Diagnosis of Aortic Dissection

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Patient BC

- 58 yo female presented to an OSH w/ neck and back pain x 24 hours
- PMH significant for CAD, s/p MI, hypertension
- On physical exam, the following was noted:
  
  Systolic BP of 60 on the right and 120 on the left
  
  2/6 systolic murmur radiating to the carotids
  
  Strong carotid/brachial pulses, weak femoral/popliteal/pedal pulses
Differential Diagnosis

- Myocardial infarction
- Pericarditis
- Pulmonary embolus
- Aortic Dissection
- Patient became hypotensive and was transferred to BIDMC where a CT scan was performed
BC’s Chest CT

Courtesy of Chad Brecher, MD, BIDMC
BC’s Aortic Dissection

Intimal flap

Intimal flap

Courtesy of Chad Brecher, MD, BIDMC
Clinical Manifestations

- Peak incidence 6th-7th decades
- Men affected more often than women
- Two-thirds of patients have hx of hypertension
- Most common symptom is sudden severe chest pain with “tearing” or “ripping” quality
- Complications include:
  - Rupture (pericardial tamponade)
  - Occlusion of aortic branch vessels (stroke, MI, splanchnic infarction)
  - Distortion of aortic annulus (aortic regurgitation)
Pathophysiology

- There are two theories:
  A. An intimal tear exposes the media to the pressure of intraluminal blood which then penetrates the medial layer and cleaves it longitudinally.
  B. Rupture of the vasa vasorum within the media leads to secondary rupture through the intima.

From Braunwald: Heart Disease: A Textbook of Cardiovascular Medicine, 6th ed. 2001
Risk factors

- Advanced age
- Hypertension (72-80% of cases)
- Bicuspid aortic valve
- Collagen diseases (Marfan’s, Ehlers-Danlos)
- Congenital abnormalities (ie Coarctation)
- Turner, Noonan syndromes
- Pregnancy
- Trauma (esp. iatrogenic)
Classification

- Classification is based on origin and extension of the dissection
  - 65% occur in the ascending aorta
  - 20% occur in the descending aorta
  - 10% occur in the aortic arch
  - 5% occur in the abdominal aorta

- Dissection in the ascending aorta requires surgery

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Our Patient BC: Stanford Type A Aortic Dissection

Intimal flap
True lumen
False lumen

Courtesy of Chad Brecher, MD, BIDMC
Our Patient BC: Extension of Dissection into Abdomen

Portal venous air

Intimal flap

Courtesy of Chad Brecher, MD, BIDMC
Imaging Studies

- The best imaging modality should:
  - Confirm/refute the diagnosis
  - Determine location/origin of the dissection
  - Identify certain anatomical features including: extent, sites of entry/re-entry, presence of thrombus, branch vessel involvement, presence of AR, pericardial effusion, coronary artery involvement

- Imaging options for dissection include:
  - CXR
  - Aortography
  - Contrast-enhanced CT
  - MRI
  - TTE/TEE
Patient 2: Chest X-Ray

- Most common finding is widening of the aortic silhouette (81-90%)
- “Calcium sign” - calcification of the aortic knob with separation of the intimal calcification from the outer aortic soft tissue border by more than 1 cm --- suggestive of dissection
- CXR is often non-diagnostic - up to 12% are normal

Sternal wires
Calcium sign

Courtesy of Chad Brecher, MD, BIDMC
Aortography

- First modality for accurate diagnosis of dissection
- Look for two lumina or an intimal flap (diagnostic)
- Indirect signs: deformity of the aortic lumen, thickening of aortic walls, branch vessel abnormalities, aortic regurgitation
- Sensitivity: 77-88%, Specificity 94%
- Advantages
  - Can determine extent/branch vessel involvement
  - Identification of complications (AR, coronary artery involvement)
- Disadvantages
  - Invasive
  - Delayed time to procedure
  - Length of procedure
Patient 3: Example of Dissection Involving the Left Renal Artery

From Braunwald: Heart Disease: A Textbook of Cardiovascular Medicine, 6th ed. 2001
CT Scan

- Assess for two distinct aortic lumina by presence of an intimal flap or differential rate of contrast opacification
- Sensitivity: 83-96%, Specificity: 87-100%
- Advantages
  - Rapid access emergently
  - Noninvasive
  - Can detect presence of thrombus in false lumen and pericardial effusion
- Disadvantages
  - Requires IV contrast
  - Cannot usually identify site of intimal tear
  - Only identify intimal flap in 75% of cases
Patient 2: Hemorrhage into False Lumen

Courtesy of Chad Brecher, MD, BIDMC
Patient 2: CT Reconstruction of Aortic Dissection

True lumen

False lumen

Intimal flap

Thrombus in false lumen

Courtesy of Chad Brecher, MD, BIDMC
Magnetic Resonance Imaging

- Current gold standard for diagnosis of aortic dissection
- Look for double lumen, visible intimal flap
- Sensitivity/Specificity: 98%
- Advantages
  
  Noninvasive
  No IV contrast or radiation required
  High-quality images in several planes
  Can assess for involvement of branch vessels, AR

- Disadvantages
  
  Not usually available on emergent basis
  Contraindicated in patients w/ pacemakers, surgical clips, certain prosthetic heart valves
  Length of study
  Safety concerns for unstable patients
Patient 4: Intimal Flap on MRI

Intimal flap
Patient 4: Involvement of Left Iliac Artery

Intimal flap
Echocardiography

- Poor sensitivity/specificity for TTE limits use
- TEE: Sensitivity 98-99%, Specificity 77-97%
- Assess for presence of undulating intimal flap separating two lumina

Advantages
- Noninvasive
- Fast
- Can be performed at the bedside
- Can look for entry/re-entry sites

Disadvantages
- Contraindicated in esophageal disease
- Poor visualization of distal ascending aorta and proximal arch
Patient 5: Aortic Dissection on TEE

F = false lumen
T = true lumen
E = entry point
I = intimal flap

Patient 6: Undulating Intimal Flap

Summary

- Aortic dissection should always be considered in the differential in patients presenting with chest pain and a hx of hypertension.
- Involvement of the ascending aorta is a surgical emergency.
- The best diagnostic studies are MRI and TEE but there is still an important role for CT as well.
References

  <http://www.uptodate.com/>
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