Anomalous Coronary Arteries

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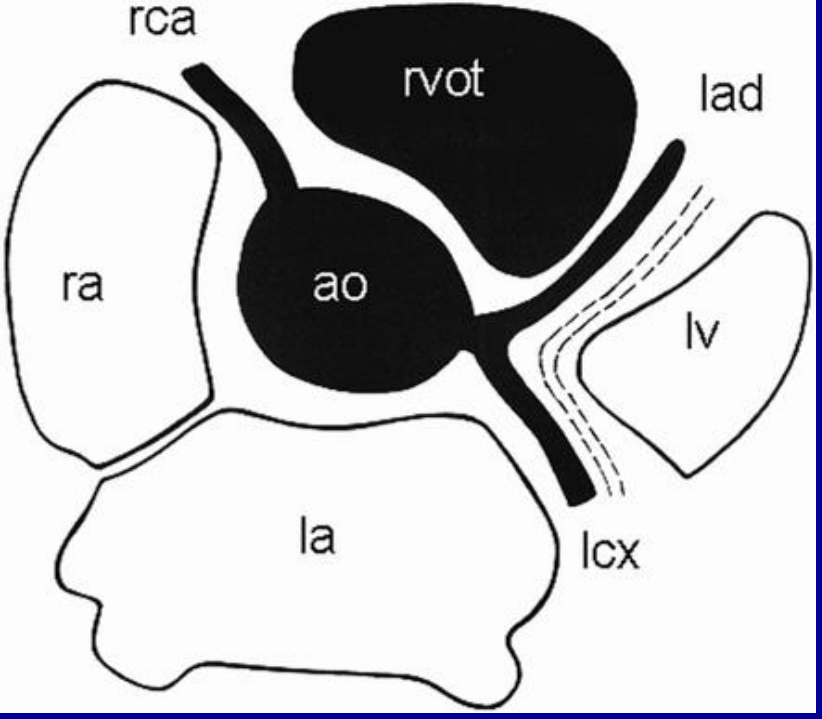
UCSD Radiology
Cardiac Rotation Presentation

Normal Anatomy

- R and L coronary arteries arise from the R and L aortic sinuses (of Valsalva)
- Usually within 1cm superior to aortic valve
- Arteries originate orthogonal to aortic wall
- Epicardial (extramural course) course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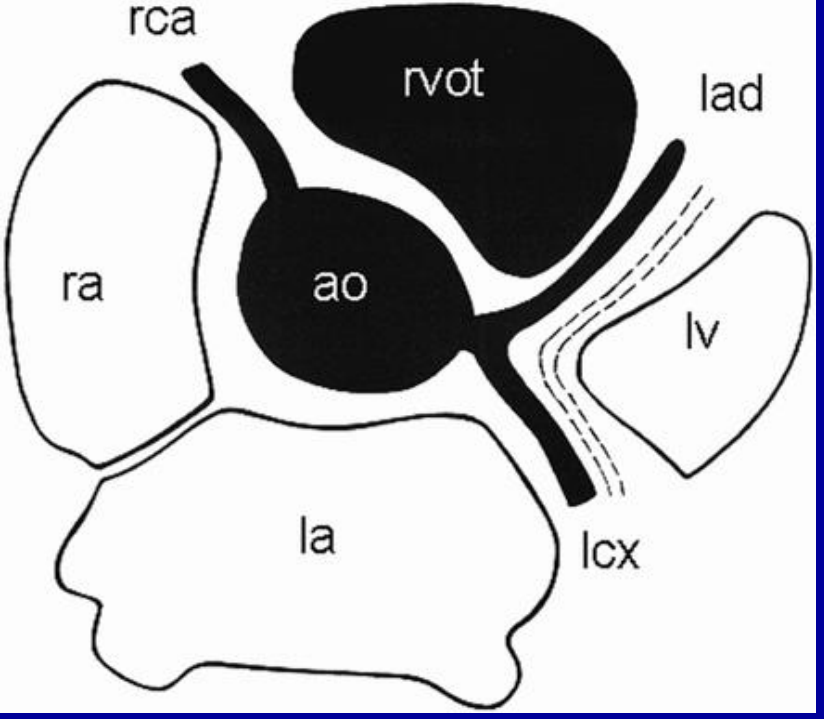
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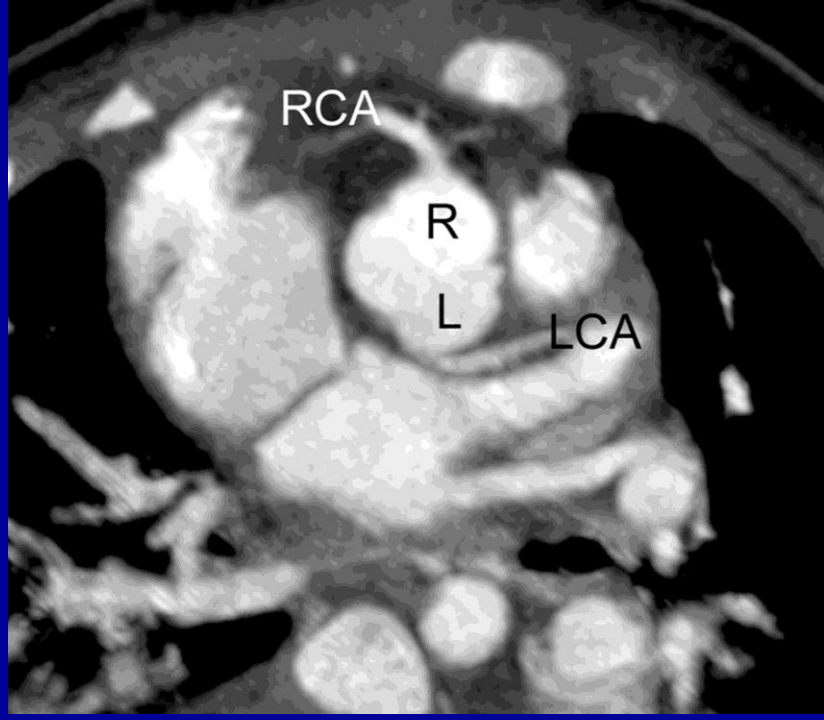
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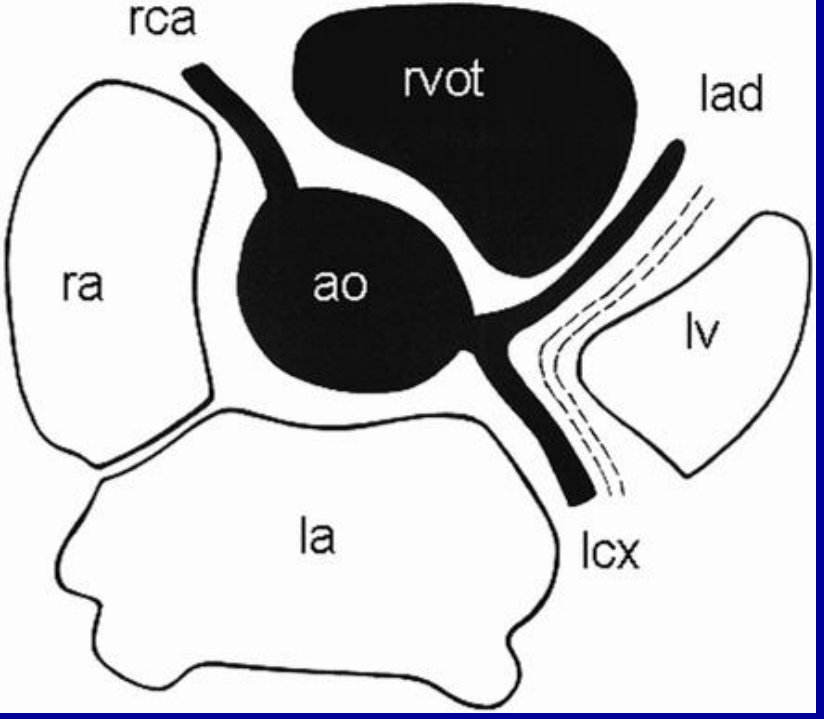
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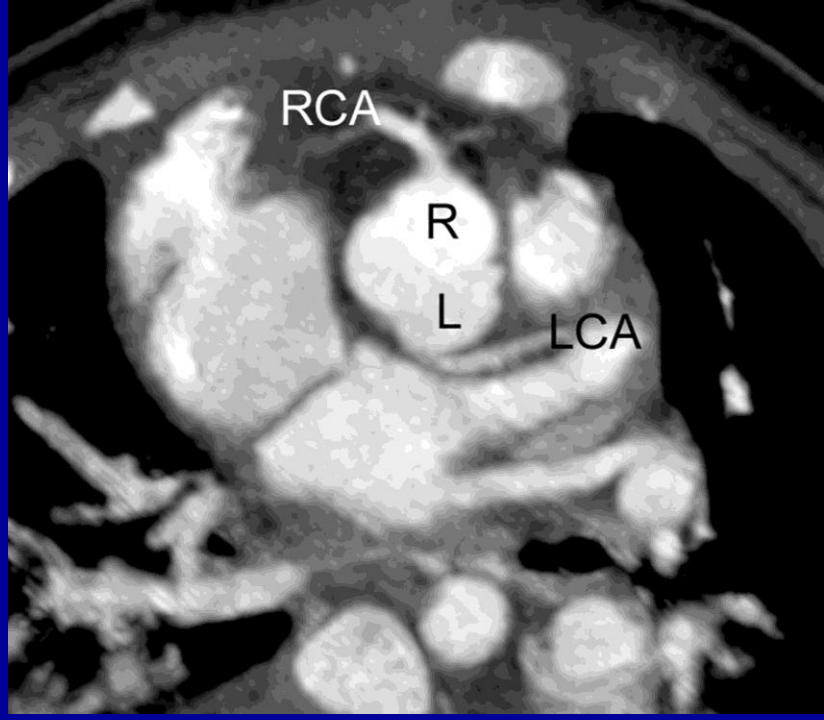
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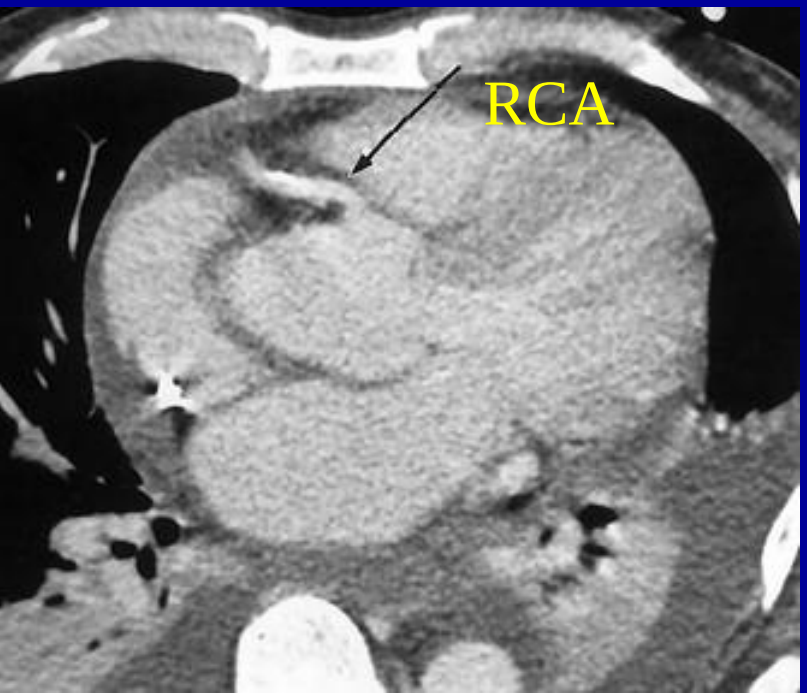
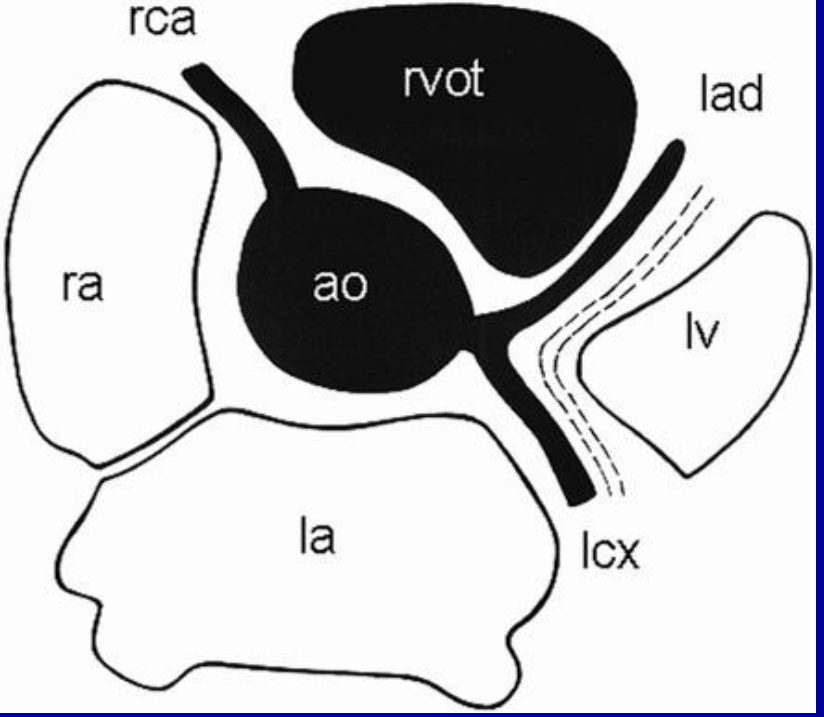

