Penetrating atherosclerotic ulcers of aorta
Disclosures

• No financial disclosures

• Thank You Dr. Panneton for giving this lecture for me. I am stuck at Norfolk with an emergency
Outline

• Aortic histology
• Aortic wall pathology
• Penetrating aortic ulcer versus IMH
• Etiology
• Diagnosis
• Clinical presentation
• Management
• What’s new
• Conclusions
Microanatomy of the vessel wall
Aorta
Aortic wall pathology

- Aortic dissection
- Aneurysm
- Aortic intramural hematoma (IMH)
- Penetrating aortic ulcer (PAU)
IMH v PAU

- IMH: Collection of blood confined to media
  - Typically circumferentially containing blood containing space without intimal discontinuity

- PAU: focal defect in the elastic lamina of the aortic wall that leads to localized medial disruption and potential rupture
IMH vs PAU
IMH: CT scan and TEE
IMH classification
CT scan for PAU
PAU vs IMH

WHY THE CONFUSION

• Often present together
• Both have intimal violation and flow in aortic wall (usually media)
• Overlapping clinical presentation
What else is relevant

- **Ulcer like projection (ULP):** localized blood filled pouch protruding into IMH with depth > 5 mm. Same contrast enhancement as true lumen, seen without atherosclerotic plaque unlike PAU

- **Intramural blood pool (IBP):** Contrast filled pol inside the IMH on postcontrast CT without communication with true lumen

- **Enhanced false lumen:** strongest predictor of IMH related events
Etiology

• Manifestation of degenerative aortic pathology
• Combination of hypertension and atherosclerotic disease
• IMH: spontaneous rupture of vasa vasorum in medial layer or as a result of PAU
  – Neovascularization or rupture of atherosclerotic plaque, rarely trauma
  – 80% PAU have associated IMH (Mayo clinic series)

Clinical presentation

• Abrupt onset of severe pain in chest, neck, back and/or abdomen (like acute aortic syndrome)

• Risk factors: old age, hypertension diffuse atherosclerotic disease of thoracic aorta

• 5.7% acute aortic syndromes related to IMH in IRAD database (16% progress to dissection)

• Majority in descending thoracic aorta (60%)

Clinical presentation

• PAU: 2-7% of acute aortic syndrome.
• PAU: > 70 years with multiple cardiovascular risk factors.
• Periaortic hematoma and hemorrhagic pericarditis more frequent with IMH than dissection

Natural history

- Spontaneous resolution in 50 – 80 %
- Progression to classic dissection or aneurysm
- Mortality ~ 20.7% (proximal 39.1%), distal (8.3%): comparable to dissection
- Normal aortic diameter is predictor of IMH regression without complications
  - > 40 mm aortic diameter $\rightarrow$ 30- fold
  - > 10 mm IMH thickness $\rightarrow$ 8- fold risk
Natural history

- Type A PAU: risk of rupture as high as 33-40 %
- Type A IMH: mortality as high as 33-40 % (with medical therapy) due to progression to dissection, rupture or aneurysm
- Type B PAU with IMH: bad prognosis (mortality upto 60%)
- Other poor prognostic predictors: age >70, concomitant PAU and IMH, max aortic diameter > 40 mm, aortic thickness > 10 mm

Diagnosis

- CT angiogram
- IVUS
- MR angiogram
- TEE
- Triple rule out coronary CT angiography
Management

• Asymptomatic
  – Expectant management with HTN control, antiplatelet and statin, pain control

• Symptomatic (general principles)
  – Ascending aorta involvement: surgical repair
  – Descending aorta: endovascular repair (TEVAR)
  – May have higher risk for spinal cord ischemia
Outcomes

- IMH with medical therapy: about 77% regress at 3 years, survival >90% at 5 years
- Surgical group higher risk
- TEVAR safe and effective (Panneton et al)
- Up to 70% survival with type a pathology
- Rapid progression of endovascular technology in ascending aorta and aortic arch territory

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What’s new

• Hybrid approach
  – Frozen elephant trunk
Arch based endovascular devices
Thoracoabdominal devices
Conclusion

• IMH and PAU represent rare but potentially life threatening aortic pathology
• With careful patient selection and implementation of correct treatment modality successful outcomes are achieved
• New less invasive endovascular technology is around the corner
THANK YOU

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