Coronary Artery Anatomy and Pathology

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Coronary Artery Anomalies

**Origin**
- Multiple ostia
- High takeoff
- Single coronary artery
- Anomalous origin of coronary artery from pulmonary artery (ALCAPA)
- Origin of coronary artery or branch from incorrect sinus
  - Retroaortic
  - Prepulmonic
  - Interarterial
  - Septal

**Course**
- Myocardial bridging
- Duplication of arteries or split artery

**Termination**
- Coronary artery fistula
- Coronary arcade
- Extracardiac termination

*may lead to compromise of blood flow

Abnormalities in Coronary Artery Origin

**Benign**
- Multiple ostia
- High takeoff

**Malignant (Potentially)**
- Single coronary artery
- Anomalous origin of coronary artery from pulmonary artery (ALCAPA)
- Origin of coronary artery or branch from incorrect sinus
  - Interarterial
  - Septal

Normal Variants

**Benign Anomalies**
- Multiple Ostia
- High takeoff
- Retroaortic
- Prepulmonic
- Duplication

**Multiple Ostia**
- Independent ostia of LAD and LCx: 2%
- Independent ostia of conus (45%)
- SA nodal (0.4%) branches
Prepulmonic LAD
Benign

Duplication or Split Vessel

Potentially Malignant Anomalies
- Interarterial Course
- Septal Course
- ALCAPA
- Single Coronary Artery

Interarterial Course RCA
Malignant
- Risk of sudden cardiac death
  - Less than interarterial LM/LAD
- Causes
  - Acute takeoff angle
  - Silt-like orifice
  - Compression of intramural segment
  - Extrinsic compression
- Debate about treatment
  - Unroofing procedure
  - Widening of ostia
  - Reimplantation
  - Do nothing
Anomalous Left Main Coronary Artery
Malignant
- Less common than anomalous RCA
- Has interarterial course in 75%
- High incidence of sudden cardiac death
- Needs surgical treatment

Single Right Coronary Artery with Large Septal LAD
- Single Coronary Artery
  - Extremely rare
  - Can be associated with congenital heart disease
  - Increased risk for sudden death
    - Major coronary branch with interarterial course
    - Proximal stenosis
- Septal Course
  - Intramyocardial
  - Less dangerous than interarterial course

Single Right Coronary Artery with benign and malignant courses

Single Left Coronary Artery
Anomalous Left Coronary Artery from the Pulmonary Artery (ALCAPA)

- Anomalous origin of left main coronary artery from PA
- Bland-Garland-White Syndrome
- Infantile and adult forms
- Most present in infancy
- Severity depends on collateral and direction of blood flow

2 year-old girl with murmur
71 year-old man with murmur and abnormal echocardiogram

Anomalous Right Coronary Artery from the Pulmonary Artery (ARCAPA)

Abnormalities in Course
Myocardial Bridging

- Common finding
  - >50% on autopsy
  - Most superficial
- Can lead to ischemia and infarct in some patients
  - Delayed coronary artery relaxation during early diastole
- Bridged segment free of atherosclerotic disease

Myocardial Bridge

Anterior Interventricular vein
Myocardial Bridge

Abnormalities in Termination Coronary Artery Fistula
- Congenital or acquired
- RCA (60%) > LCA (40%)
- Artery dilated and tortuous
- Drainage site important
- Right Drainage
  - Most common
  - Extracardiac L to R shunt
- Left Drainage
  - Intrinsic aortic insufficiency
- May lead to myocardial ischemia

LCx to Coronary Sinus Fistula

Coronary Artery Fistula

Acquired Coronary Artery Abnormalities
- Coronary diameter >1.5x normal
- Causes
  - Atherosclerosis
  - Kawasaki’s Disease
  - Congenital
  - Connective Tissue Disease
- Saphenous Vein Grafts
  - Accelerated atherosclerosis
  - Distant from anastomosis
Coronary Artery Aneurysm RCA

Summary

- Coronary artery anatomy is widely variable
- No real normal exists
- Anomalies can be considered congenital or acquired

- Congenital anomalies can be differentiated in different ways
  - Anomalous course
  - Anomalous origin
  - Anomalous termination
  - Benign
  - Potentially malignant