RCA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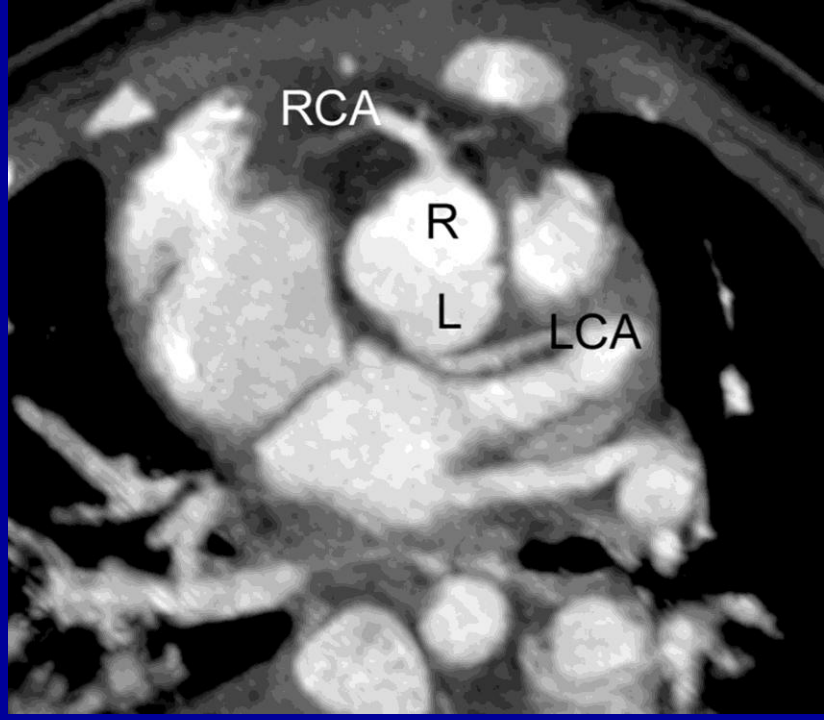
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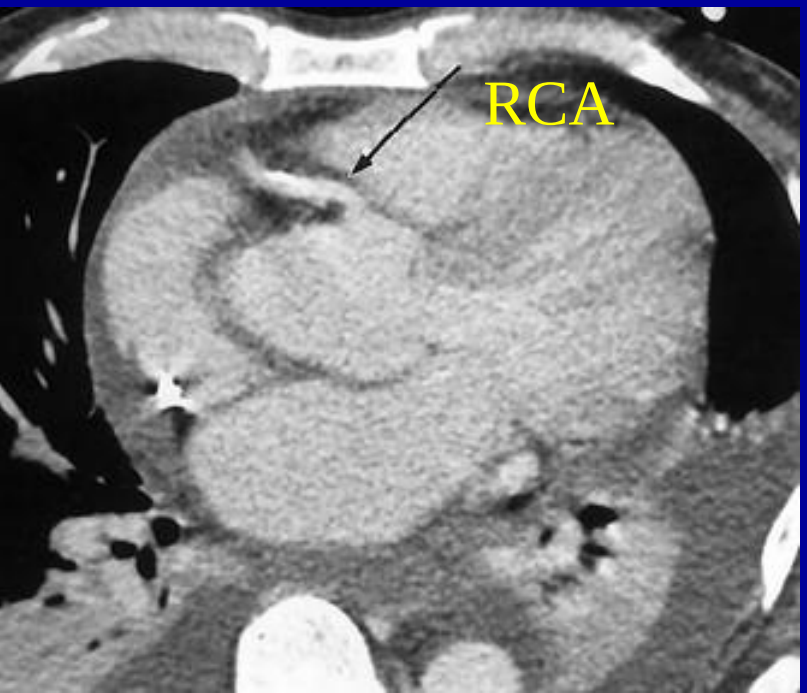
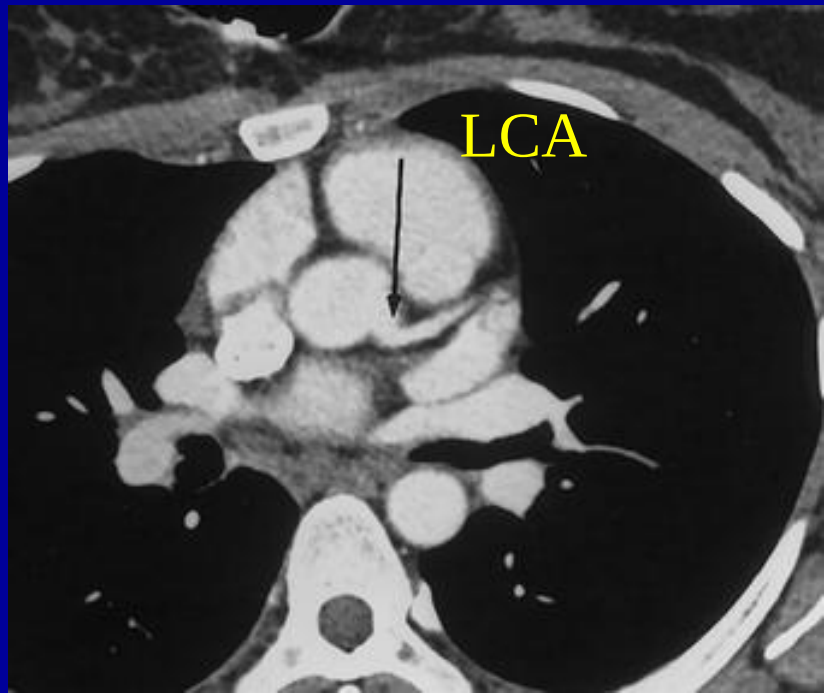

RCA


LCA

Anomalous Coronary Arteries

- Found in ~0.1%-1.3% of patients undergoing cardiac catheterization
- Can be assoc w/ congenital heart dz or be isolated anomaly
- Angio evaluation can be challenging; misdiagnosis in up to 50% of cases
- Rare but important cause of CP, arrhythmia, MI & sudden cardiac death; TREATABLE

Why Is It So Dangerous?

- Not fully understood; many variants benign
- But some variants w/ mortality rates >50%
- Depends on course of anomalous artery: retroaortic & anterior courses benign
- Dangerous: “interarterial” course b/w aorta & RVOT
- Pathophysiolgy unclear: compression or kinking during systole vs. abnl narrowing of ostium

Role for Noninvasive Imaging

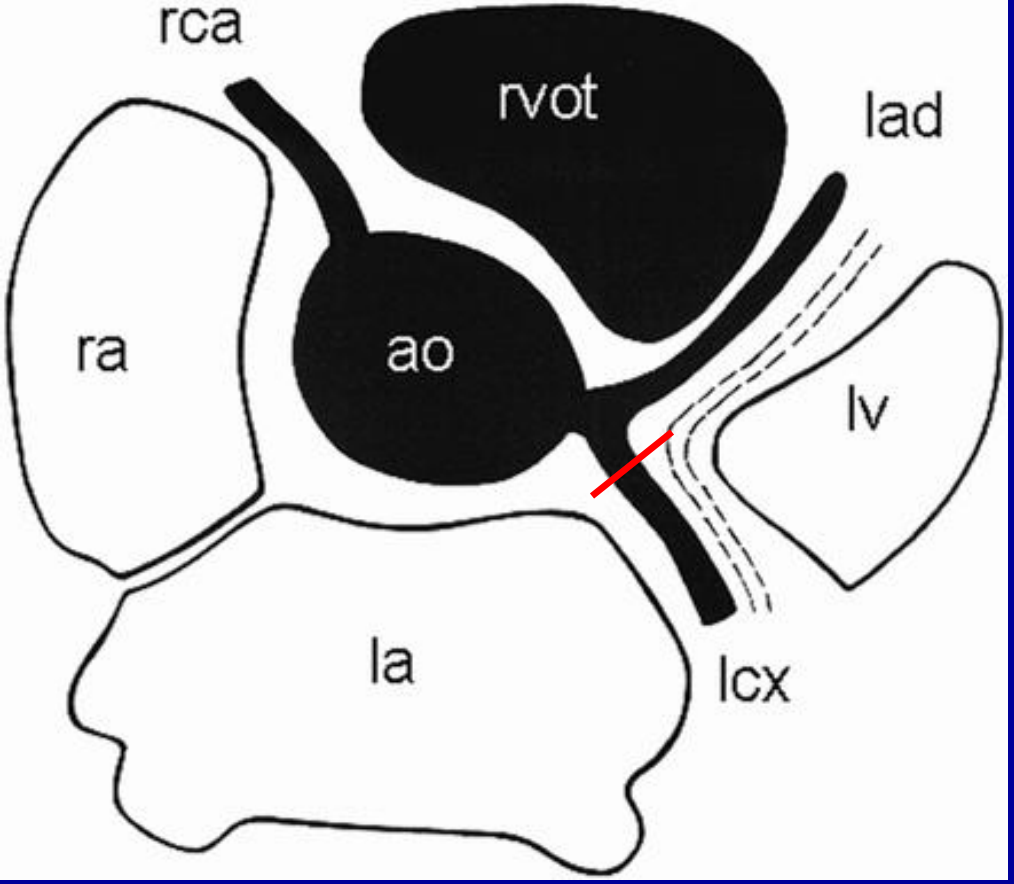
- Often challenging to diagnose in selective coronary angiogram (e.g. difficult to see relationship to MPA)
- Limited eval of small vessels w/ echo
- CT allows eval of not just arterial caliber and lumen but also their course and relationship to adjacent structures
- Cardiac MRI/A may also be useful but cannot perform on pts c pacers/AICDs

Anomalous Coronary Anatomy

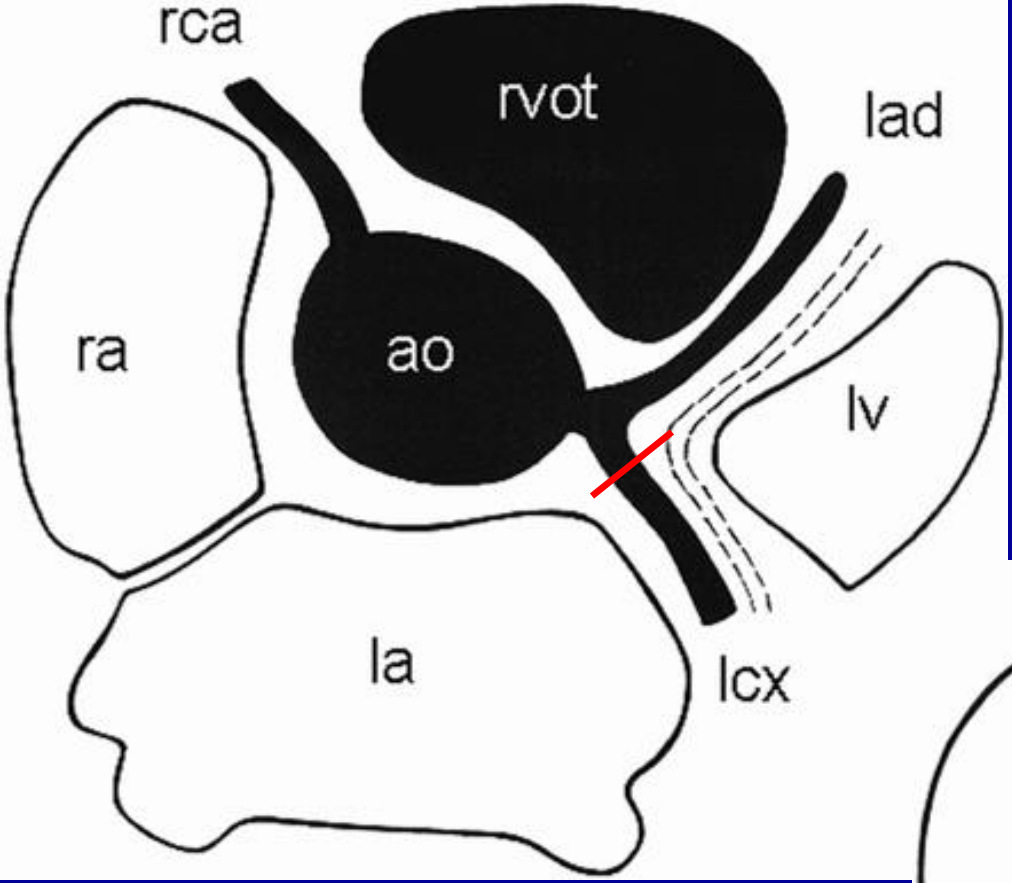
- ~60% cases involve the circumflex
- ~40% involve the LM or RCA

Anomalous Circumflex Artery

- Anomalous circumflex:
- Either off R sinus or branches off RCA
- ALMOST ALWAYS RETROCARDIAC→ BENIGN

