

IMH and PAU Intramural hematoma and penetrating atherosclerotic ulcer

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www.stanford.edu/~dominikf/RSNA/

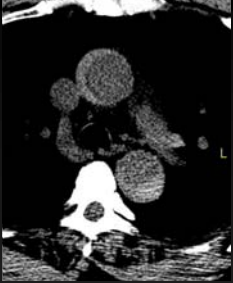


- 62 year old man with hypercholesterolemia and hypertension;
- presents to the ER after squeezing chest pain in the morning, some back pain
- ECG: dynamic T-wave inversion. ER physician requests CT before IV lysis (AT3 antagonist).



Intramural Hematoma

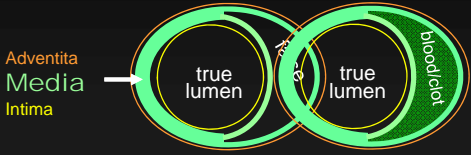
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non contrast CT

Intramural Hematoma (traditional Def.)

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



Adventitia
Media
Intima

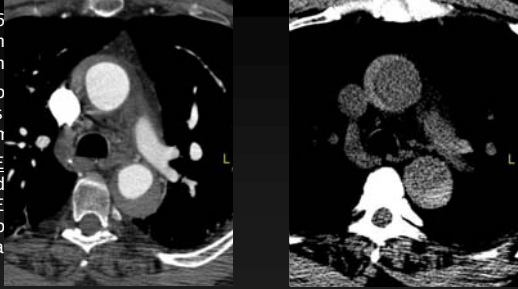
Classic Dissection Intramural Hematoma

Acute aortic syndromes

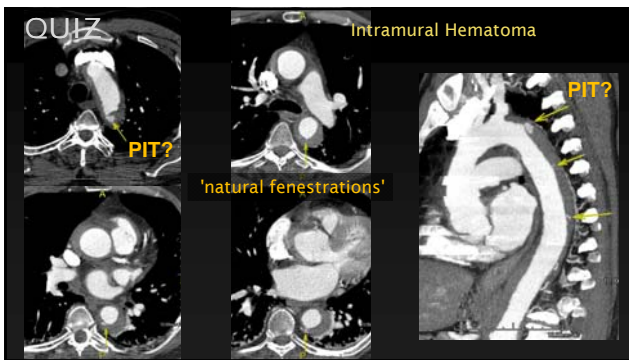
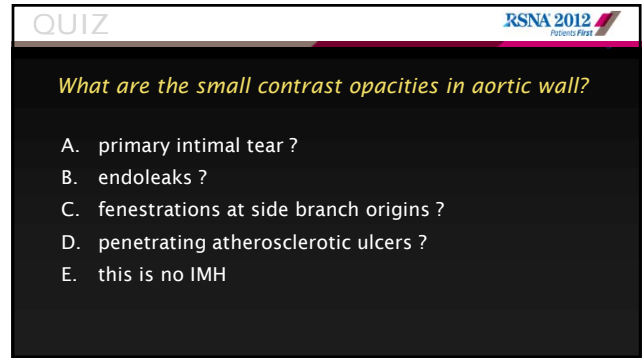
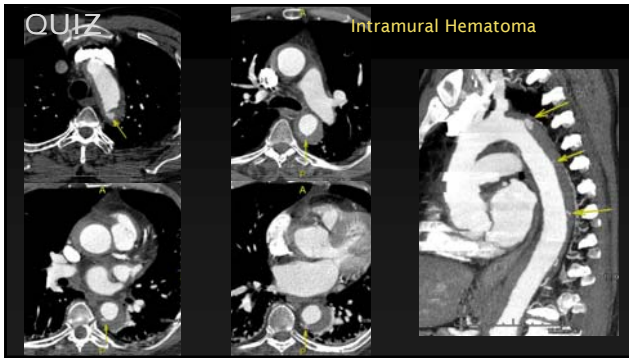
Aortic dissection	[70-90%]
> Classic aortic dissection	
> Intramural hematoma	
> Dissection variant	
'limited intimal tear' =	
'limited dissection'	
Intramural hematoma	[5-25%]
Penetrating atherosclerotic ulcer	[5-15%]
> with intramural hematoma	

