# CT of Thoracic Aortic Dissection

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## Aortic Dissection

- Most common thoracic aortic emergency
- Untreated mortality 36-72% in first 48 hours; 62-91% at 1 month
- Males > Females
- Tear in aortic wall allows blood to enter media & “dissect” into the media

## Risk Factors

- Hypertension
- Connective tissue abnormality
  - Marfan syndrome
  - Ehler’s Danlos syndrome
  - Turner’s syndrome
  - Cystic medial necrosis
  - Familial

## Risk Factors

- Pregnancy
- Bicuspid aortic valve
- Aortic surgery
- Catheterization
- Coarctation

## Presentation

- Classic - acute severe tearing substernal chest pain radiating to back in up to 70% of patients
- Aortic valvular murmur (AI) 65%
- Asymmetric pulses in upper extremities if arch involved
- Absent femoral pulses (25%)

## Presentation

- 15-20% no chest pain
- Symptoms related to aortic branch vessel involvement
  - Myocardial infarction and CHF
  - Abdominal pain / mesenteric ischemia
  - Stroke, confusion, coma or syncope

## Acute Aortic Syndrome

- Acute aortic syndrome
  - Aortic dissection
  - Intramural hematoma (IMH)
  - Penetrating aortic ulcer

## Signs and Symptoms of Aortic Dissection

- Mimic many other diseases
  - Myocardial Infarction
  - Gastroesophageal reflux disease
  - Musculoskeletal chest wall pain
- Pain
- Blood pressure change
  - hypertension (important to control)
  - hypotension with rupture

## CT Aortography

- MDCT
- Pre & post contrast helical CT
- 1.25 / 2.5 mm collimation
- ECG-gate thoracic portion
- IV contrast
  - 120-150 mL; 4 cc / second
  - Timing bolus or trigger by density
- Post processing (multiplanar / 3D)

## CT Dissection Pitfalls

- Technical: incorrect bolus
- Streak artifacts
  - High-attenuation material
  - Cardiac motion
- Motion aortic sinuses

## CT Dissection Pitfalls

- Periaortic structures
  - Aortic arch branches / veins,
  - Pericardial recess
  - Thymus
  - Atelectasis
  - Pleural thickening or effusion

## Information on CT

- Determine extent (classify)
- Identify complications
- Identify lumens
- Identify “entry” and “reentry” tears
- Identify source of perfusion of all major branches
  - True
  - False
  - Mixed or indeterminate

## Dissection: Extent

- DeBakey Classification
  - I ascending & descending
  - II ascending only
  - III descending only
- Stanford Classification
  - A: ascending aorta
  - B: no ascending aorta

## Identify Complications

- Acute Dissection
  - Impending / rupture
  - Malperfusion
- New symptoms in chronic dissection
  - Impending rupture
    - Rapid expansion
    - Leak

## Identify Lumens

- True lumen
  - Prone to collapse
  - Has branch artery origins
- False lumen
  - Prone to ectasia
  - Ruptures

## Identify Lumens

- Rules of thumb
  - Trace both lumens from end to end
  - The lumens are continuous
  - False lumen tapers / disappears
    - Often inconsequential
  - True lumen tapers / disappears
    - Lethal
  - Cross the flap – change the lumen

## Lumens : CT Findings

- Intimal flap (may be calcified)
- Usually 2 lumens (true and false)
- Cobwebs of media may create multiple false lumen channels
- Document extent of dissection & extension into branch vessels

## Lumens : CT Findings

- True lumen
  - Flow
  - Smaller
  - Gives rise to coronary arteries
  - SMA, celiac, right renal artery
- False lumen
  - Flow or thrombosed
  - Larger
  - Left renal artery origin usually

## Identify Tears

- Gap in the flap
- Relation to vessel origins
  - Covered stent for proximal tear
  - Bare stent for distal tear
- Aortic dimensions

## Identify Malperfusion

- True lumen is of adequate caliber
  - From heart to branch arteries
- Flap spares every major branch
  - Does not enter a branch artery origin
  - Does not prolapse across origin
- Absence of malperfusion on CT in acute dissection doesn't it

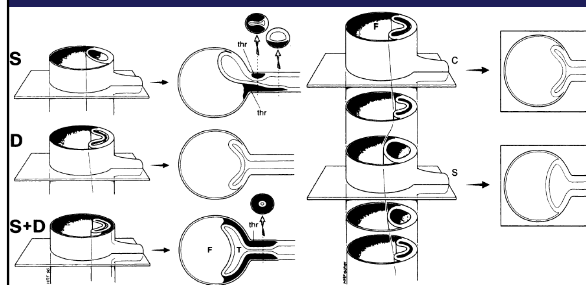
## Identify Malperfusion

- Types
  - Static
    - Flap intersects vessel origin
  - Dynamic
    - Flap spares vessel origin
    - Prolepses across the origin
  - Miscellanous
    - Thrombosis / embolism

## Identify Malperfusion

- Early: Rule out ischemia
  - Opacification of artery, end organ, vein consistent with that in aorta
  - Opacification uniform
- Late: Rule out infarction
  - Bowel wall thickening
  - Pneumatosis
  - Peritoneal fluid
  - Non-uniform opacification of origins

## Mechanisms of Malperfusion




## Treatment

- Surgical (or stent graft)
  - Ascending aorta involved due to risk of rupture into pericardium
  - Continued pain
  - Evidence of rupture
  - Organ ischemia

## Treatment

- Medical
  - Descending aorta (III or B)
  - Pain control
  - Aggressive hypertension control

## Penetrating Ulcer

- Ulceration of atherosclerotic plaque from intima into media
- Characteristics
  - Outpouching of contrast (wide mouth)
  - Communicates with the lumen
  - Wall hematoma
- Extensive atherosclerotic disease
- Most common descending aorta

## Penetrating Ulcer

- Older patients
- Chest / back pain & hypertension
- Acute or subacute
  - Typical dissection
  - Rupture
  - Intramural hematoma
- Dissection variant



## Penetrating Ulcer

- Treatment may be similar to classic dissection
- 2/3 ulcer and aorta are stable in size over time
  - Medical management
- 1/3 ulcer and/or aorta enlarge over time
  - Surgery or endograft

## Intramural Hematoma

- Dissection variant
- No entry tear or ulcer
- Spontaneous; ?Rupture vaso vasora
- Older patients; M = F
- Chest / back pain & hypertension
- Treatment: same as dissection

## Thrombose False Lumen and Branch Artery Pseudoaneurysms

- Ulcer-like projections
- Obvious break in the luminal contour
- Gaping communication with the aortic true lumen
- Branch Artery Pseudoaneurysms
- Frequently isodense with the aorta
- No apparent communication
- Adjacent/continuous branch artery