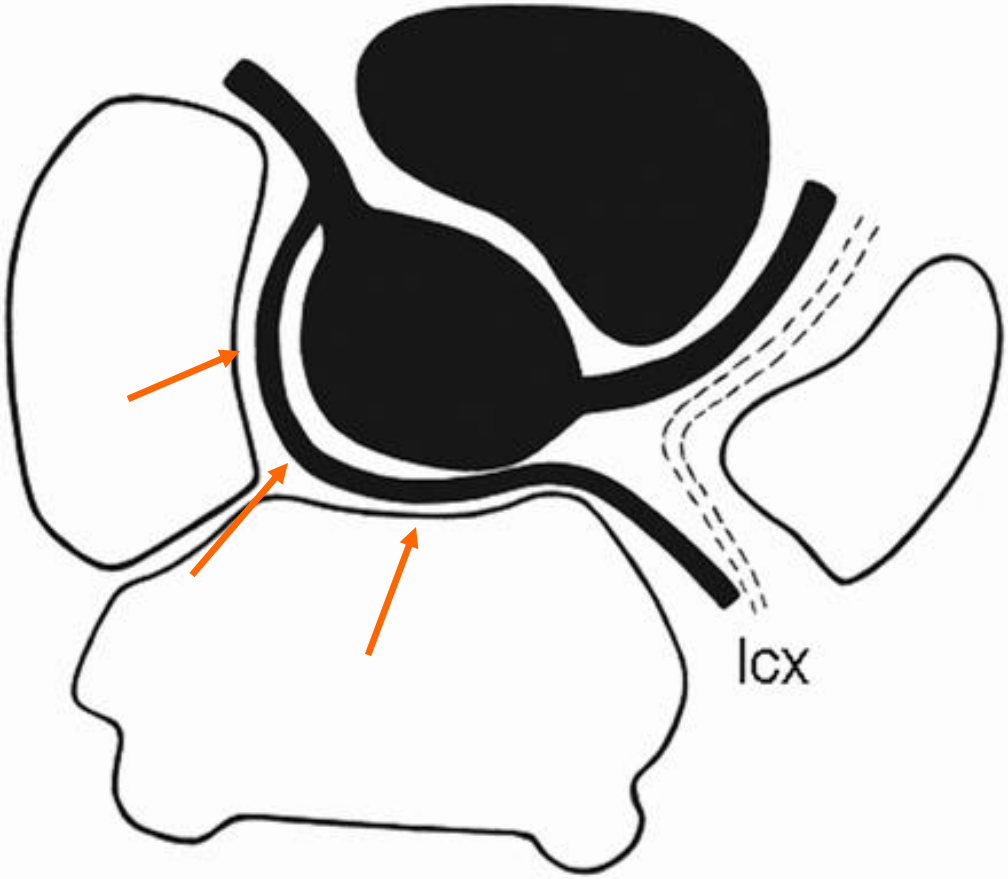


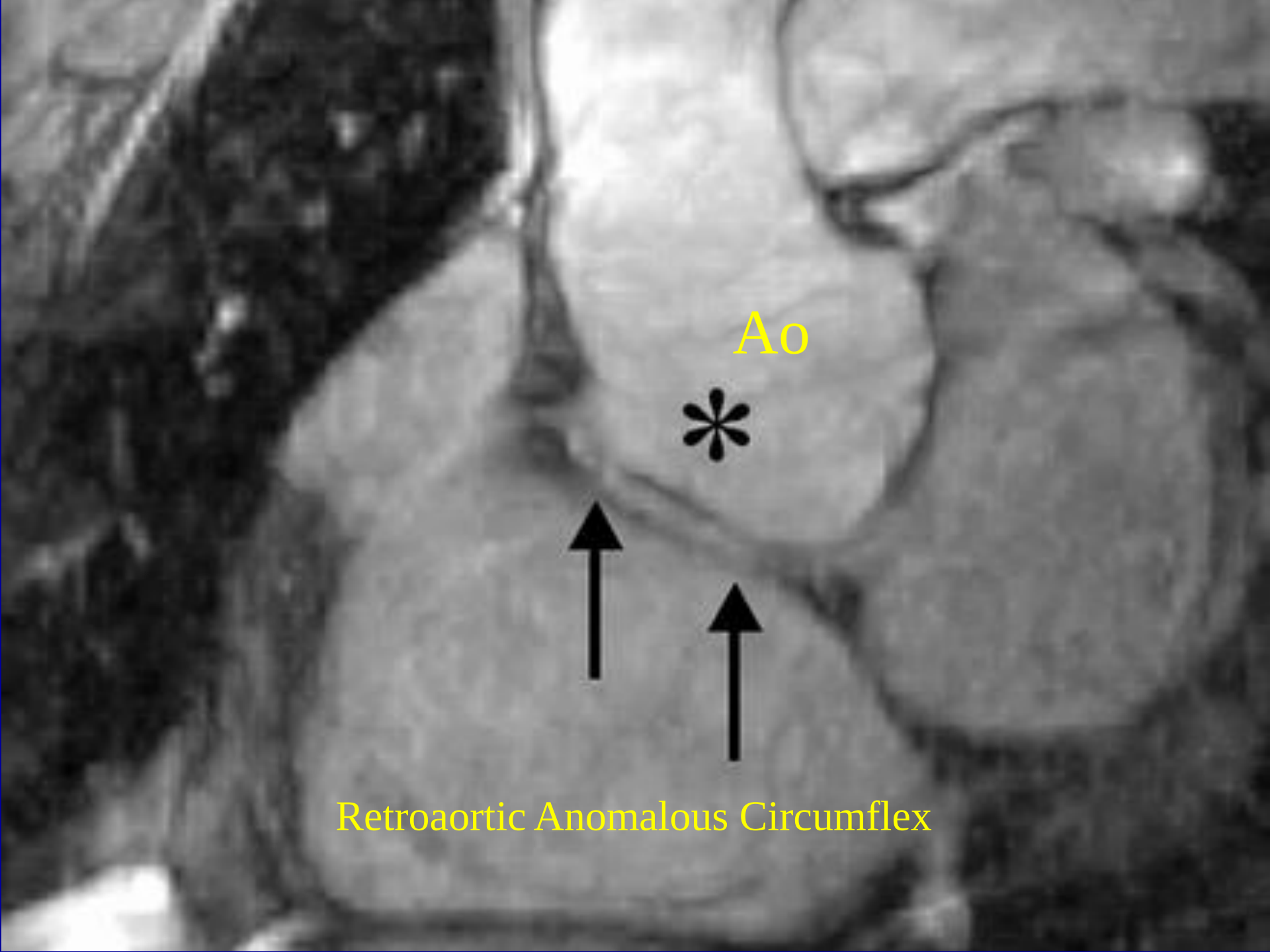
Normal Anatomy



Normal Anatomy

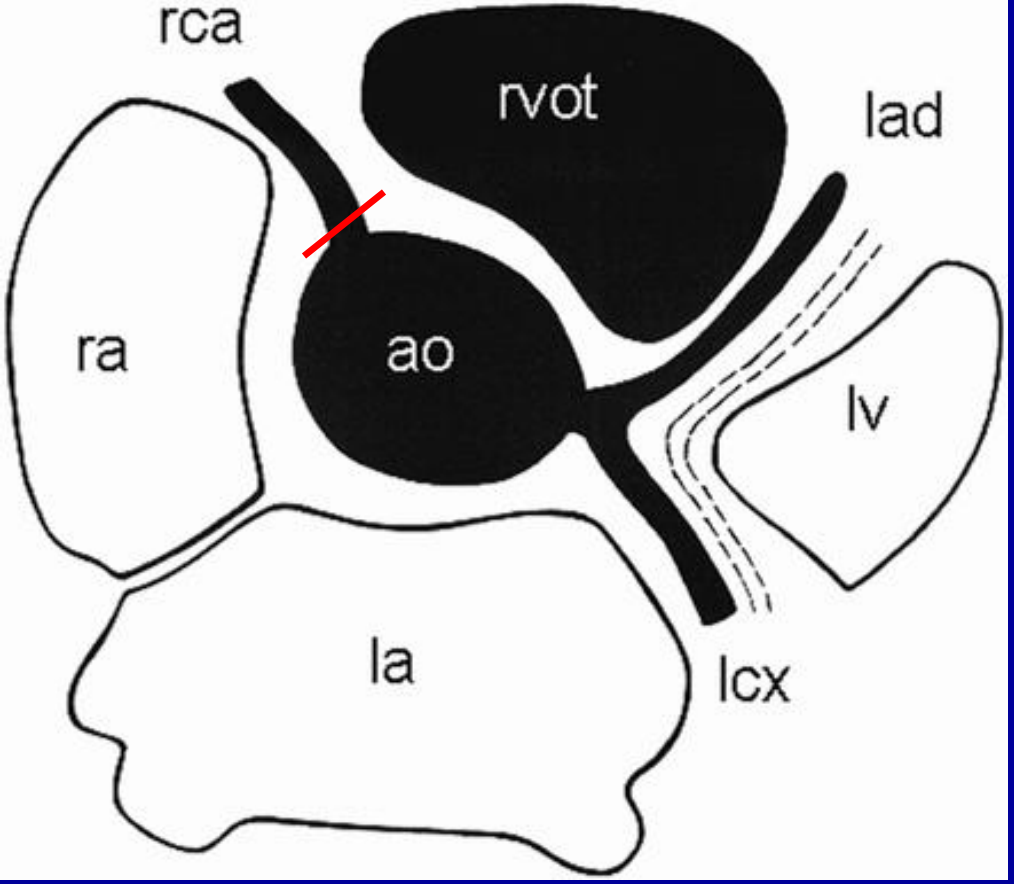
Anomalous Circumflex:
Retroaortic→ BENIGN



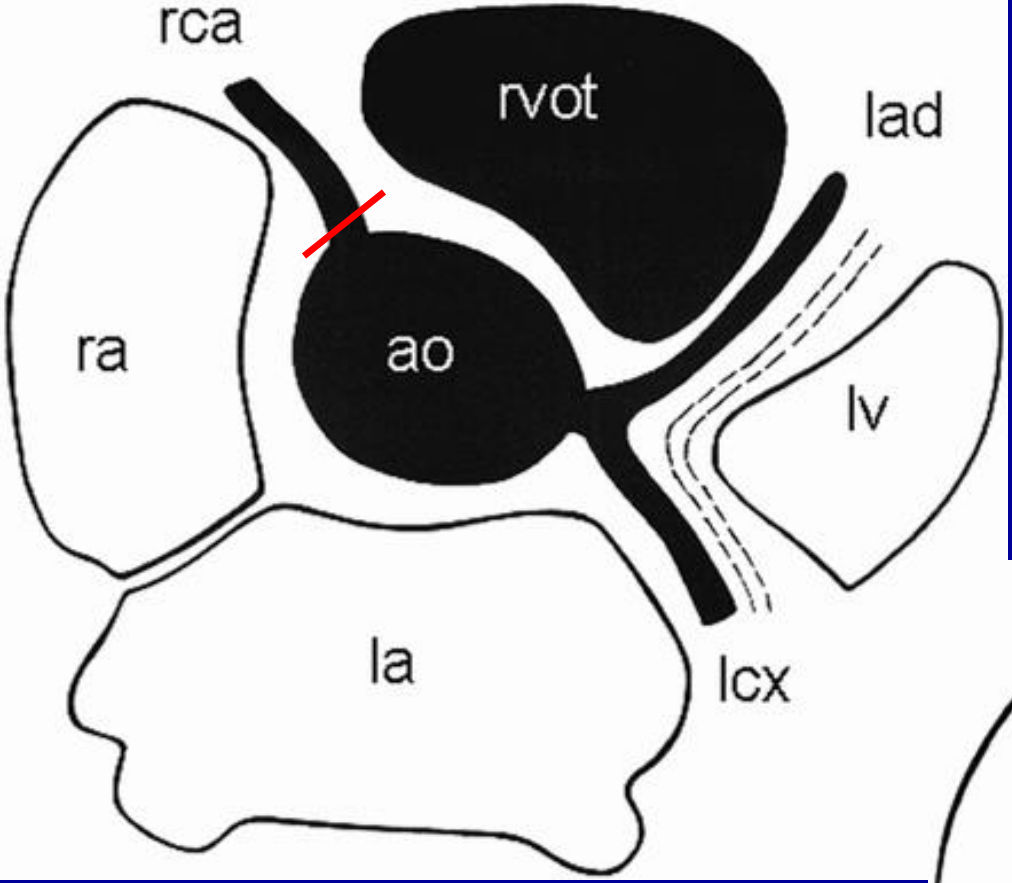

Ao
Retroaortic Anomalous Circumflex

Anomalous Right Coronary

- Anomalous RCA:
- Either off L sinus or branches off single left coronary
- Can be retroaortic but IN VAST MAJORITY (>90%) OF CASES INTERARTERIAL→ MALIGNANT

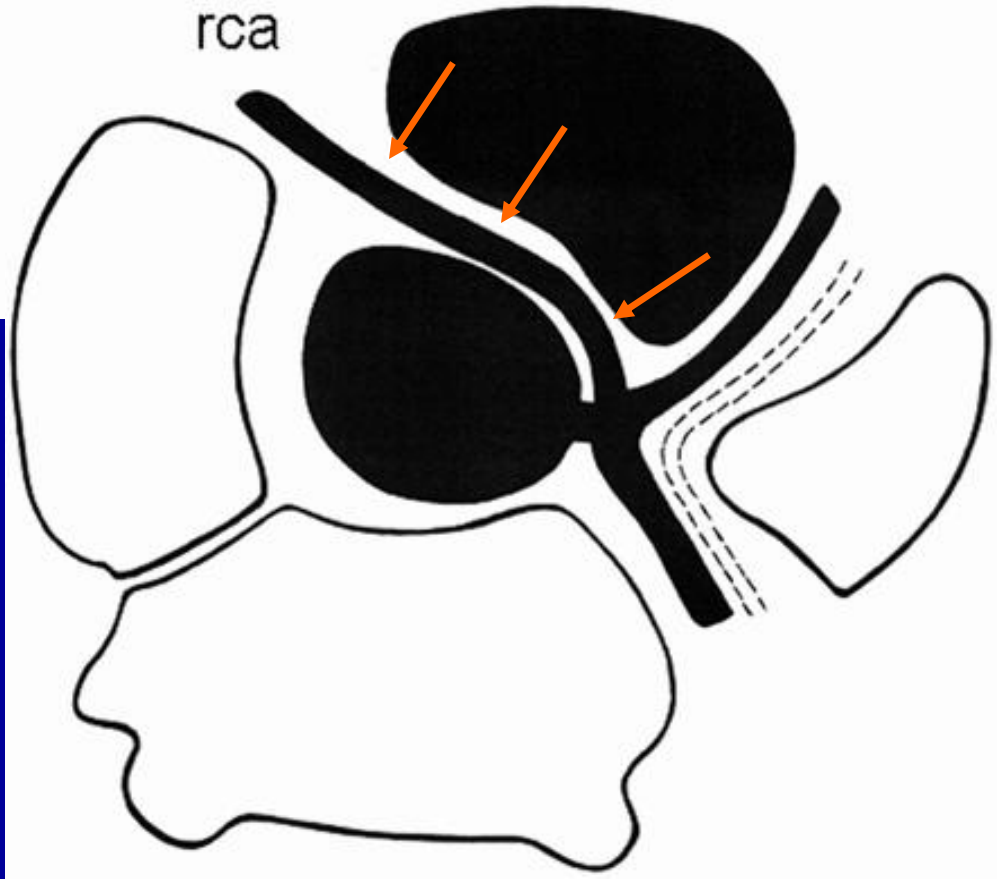


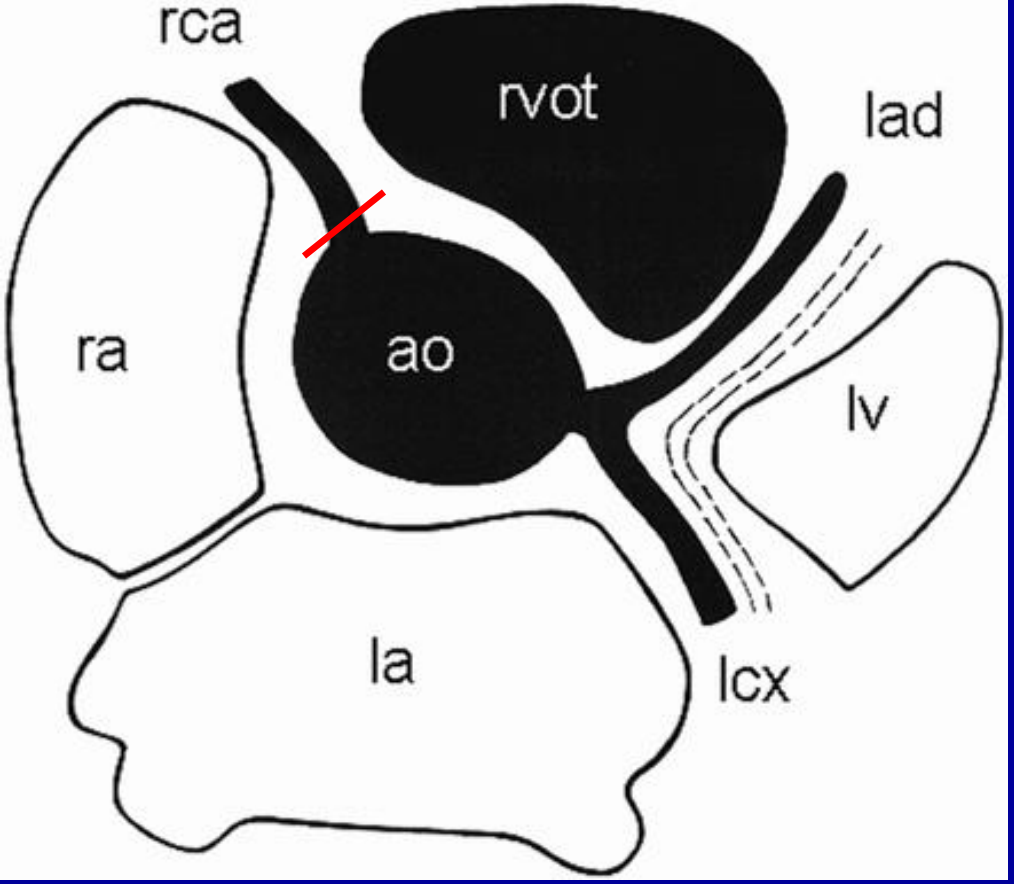
Normal Anatomy



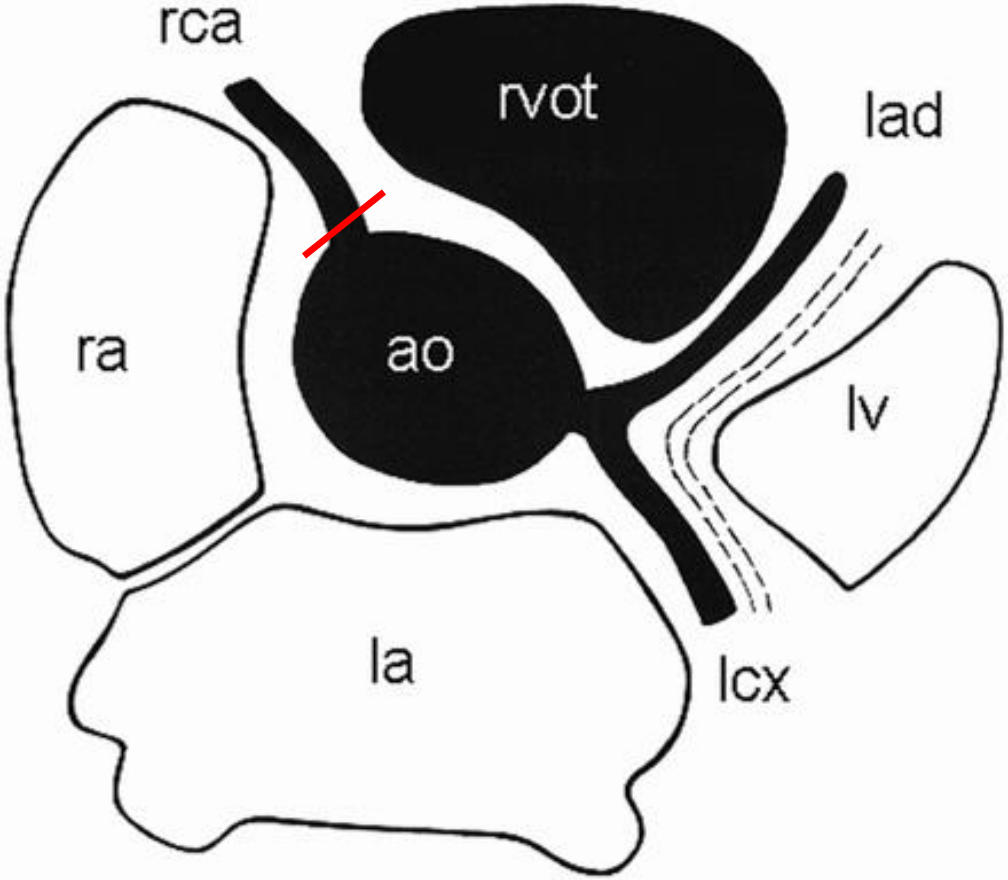
Normal Anatomy

Anomalous RCA:
Interarterial→ISCHEMIA!!