Semin Thorac Cardiovasc Surg 2008 (Dec) 20:340-347

Intramural Hematoma



CTA non contrast CT



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 ⁽¹⁾: communications often exist:

- isolated PIT (primary intimal tear) w/o flow
- small side-branch communications ('branch artery pseudoaneurysms' ⁽²⁾, 'natural fenestrations', 'puddles')

(1) AHA/AATS Practice Guidelines, Circulation 2010;121:e266-e369
(2) Williams, J Vasc Interv Radiol. 2006;17:765-771

IMH Prognosis

ACUTE (somewhat less grave than acute AD)

- Type-A has >four times mortality (42%) of Type-B (8%) [IRAD]
- Progression to dissection in 16%-36% (usually with persistent/recurrent pain)
- Regression: ~10%

IMH with PAU: 62%, IMH without PAU: 29%

LATE FATE (also a little better than AD)

- resolution, progression to dissection
- late aneurysm

Intramural Hematoma

TREATMENT

- **Type A:** surgery favored in West (expectant /w aggressive medical treatment in Asia)
- **Type B: conservative;** surgery or stent-graft if recurring, refractory chest pain, evidence of increasing extent and diameter
- long term f/u (1, 3, 6, 9,12, 24mo, ..)

Acute aortic syndromes

Aortic dissection	[70-90%]
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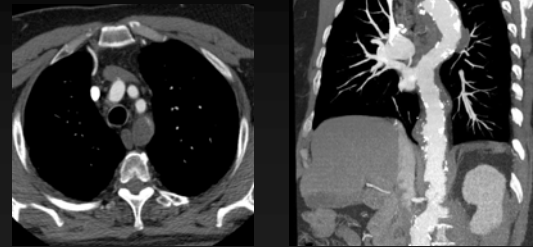
Penetrating Atherosclerotic Ulcer Clinical Background

- Incidence: ~5-15% of acute aortic syndromes
- rupture of acute thoracic PAU ~ 21%-47%
- typically descending aorta, often multiple, with extensive atherosclerotic change

Patients with PAU: older than pts. w/ dissection

- more risk factors and co-morbidities
 - hypertension: 85%, chronic renal insufficiency: 31%;
 - CAD: 61%; PAOD : 17%; CVA: 12%;
 - AAA or TAA: 53%;

extensive atherosclerotic change Multiple PAUs (73 y/o man)

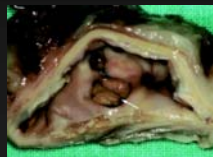


Pathology

Atherosclerotic ulcer

- ◊ 'ulcerated plaque' (*confined to intima*)
- ◊ may cause cholesterol embolism

Adventitia
Media
Intima



Heart. 2001; 85: 385

QUIZ 69 y/o man chest/abd/pelv/lower extremity CTA r/o embolism ('blue toe syndrome')



QUIZ

What kind of lesion is seen in the aortic wall

- A. acute penetrating atherosclerotic ulcer (PAU)
- B. small atherosclerotic ulcer, causing embolism
- C. focal dissection

QUIZ 69 y/o man

chest/abd/pelv/lower extremity CTA
r/o embolism ('blue toe syndrome')



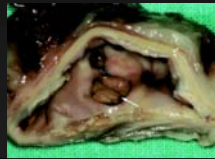
possible atherosclerotic ulcer (ulcerated plaque)

Pathology

Atherosclerotic ulcer

- ✦ 'ulcerated plaque' (confined to intima)
- ✦ may cause cholesterol embolism

Adventitia
Media
Intima



Heart. 2001 : 85: 365

Pathology

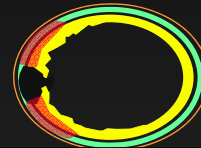
Atherosclerotic ulcer

- ✦ 'ulcerated plaque' (confined to intima)
- ✦ may cause cholesterol embolism

Penetrating atherosclerotic ulcer (PAU)

- ✦ penetrates through internal elastic lamina into media, +/- hematoma formaion

Adventitia
Media
Intima



Pathology

Atherosclerotic ulcer

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Adventitia
Media
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Pathology

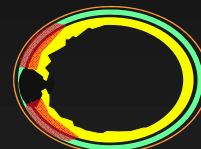
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Adventitia
Media
Intima



Pathology

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

Adventitia
Media
Intima



Radiology (CT)

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

NON-ACUTE ?

