('limited dissection')
- class 4: penetrating athero-sclerotic ulcer
- class 5: iatrogenic and traumatic dissection

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**Dissection variant:**

**Limited Intimal Tear**

Top, TEE of patient 2 whose initial clinical presentation was suspicious for aortic dissection but in whom no dissecting flap or hematoma was found, although aortic aneurysm was noted.

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**Murray, Circulation, Volume XLVII, April 1973**

Figure 1: potentials following spontaneous laceration of the ascending aorta.

(a.) through-and-through laceration resulting in hemo-pericardium.
(b.) incomplete dissecting aneurysm.
(c.) Classical dissecting aneurysm.
(d.) Classical dissecting aneurysm complicated by saccular aneurysm.
54 y/o man severe chest pain

References
Circulation 2010; 121: e266-e369
Semin Ultrasound CT and MR (2012) 33:222-34

80-year-old woman, no significant PMH
- presenting with anterior left-sided chest pain and nausea/vomiting. Enlarged mediastinum on chest x-ray.

What is the cause of the patient’s acute aortic syndrome?

A. Type A intramural hematoma?
   (needs ascending aortic repair)
B. Rupturing arch aneurysm?
   (arch replacement)
C. Penetrating atherosclerotic ulcer in desc. aorta?
   (stent-graft in descending aorta)

DIAGNOSIS?
(A) Type A intramural hematoma?
(B) Rupturing aneurysm?
(C) Penetrating atheroscl. Ulcer?
Leaking Aneurysm / w Rupture
Stentgraft, desc. aorta, patient died 48 h later

Acute aortic syndromes

- Aortic dissection
  - Classic aortic dissection
  - Intramural hematoma
  - Dissection variant
  - ‘limited intimal tear’ = ‘limited dissection’
- Intramural hematoma [5-25%]
- Penetrating atherosclerotic ulcer
  - with intramural hematoma
- Diseased [5-15%]
- Diseased media
- Diseased intima

Seminars in Ultrasound, CT, and MR 2012;33:222-34

Thank You ...