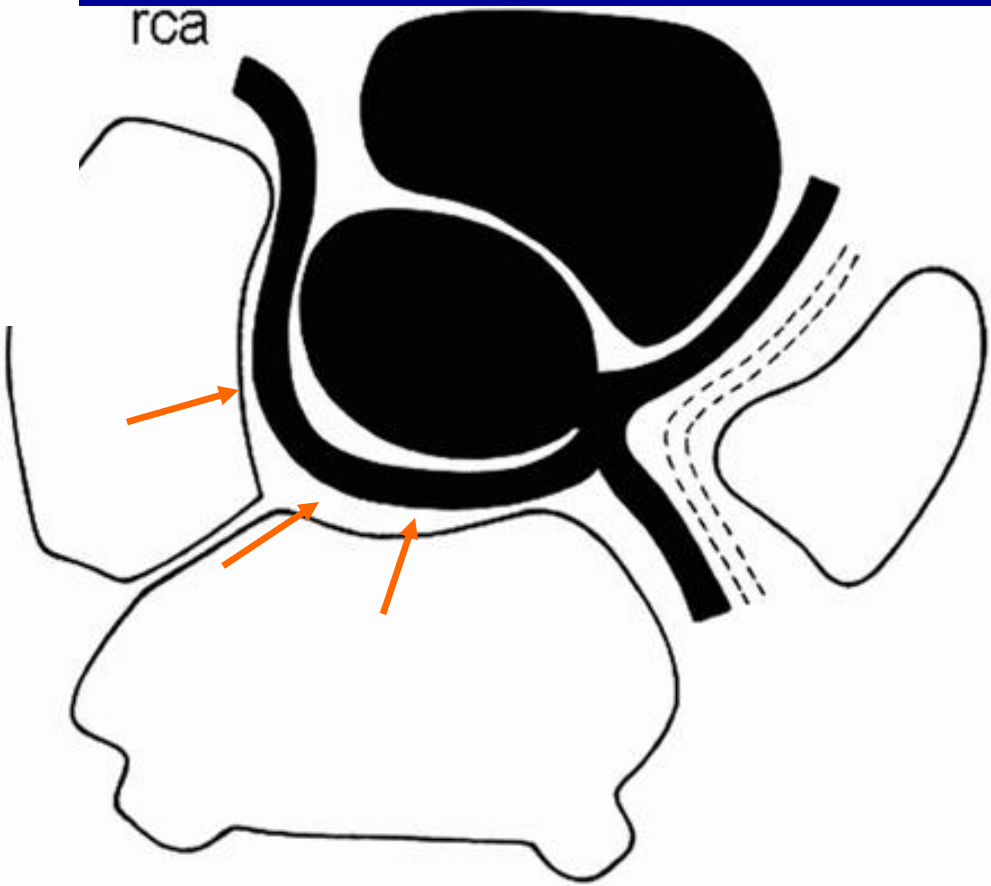


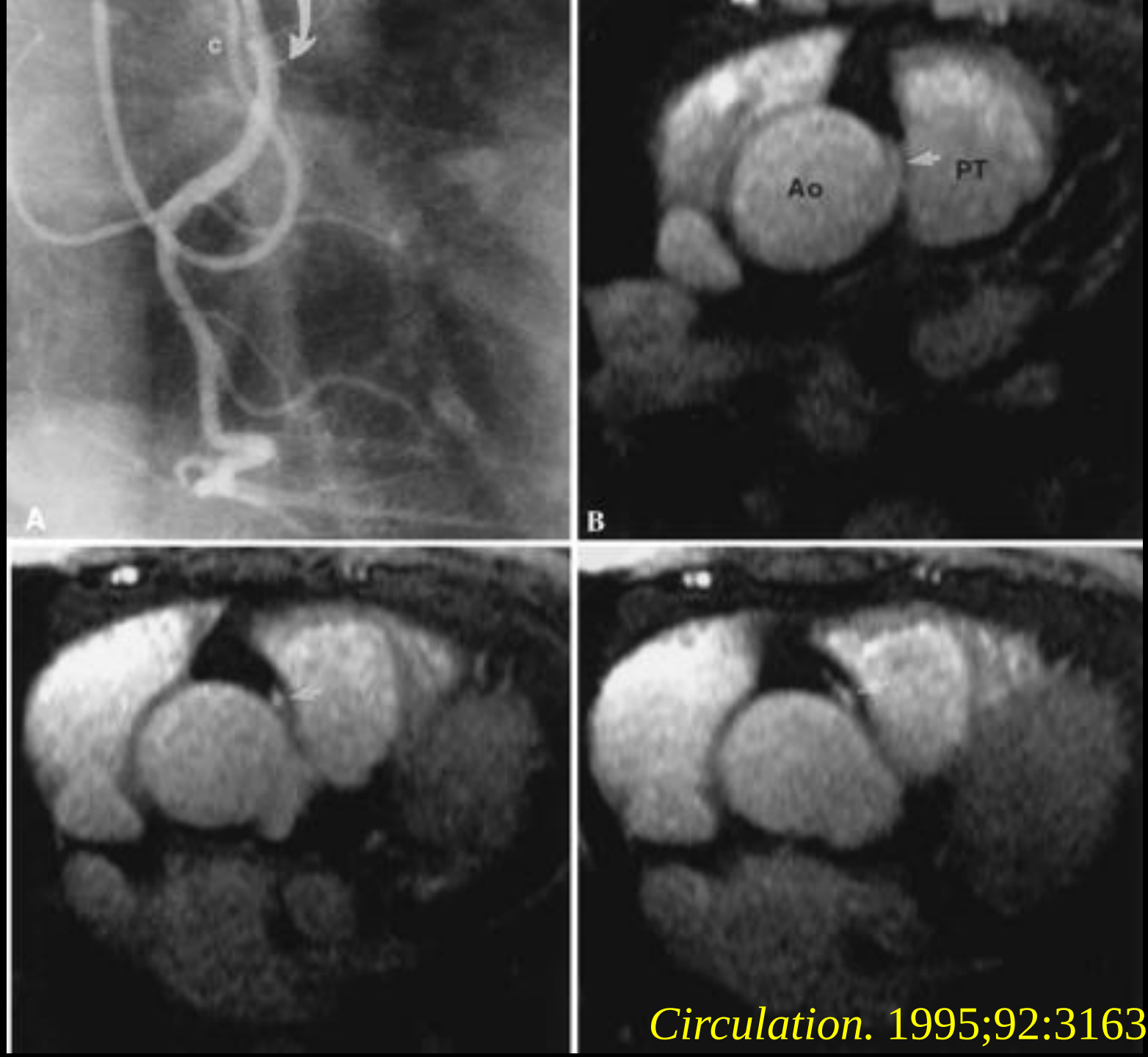
Normal Anatomy



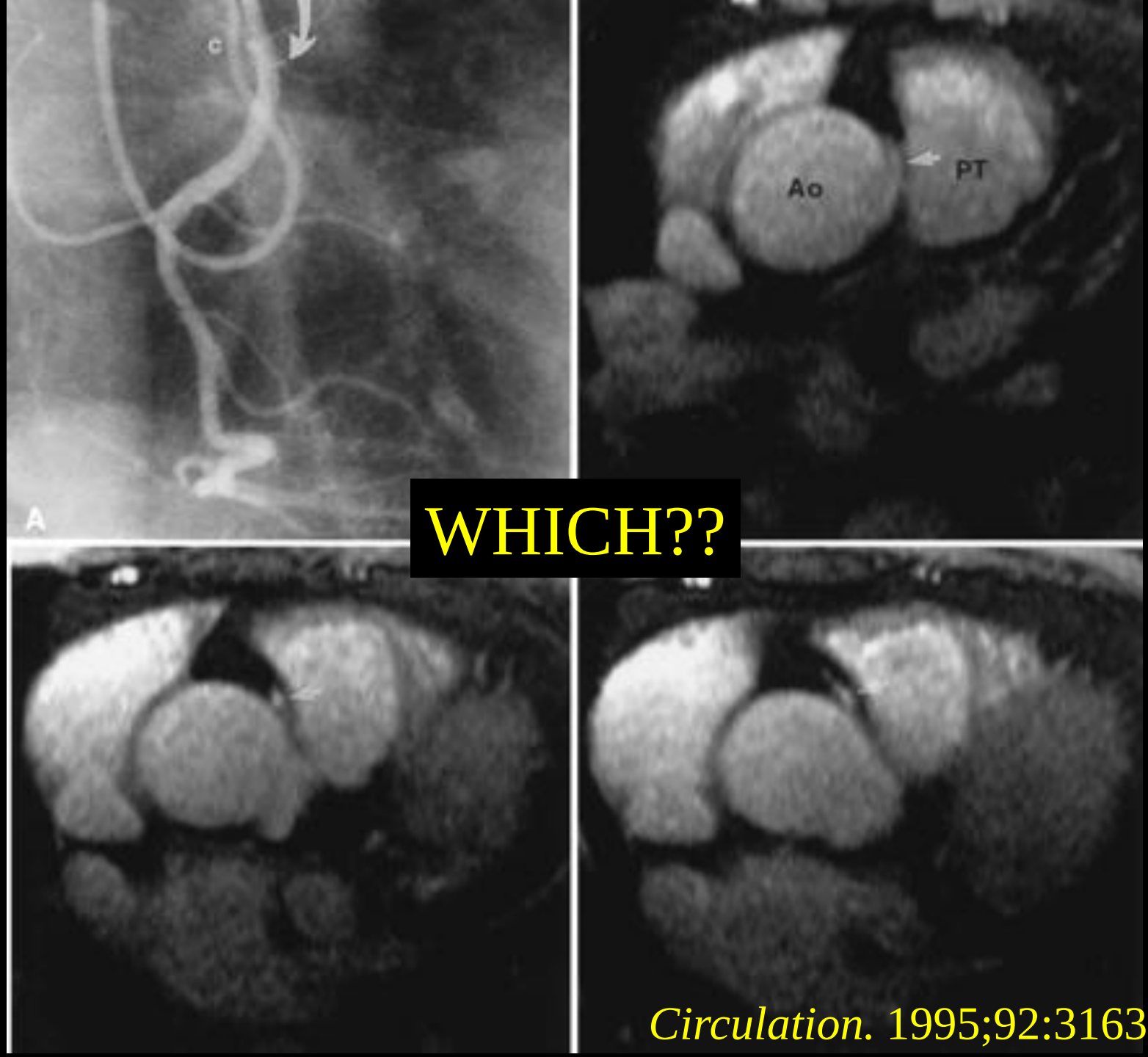
Normal Anatomy

Anomalous RCA:
Retroaortic→ BENIGN



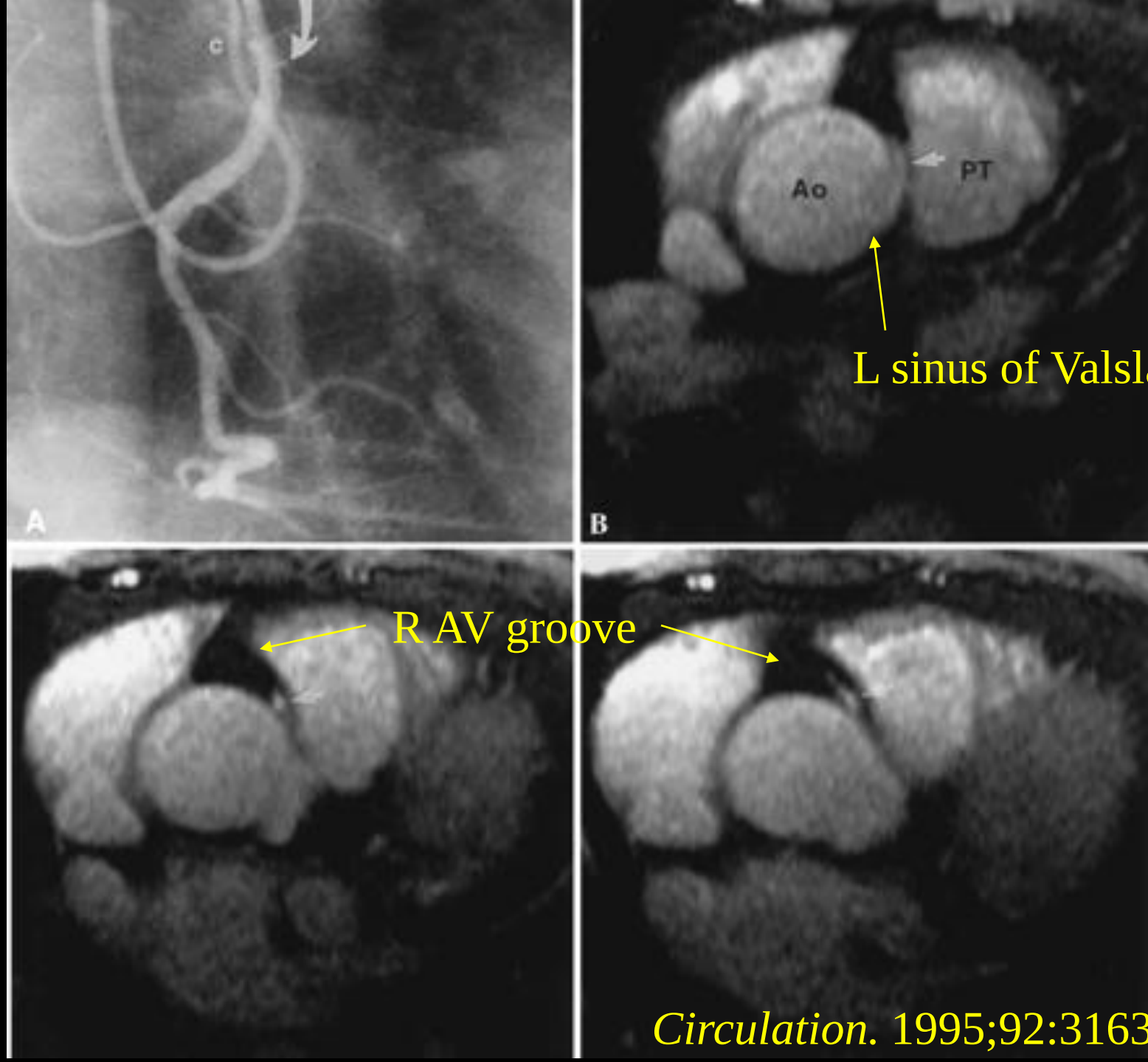


Circulation. 1995;92:3163-3171.



WHICH??

Circulation. 1995;92:3163-3171.