- non-penetrating a.ulcer,
- chronic, healed PA ulcer,
- small aneurysm

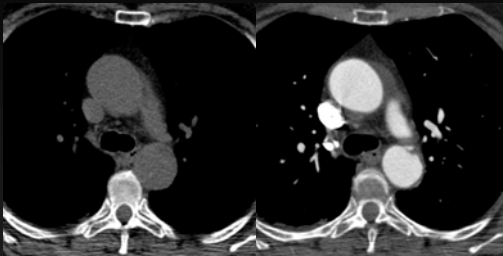
ACUTE ?

- penetrating atherosclerotic ulcer
- 1. IMH: always acute
- 2. Pain !!



QUIZ

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



QUIZ

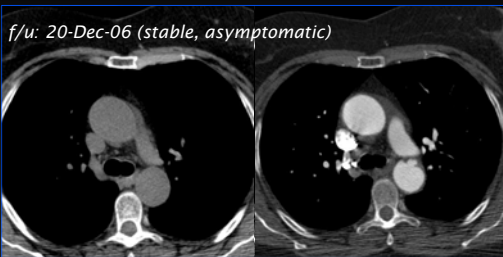
RSNA 2012
Pathology Quiz

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)

QUIZ

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



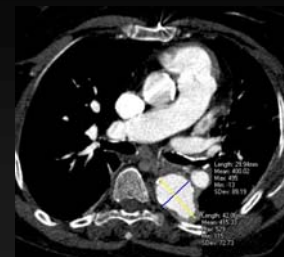
f/u: 20-Dec-06 (stable, asymptomatic)

cannot rule out PAU without IMH – need follow up!

QUIZ Ulcer like lesion of the thoracic aorta

83 y/o woman

shortness of breath
pleuritic chest pain
→ PE CT



Dec 2005

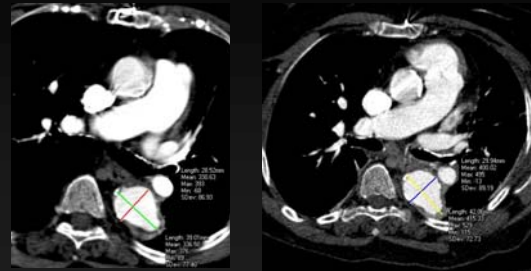
QUIZ

RSNA 2012
Patients First

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

- A. acute penetrating atherosclerotic ulcer /w rupture (immediate stent-grafting)
- B. not sure, no typical pain, but cannot rule out PAU (recommend non-contrast CT to look for IMH, comparison with priors, if available)
- C. looks 'chronic', send patient home (recommend follow up, like chronic aneurysm)

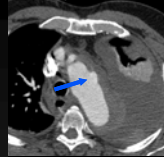
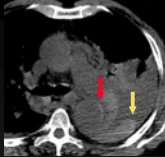
QUIZ Ulcer like lesion of the thoracic aorta



Oct 2000 Dec 2005

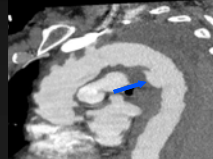
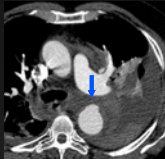
QUIZ 83 y/o man with acute chest pain

non-contrast



CTA

CTA



QUIZ

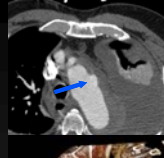
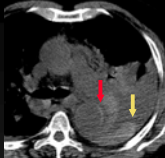
RSNA 2012
Patients First

What is the aortic abnormality ?

