Coronary Artery Anomalies
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Objectives

Congenital anomalies of:
- origin
- course (proximal course)
- termination

Emphasis on clinical relevance

Anomalies of Origin

Single Origin
common origin RCA, left main

Single Origin
problem: proximal CAD

Single Origin
problem: proximal CAD or if travels b/t Ao + PA
**Multiple Origins**

conus branch: directly off Ao

normal: off RCA directly off Ao

**Multiple Origins**

conus branch: directly off Ao

normal: off RCA directly off Ao

**Multiple Origins**

no left main; LCx, LAD off Ao

hard to catheterize

**Multiple Origins**

? collaterals if proximal CAD

arises off tubular ascending Ao

**High Origin**

arises off tubular ascending Ao

Courtesy C Santiago Restrepo, MD
High Origin arises off tubular ascending Ao

High Origin rarely significant; hard to cannulate

High Origin surgeons: high x-clamp if bypass

65 yo, rule out PE

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RCA off Ao normal location

65 yo, rule out PE
LCA off main PA
Anomalous LCA off PA

LCA territory supplied by RCA

Left heart flow: collaterals from RCA

retrograde flow in LCA (into PA)

Left heart flow: collaterals from RCA
Anomalous LCA off PA
most: major MI ~ 6 weeks of age

2 month old; cardiomegaly + edema

Anomalous Left CA off PA

neonate

6 - 8 weeks
Anomalous LCA off PA
if enough collaterals: asymptomatic
Anomalous LCA off PA
at risk if develop CAD in RCA

Anomalies of Course

Anomalies of Origin
and Proximal Course

Origin off the Wrong Cusp
RCA off left cusp
Origin off the Wrong Cusp
LCA off right cusp
Origin off the Wrong Cusp
Left circumflex / LAD off right cusp

Origin off the Wrong Cusp
Proximal course abnormal

Abnormal Proximal Course
Interarterial: b/t Ao and PA / RVOT

Abnormal Proximal Course
Pre-pulmonic: anterior to PA

Abnormal Proximal Course
Retro-aortic course

Abnormal Proximal Course
Septal course

Courtesy of Cristopher Meyer, MD
Oblique MPRs: under PA, in septum distinguish from interarterial

Abnormal Proximal Course

Interarterial: “malignant”: risk SCD

Abnormal Proximal Course

Coronal Oblique MIP

Sagittal Oblique MPR

Abnormal Proximal Course

? compression between Ao, PA

Abnormal Proximal Course

greater risk: ostium at acute

Abnormal Proximal Course

slit-like ostium

vessel lunate instead of round

Abnormal Proximal Course

slit-like ostium

vessel lunate instead of round
Abnormal Proximal Course
↑ risk: intramural, within adventitia

Abnormal Proximal Course
increased risk: intramural course

Tx: “malignant” course
may perform stress test;
repair anomalous left main, LAD

Tx: “malignant” course
may perform stress test;
usually repair LCx; +/- RCA

Tx: “malignant” course
different risk interarterial RCA:
“high” (PA) vs “low” (RVOT)

Tx: “malignant” course
CABG; create fistula Ao, distal CA
anomalous origin
Tx: “malignant” course
CABG; create fistula Ao, distal CA
interarterial course

25 yo, syncope

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25 yo, syncope
25 yo, syncope

Origin from Wrong Cusp
> 1 abnormality

Other Anomalies of Course

30 yo, atypical chest pain

Myocardial Bridge
Coronary “dives” into myocardium

30 yo, atypical chest pain
Coronary “dives” into myocardium
Myocardial Bridge
+ / - narrowed; usually incidental

Myocardial Bridge
rarely: causes ischemia
look for Δ caliber diastole/systole

Myocardial Bridge
rarely: causes ischemia
if sx: functional stress testing

Myocardial Bridge
no atherosclerosis: ? absence metabolically active fat

Coronary Fistula
coronary artery terminates in:
cardiac chamber (coronary cameral fistula)

Anomalies of Termination
Coronary Fistula
coronary artery terminates in:
coronary sinus

Coronary Fistula
coronary artery terminates in:
pulmonary artery

courtesy of Suhny Abbara, MD

Coronary Fistula
coronary artery terminates in:
pulmonary artery

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Coronary Fistula
coronary artery terminates in:
superior vena cava

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courtesy of Suhny Abbara, MD
Coronary Fistula

coronary artery terminates in:
superior vena cava

acts as shunt: most often L→R
(RV most common site)

Coronary Fistula

affected vessel usually dilated,
tortuous from increased flow

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tortuous from increased flow

Coronary Fistula

may be steal phenomenon →
ischemia

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30 yo, angina, + stress test in LAD territory

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Coronary Fistula may be steal phenomenon → ischemia

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Coronary Fistula may be steal phenomenon → ischemia

RCA + LCx fistula to coronary sinus

Coronary Fistula may be steal phenomenon → ischemia

RCA + LCx fistula to coronary sinus

Associated Cardiac Anomalies

Coronary Anomalies may be isolated or associated with congenital heart dz

Coronary Anomalies particularly common: Transposition Great Vessels

35 yo, D-loop TGA, s/p Mustard procedure
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Coronary Anomalies particularly common: Transposition Great Vessels

LMain

RCA off noncoronary cusp

Coronary Anomalies particularly common: Transposition Great Vessels

fistula to systemic atrium; ? post-operative

Coronary Anomalies particularly common: Tetralogy of Fallot

25 yo s/p TOF repair; Ca++ in post op PA
courtesy of Christopher Meyer, MD
Coronary Anomalies particularly common: Tetralogy of Fallot

- LAD off right coronary cusp

Coronary Anomalies particularly common: Tetralogy of Fallot

- LAD off R coronary cusp, septal course

Coronary Anomalies

surgeons need to be aware pre-op; anomalous course could be injured

Conclusions

Anomalies of:

- origin
- course
- termination

Incidental or associated w/ CHD

Take Home Points

- Dilated, tortuous: consider fistula to low pressure system
- May act as shunt
- May cause symptoms:
  - steal phenomenon