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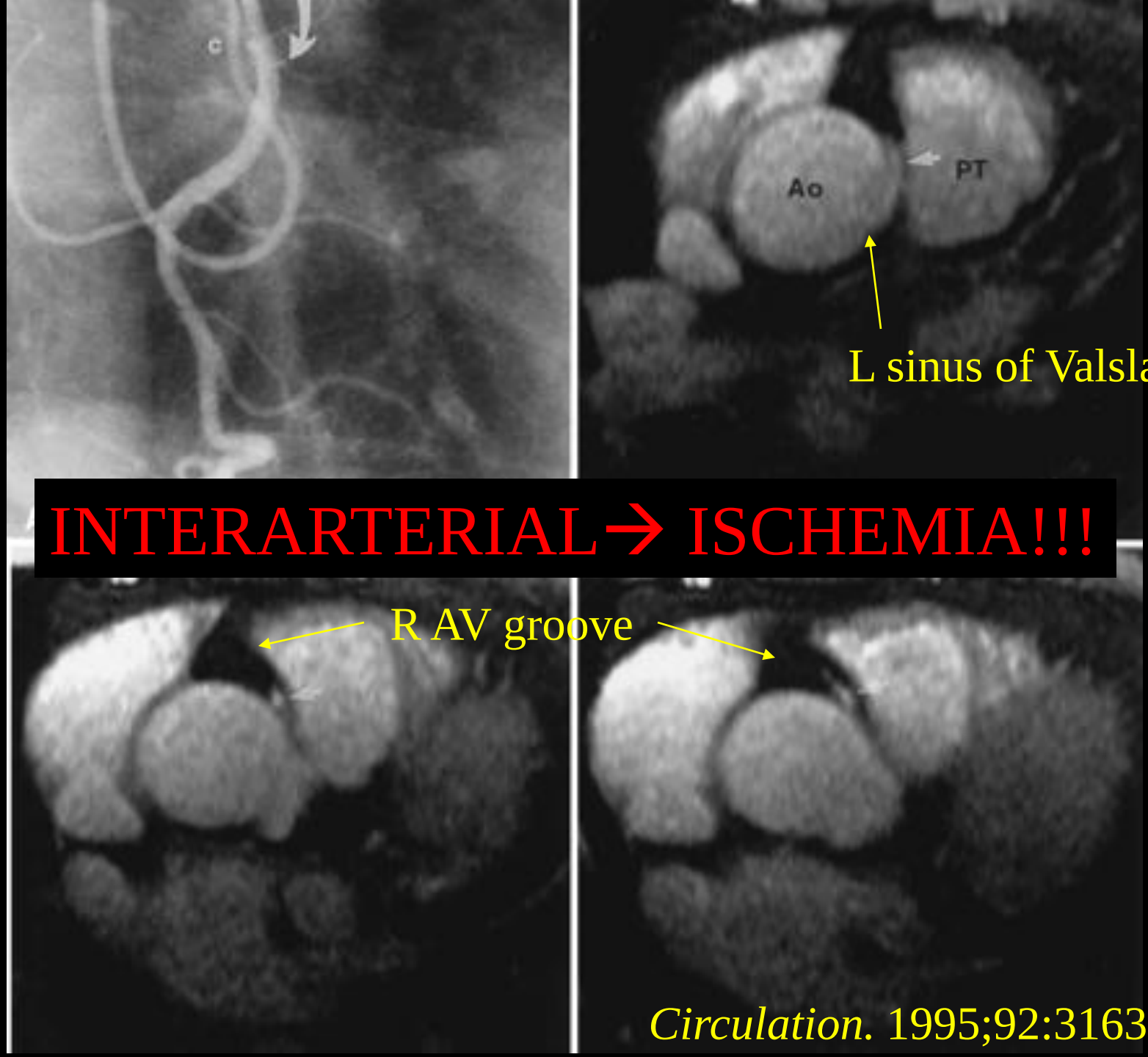
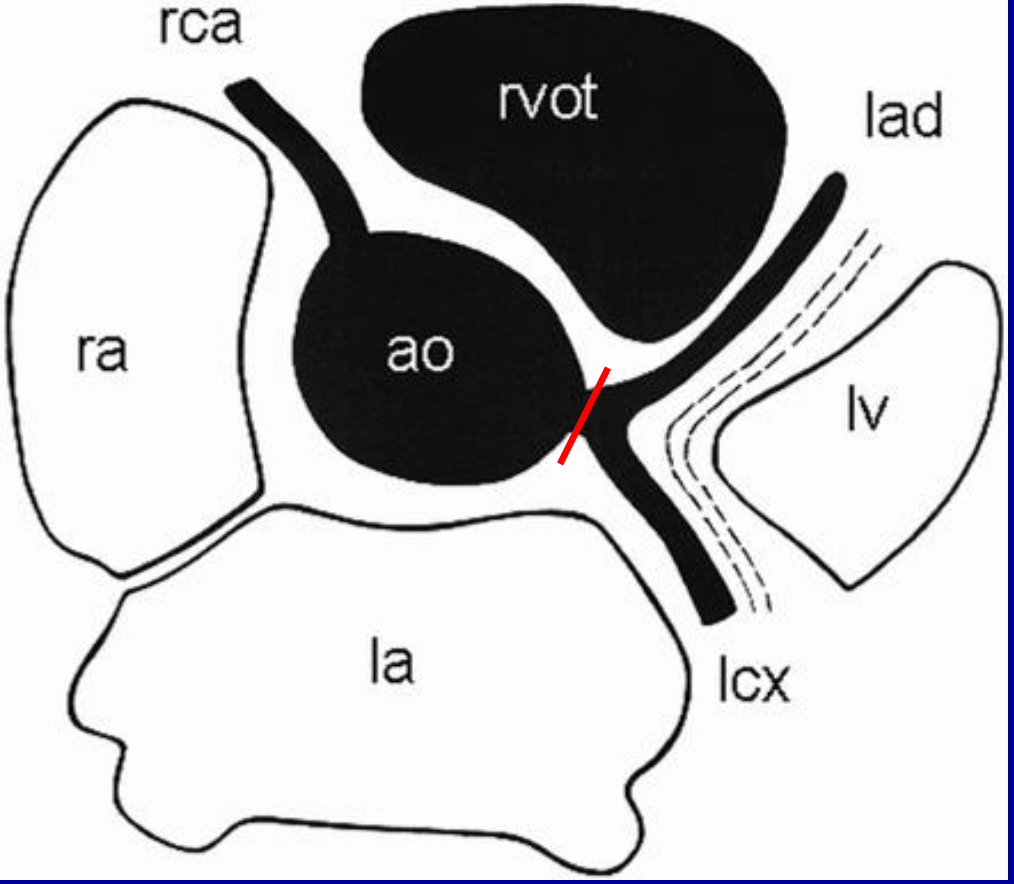


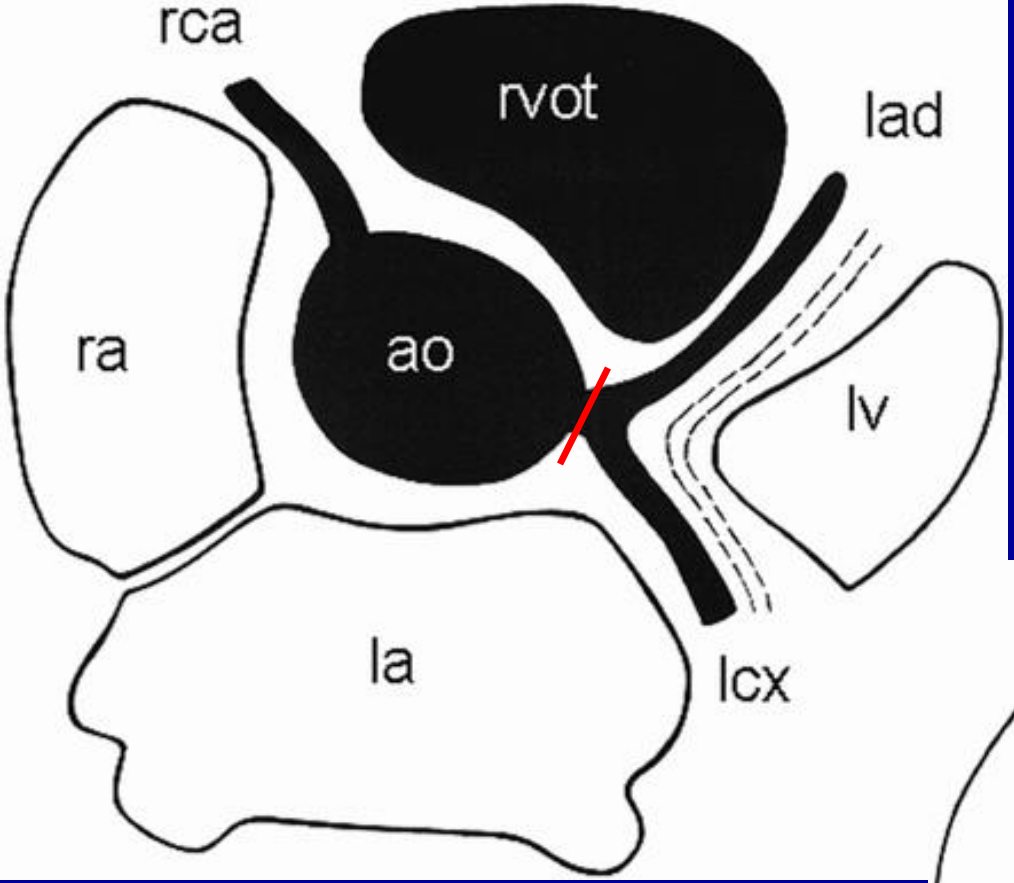
Circulation. 1995;92:3163-3171.

Anomalous Left Coronary

- Anomalous LCA:
- Either off R sinus or branches off single right coronary
- Can be retroaortic, anterior or intramural but IN MOST CASES (75%) INTERARTERIAL→ MALIGNANT

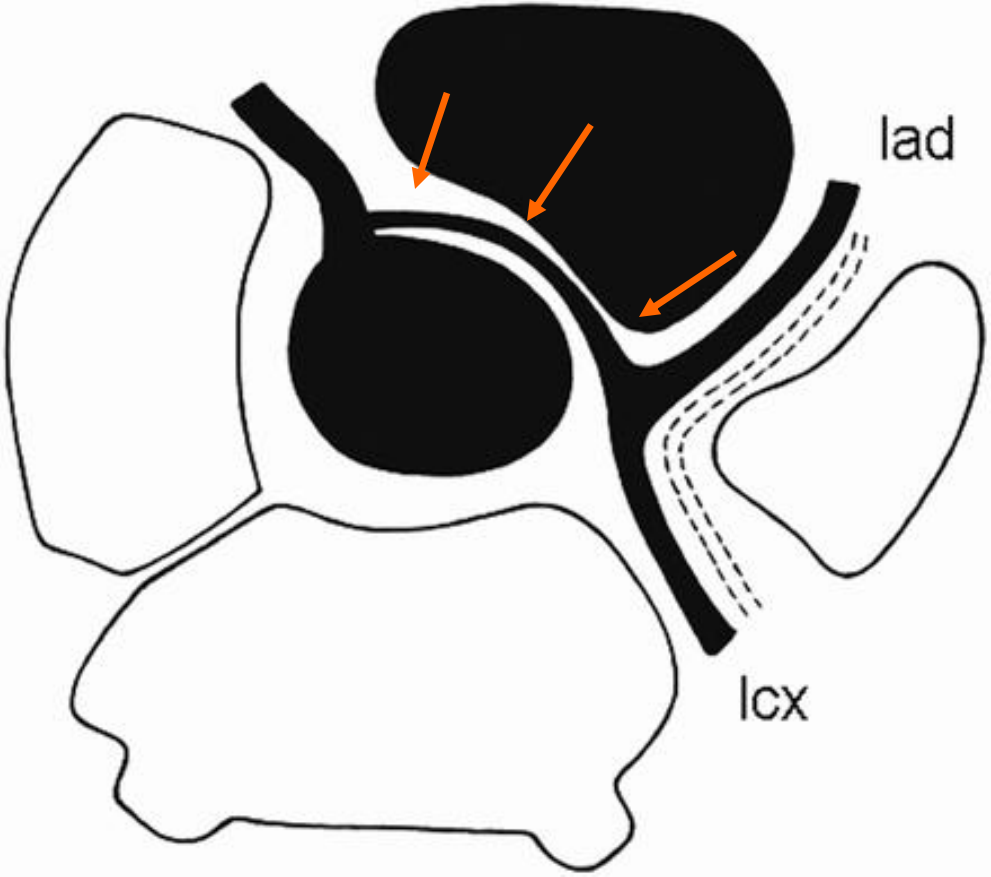


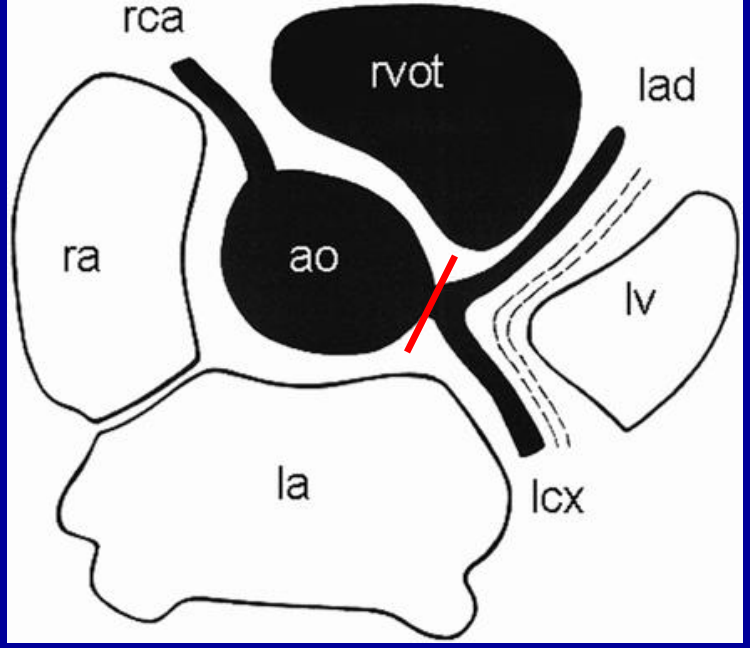
Normal Anatomy



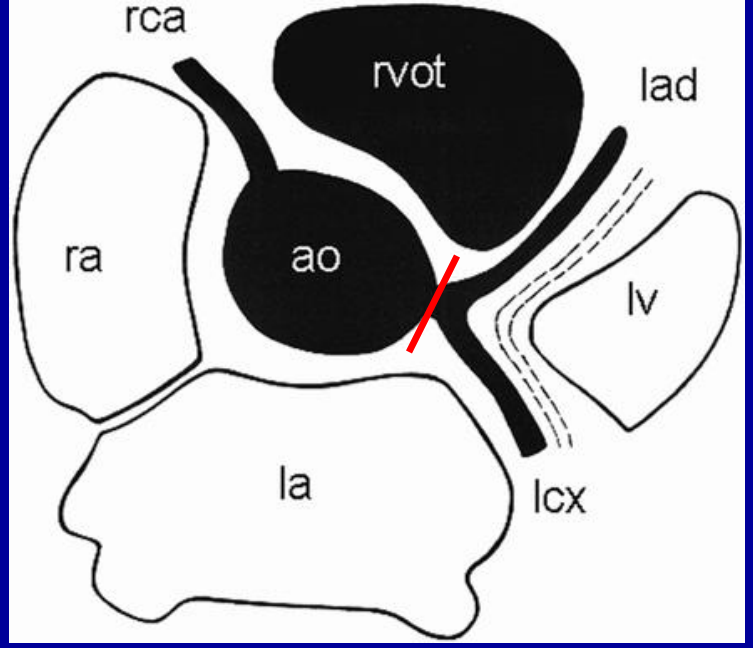
Normal Anatomy

Anomalous LCA:
Interarterial→ISCHEMIA!!