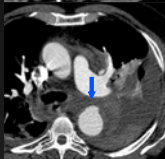
- A. chronic atherosclerotic aneurysm → routine follow-up / surveillance
- B. type-B (descending aorta) intramural hematoma → blood pressure / pain control
- C. acute penetrating ulcer with IMH and pleural effusion → consider stent grafting soon
- D. acute PAU with IMH and rupture → immediate stent-grafting)

QUIZ 83 y/o man with acute chest pain

non-contrast



CTA



Penetrating Atherosclerotic Ulcer

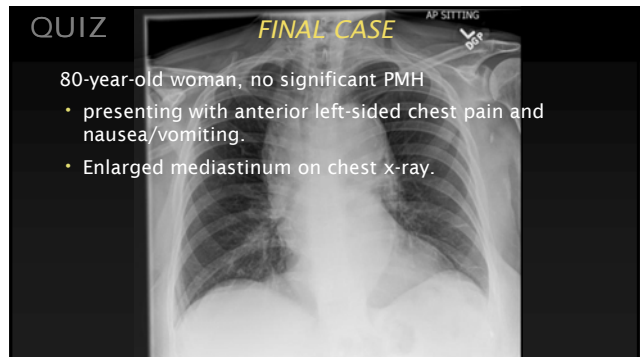
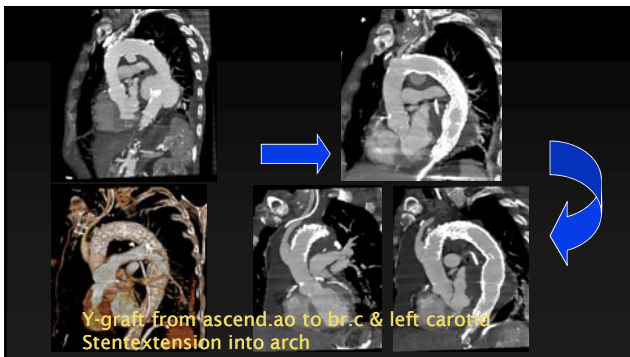
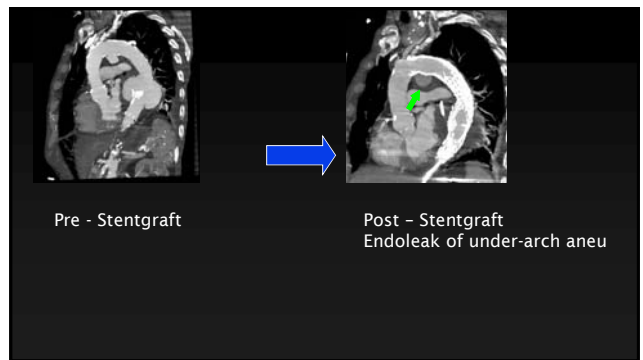
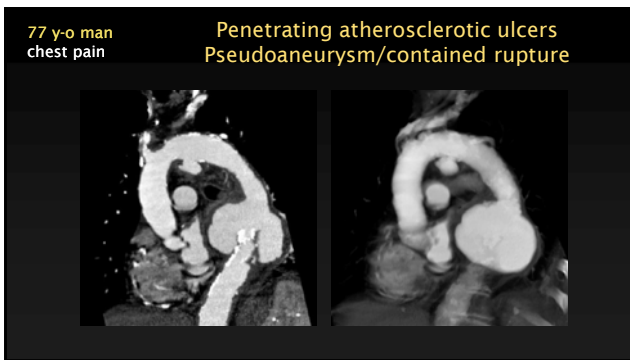
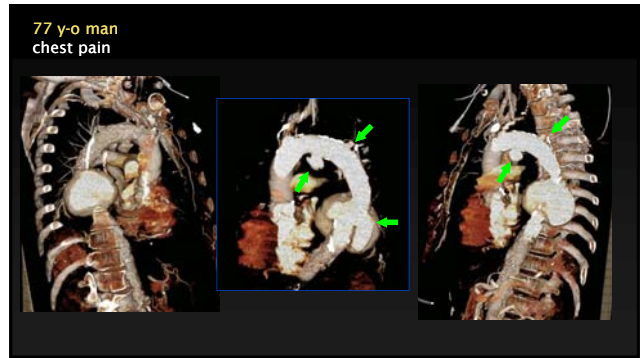
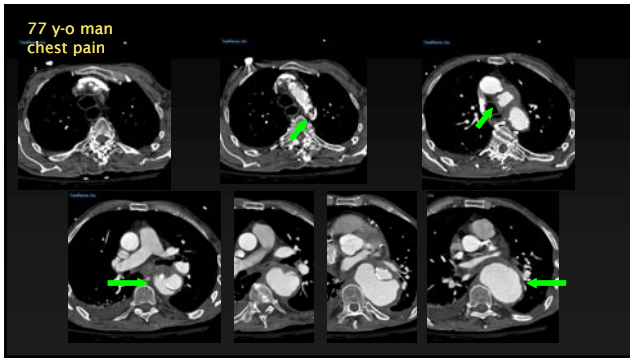
Treatment