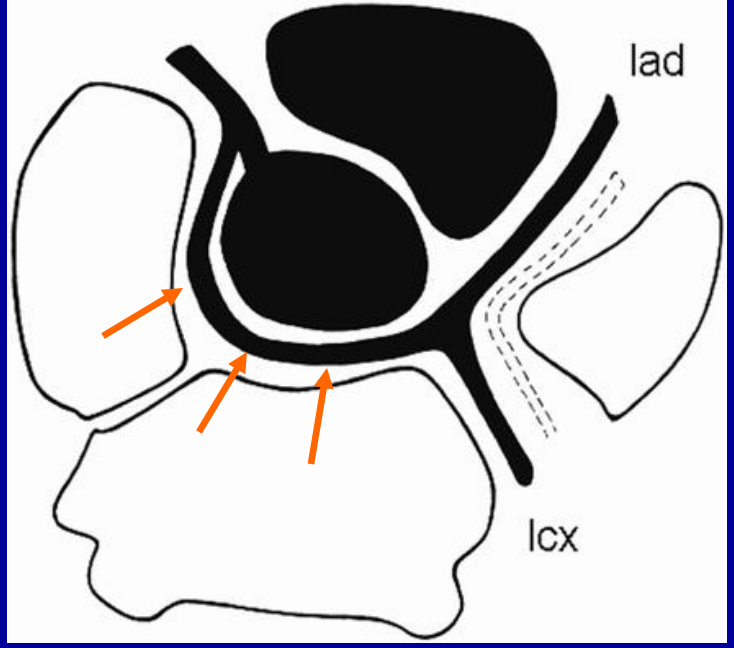




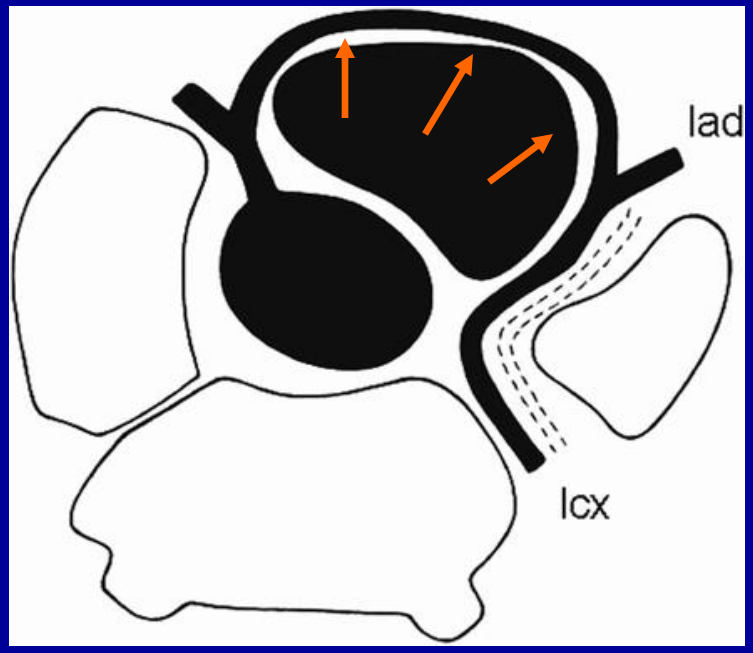
Normal Anatomy



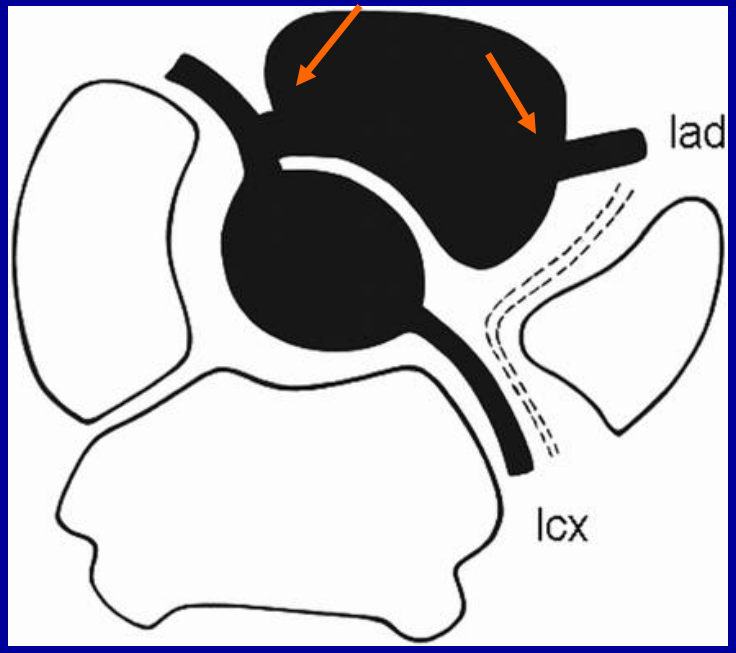
Normal Anatomy



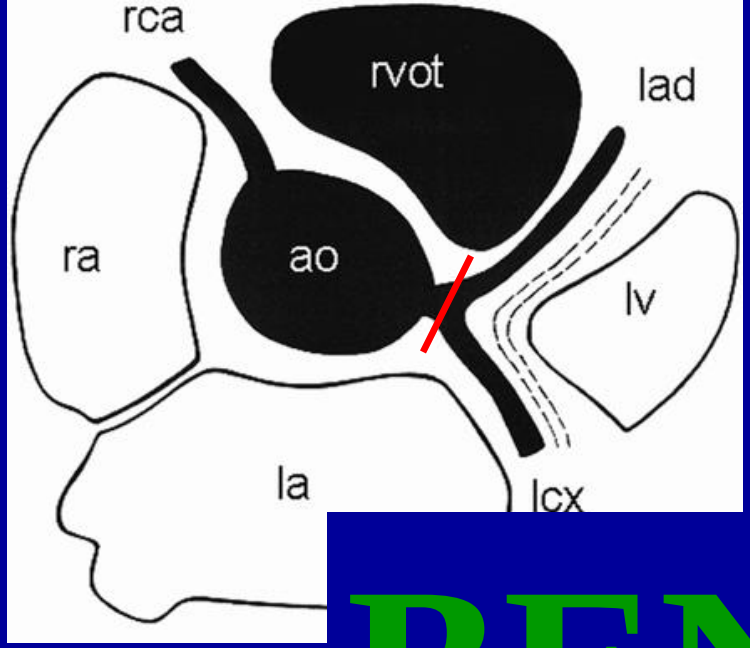
Anom LCA: Retroaortic



Anom LCA: Anterior



Anom LCA: Intramural



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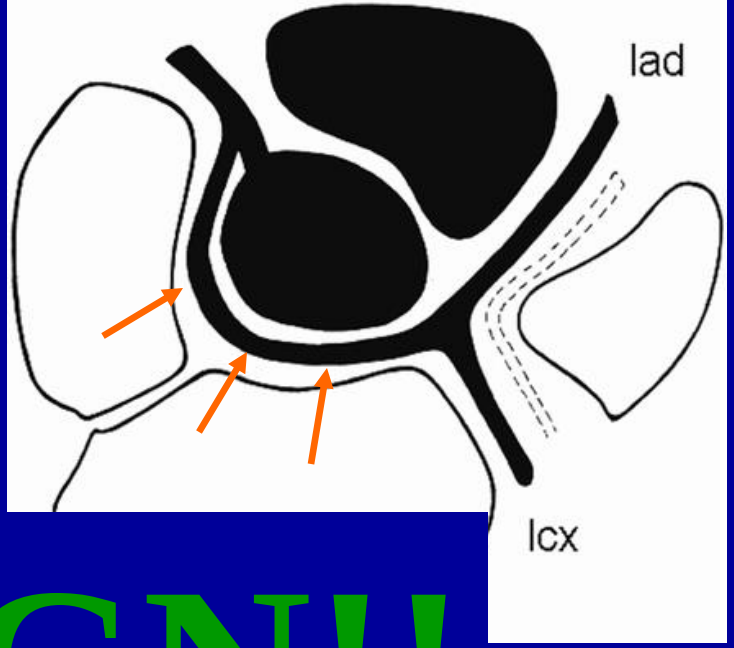
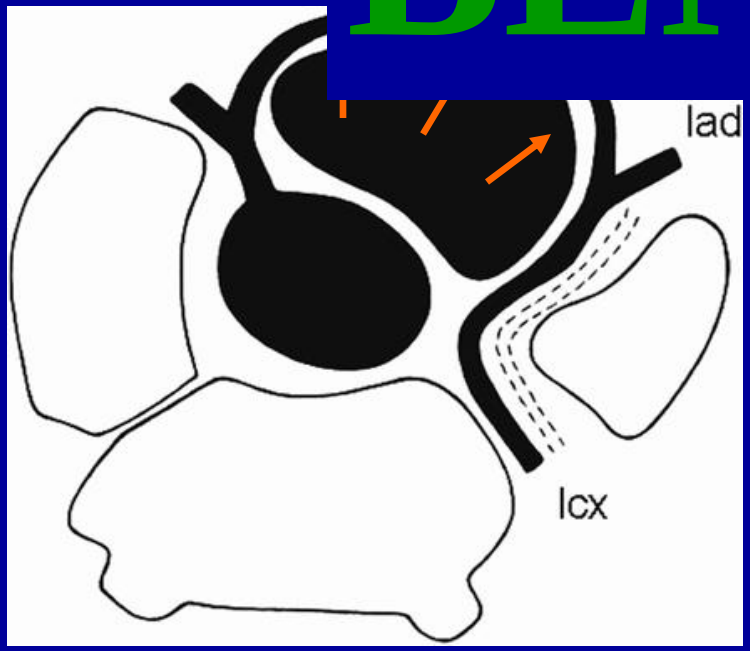
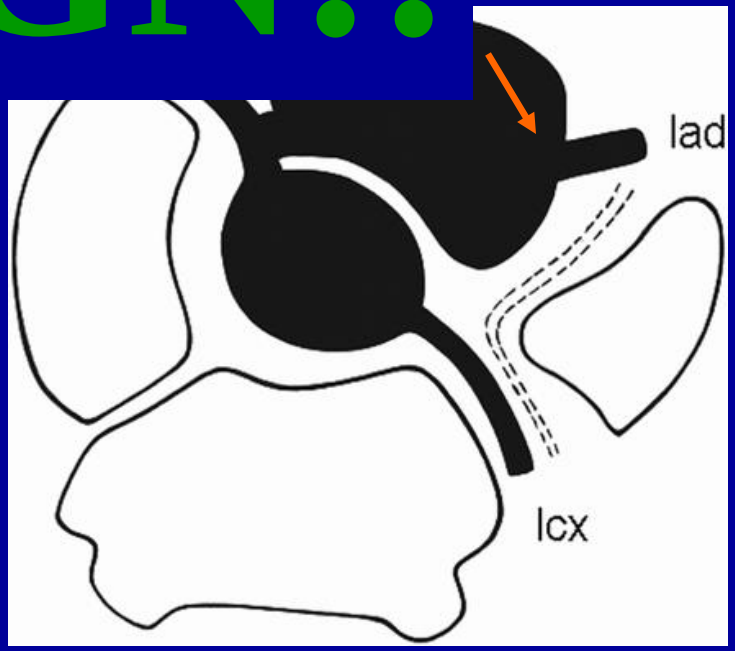


aortic

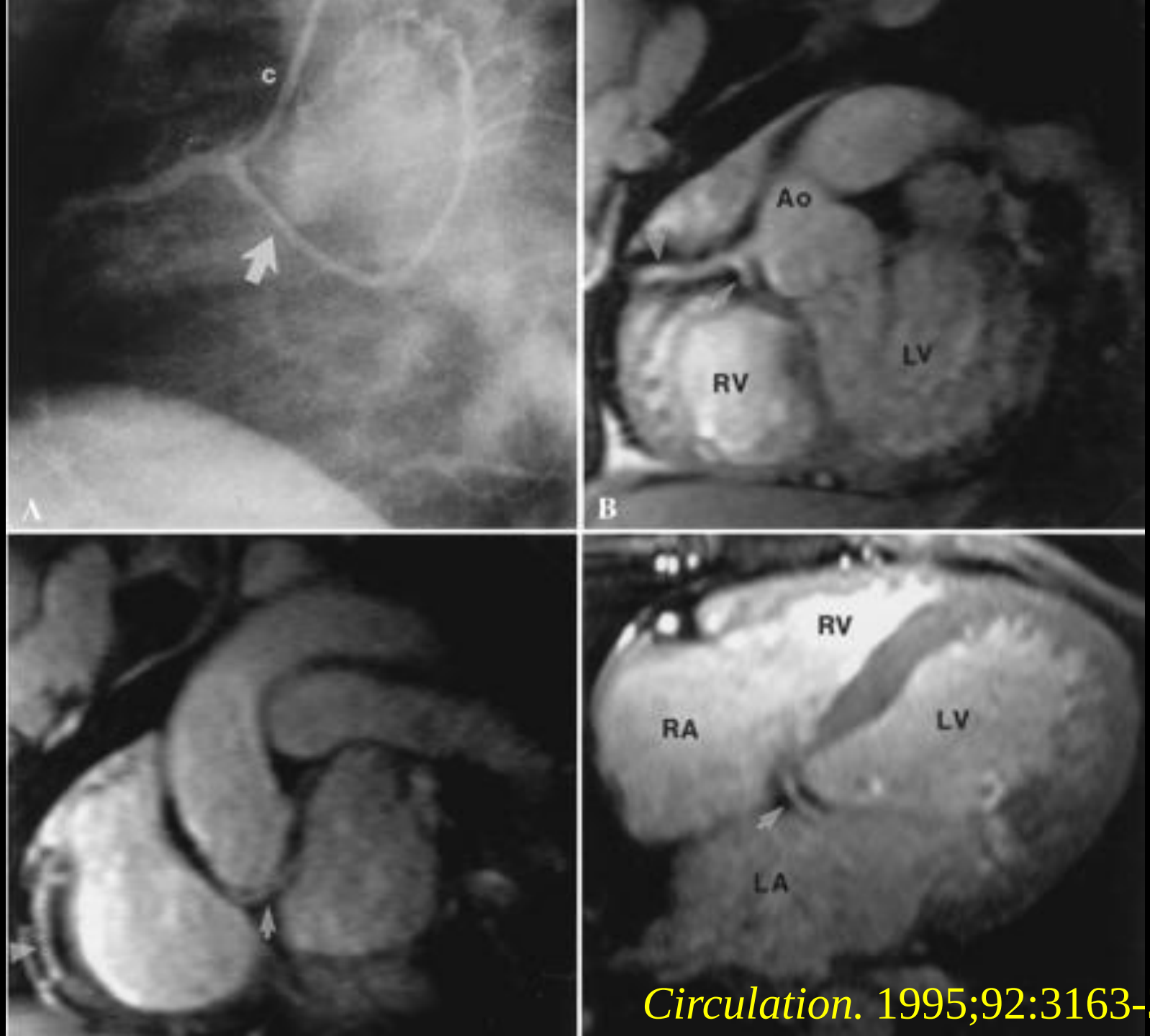
BENIGN!!