- ❖ Type A: ascending aorta (rare) surg. repair
- ❖ Type B: small, stable, uncomplicated: conservative w. f/u
- ❖ leaking / rupture, growing, cont. symptoms: surgical, stent-graft, or both (debranching)

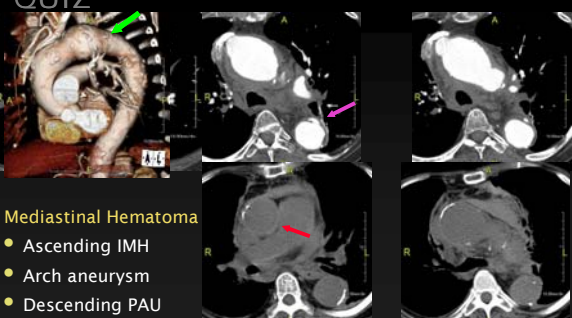
Prognosis

- ❖ 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



QUIZ



Mediastinal Hematoma


- Ascending IMH
- Arch aneurysm
- Descending PAU

QUIZ RSNA 2012
Patients First

What is the cause of the patient's acute aortic syndrome (and mediastinal hematoma)?

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

QUIZ

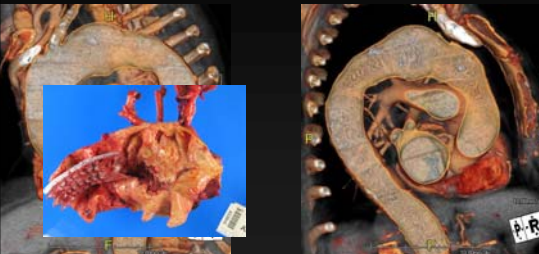


DIAGNOSIS?

- Type A intramural hematoma ?
- Rupturing aneurysm?
- Penetrating atheroscl. Ulcer?

Leaking Aneurysm / w Rupture

Stentgraft, desc. aorta, patient died 48 h later



Acute aortic syndromes

Aortic dissection	[70-90%]
<ul style="list-style-type: none"> ➢ Classic aortic dissection ➢ Intramural hematoma ➢ Dissection variant 	
<ul style="list-style-type: none"> 'limited intimal tear' = 'limited dissection' 	
Intramural hematoma	[5-25%]
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<ul style="list-style-type: none"> ➢ with intramural hematoma 	

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Intramural Hematoma

- IMH is not a disease
- IMH is an imaging finding
 - in AD, and PAU, (and trauma, rupturing aneu,...)
 - dynamic

LOOK FOR

- location/extent: Type-A vs Type-B
- presence/absence of PAU or intimal tear
if present, location of PAU or intimal tear
- signs of rupture / progression

Acute aortic syndromes

Aortic dissection	[70-90%]	} Diseased media
➢ Classic aortic dissection		
➢ Intramural hematoma		
➢ Dissection variant		} Diseased intima
'limited intimal tear' = 'limited dissection'		
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Thank You ...



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