Anom LCA: Anterior



Anom LCA: Intramural



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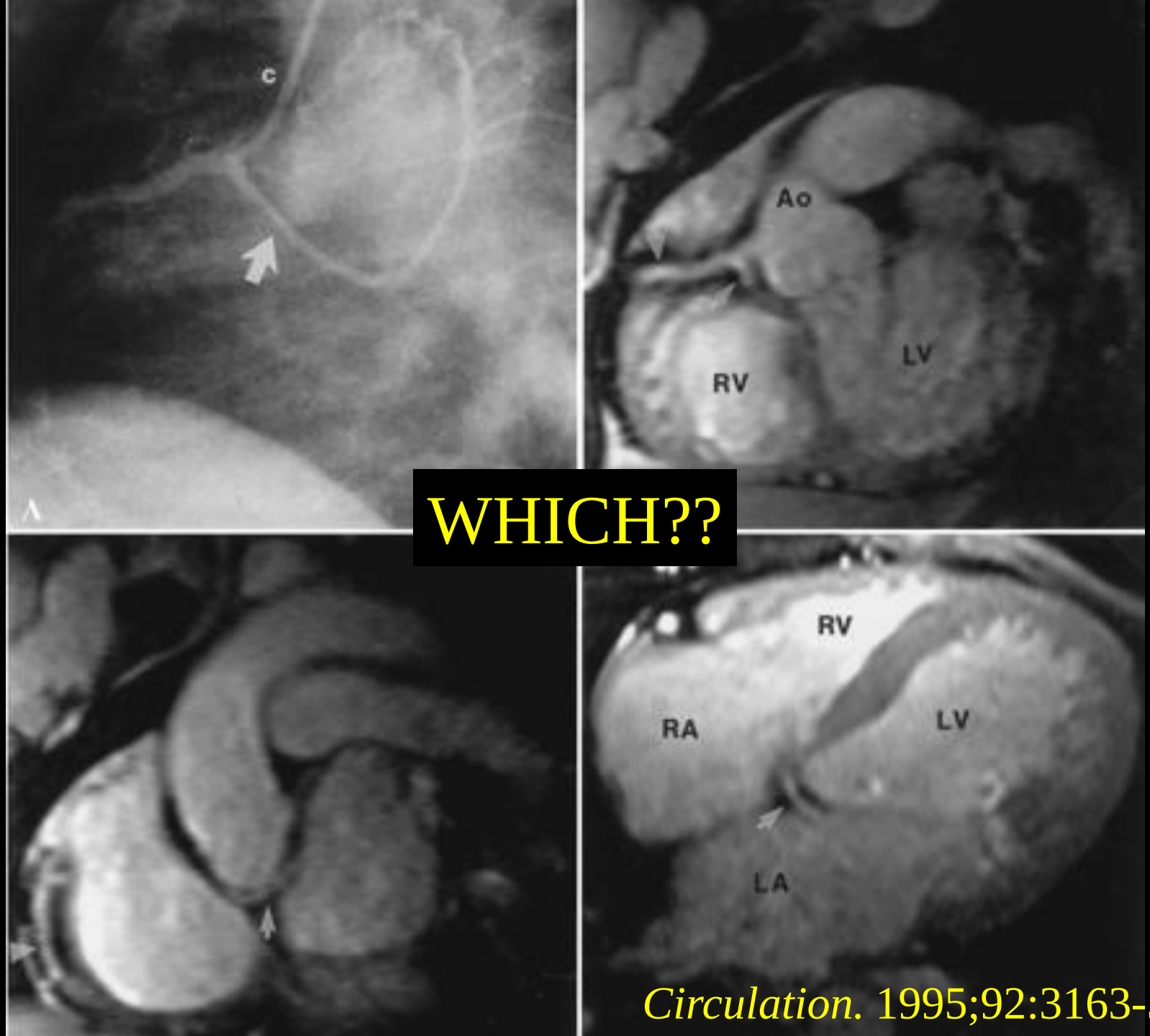

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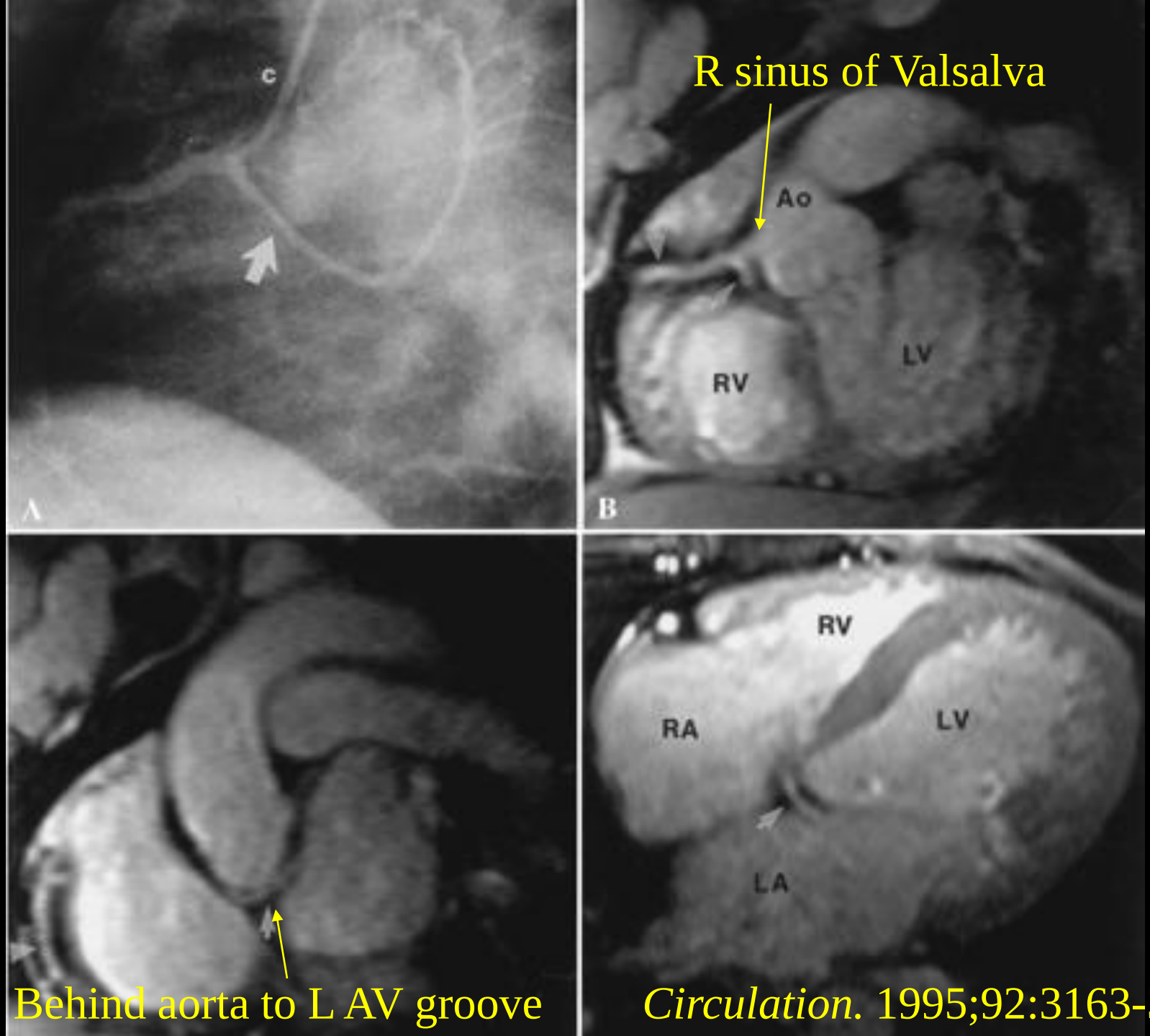

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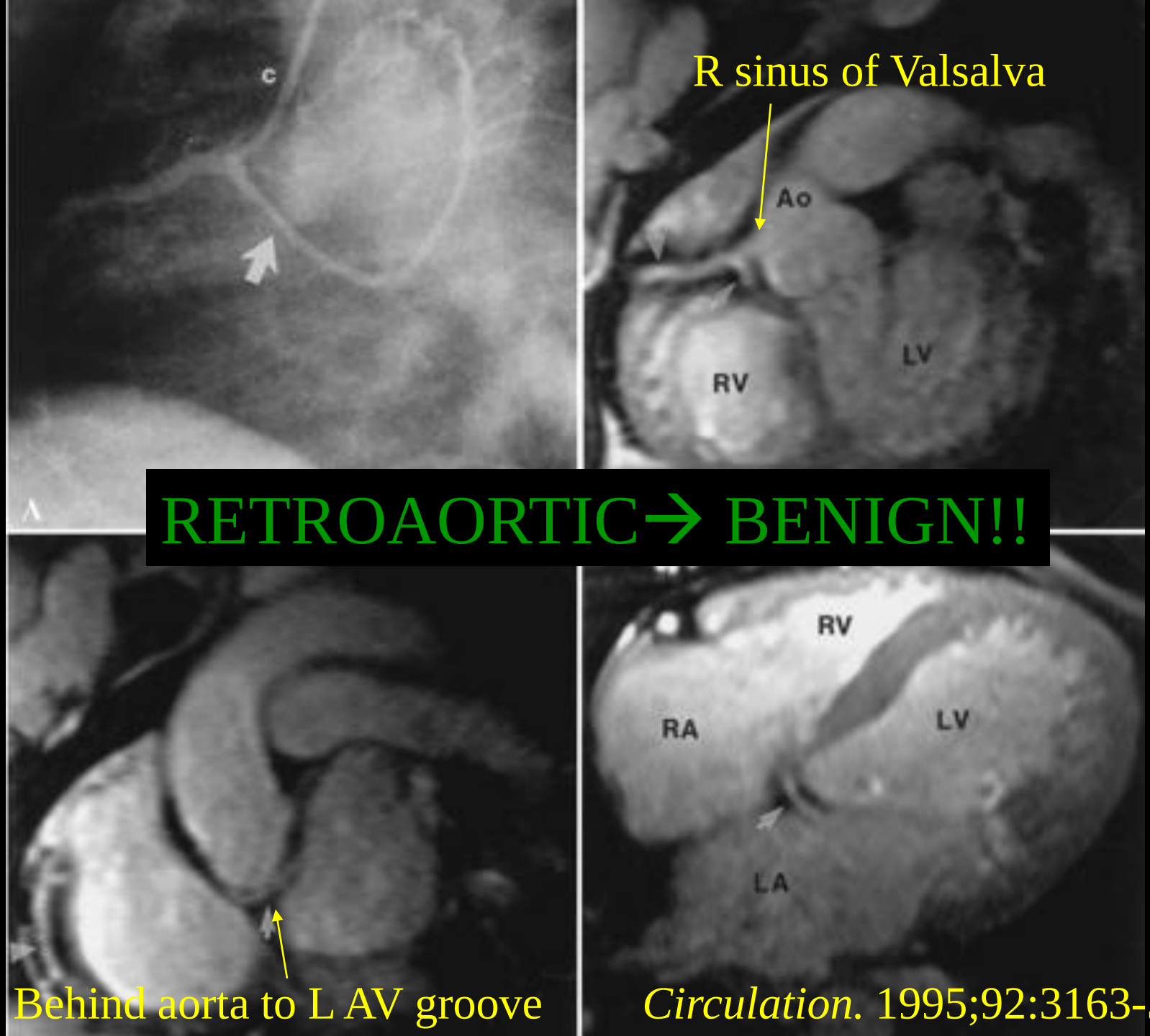
R sinus of Valsalva
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LV
RETROAORTIC→ BENIGN!!
RV
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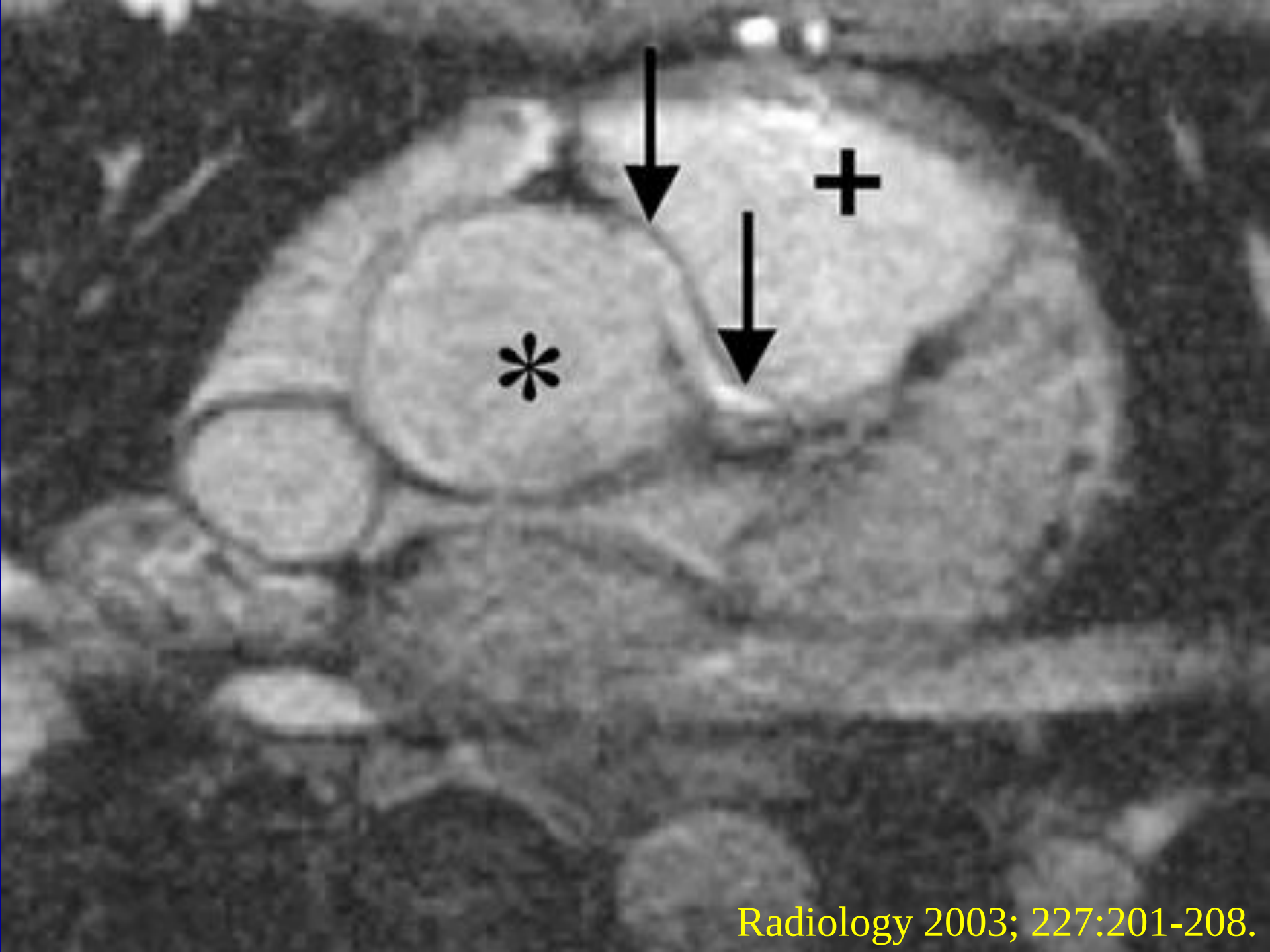
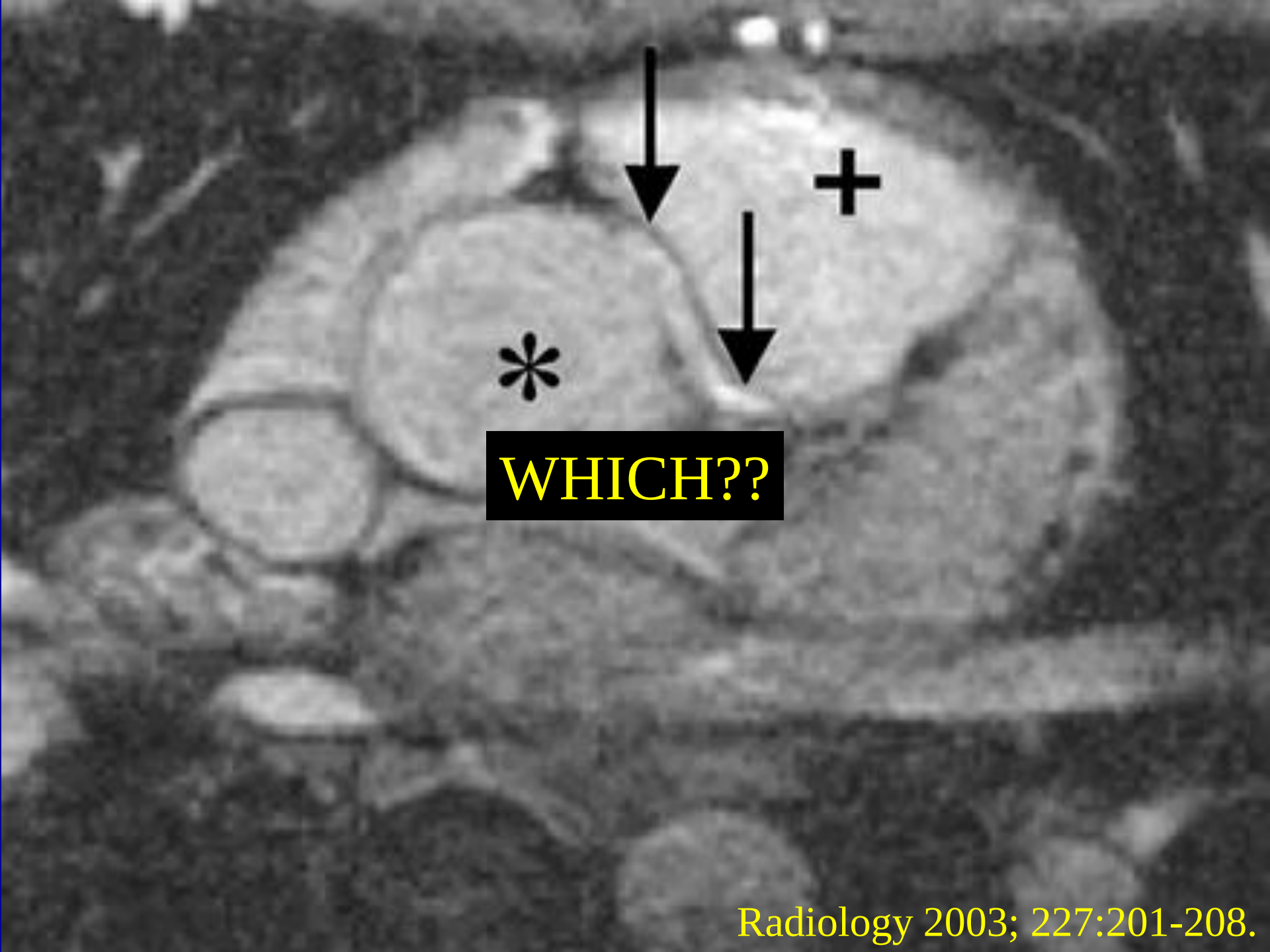
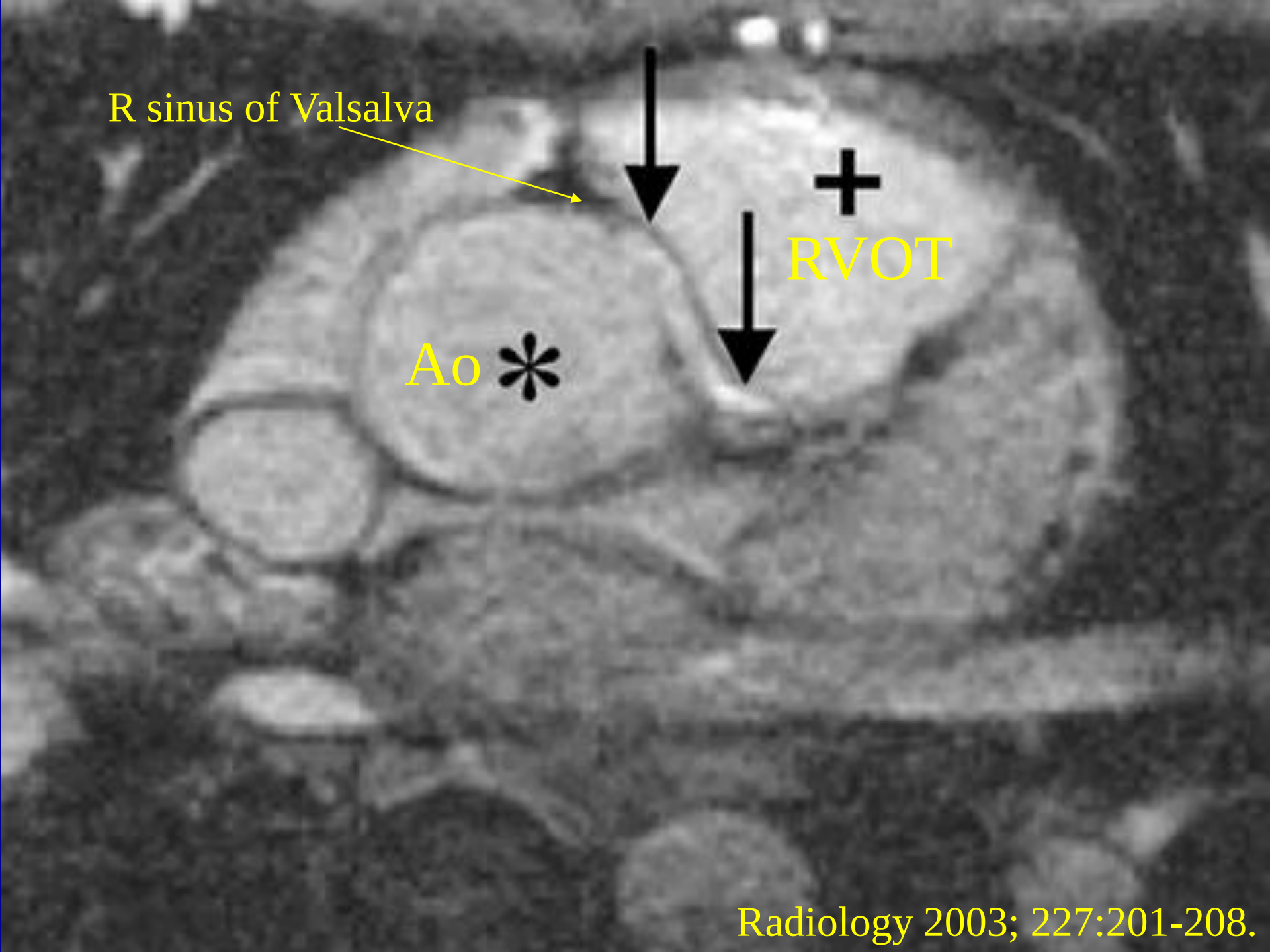
Behind aorta to L AV groove
Circulation. 1995;92:3163-3171.



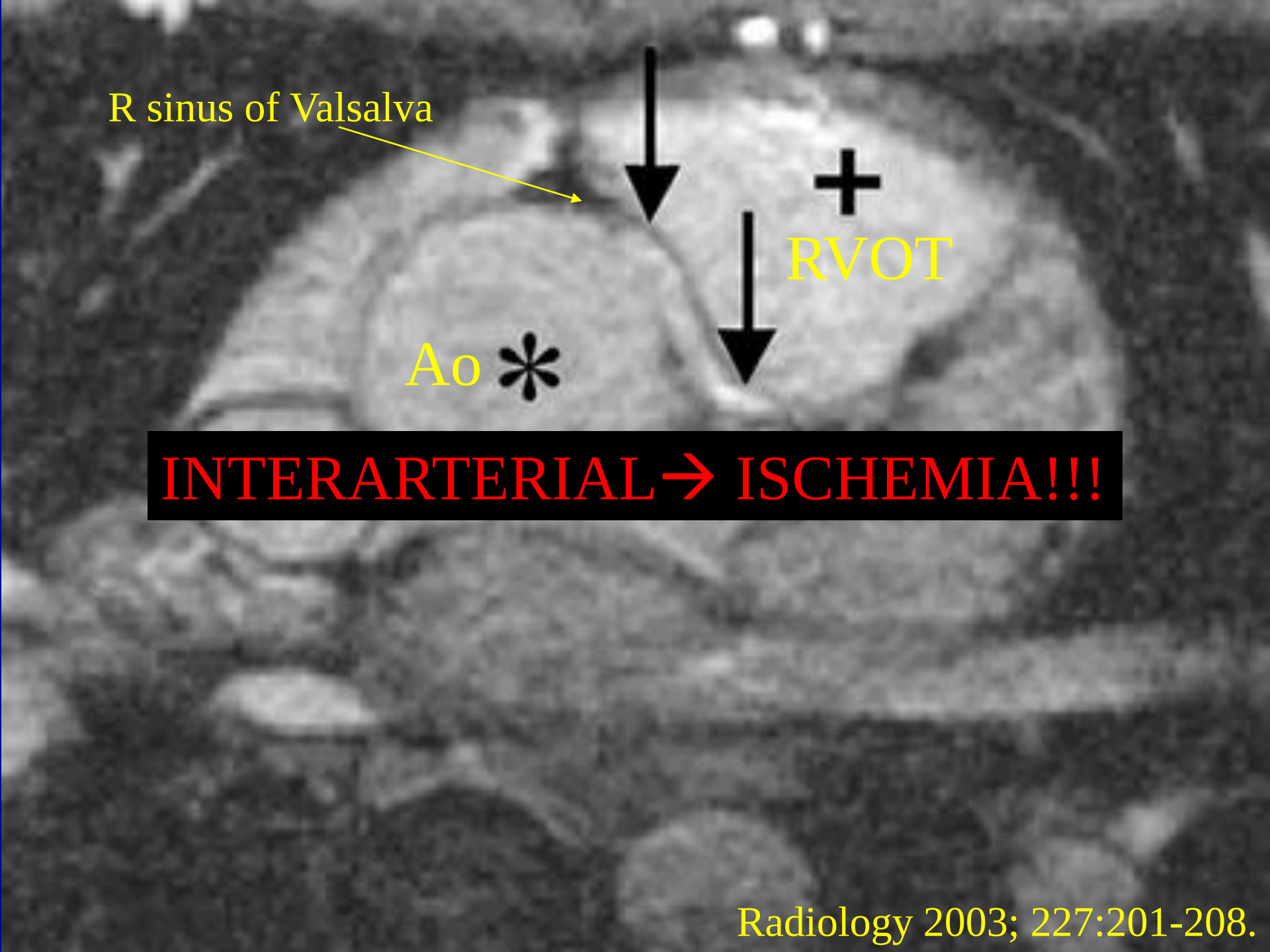
Radiology 2003; 227:201-208.



Radiology 2003; 227:201-208.



Radiology 2003; 227:201-208.



Radiology 2003; 227:201-208.

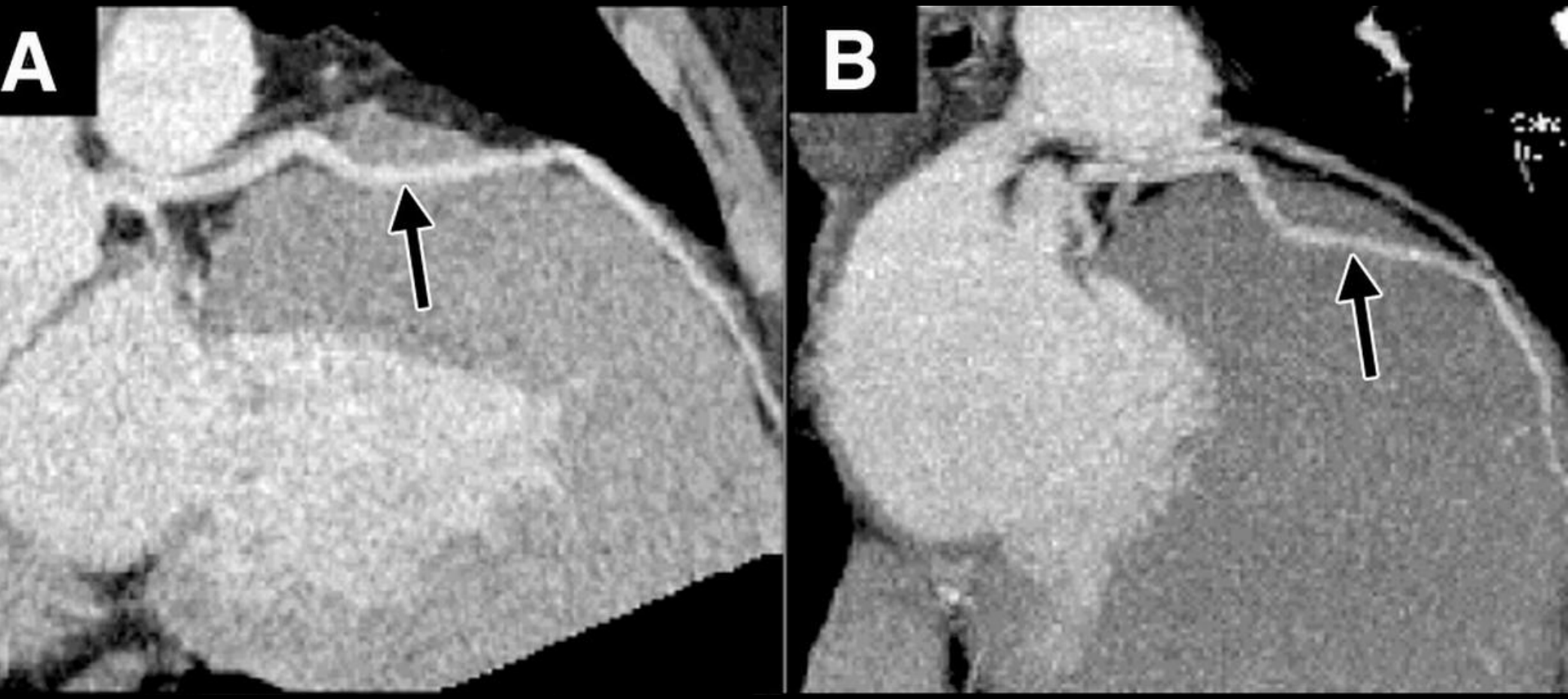
“Myocardial Bridging”

- Segment of coronary artery dives below epicardial surface, surrounded by myocardium
- In some cases the buried segment significantly narrows during systole, thought to compromise coronary blood flow
- Controversial as most coronary flow is during diastole
- This finding is USUALLY BENIGN but isolated reports of clot at site of bridge leading to MI

Myocardial bridge over LAD

Diastole

Systole



Radiology 2004;232:7-17.

Conclusion

- Anomalous coronary arteries are rare but potentially life-threatening & treatable causes for CP, MI & sudden cardiac death
- Radiologists can play vital role in making diagnosis, provided that we are aware of it
- Not difficult to diagnose once familiar with basic variations on anomalous anatomy and which are the dangerous variants

References

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