Closure of coronary artery fistulas and long term outcomes

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TCTAP Seoul, Korea 2015

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Guy's and St Thomas' NHS
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Disclosures

Consultancy: NuMED Inc

Lifetech Inc

Venus Medtech

Proctor: Medtronic Inc

St Jude Medical

Coronary artery fistulas

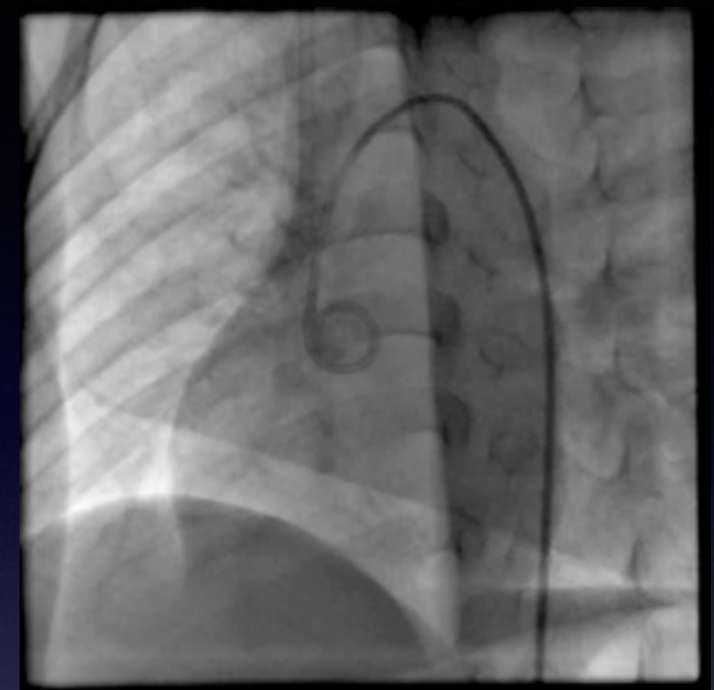
- CAVFs need to be closed when symptoms are present
  - Symptoms occur at the extremes of life
    - CCF in newborn or early infancy < 1 year of age
    - In older patients, symptoms of angina, breathlessness, palpitations
- In some pts, asymptomatic murmur is main finding

Coronary artery fistulas

- In neonates, only close CAVF, if CCF occurs or ventilator-dependence
- Otherwise wait for adequate weight e.g. > 10 kg in asymptomatic fistulas
- Technically procedure is easier in bigger children
- Occasionally small CAVFs may close spontaneously

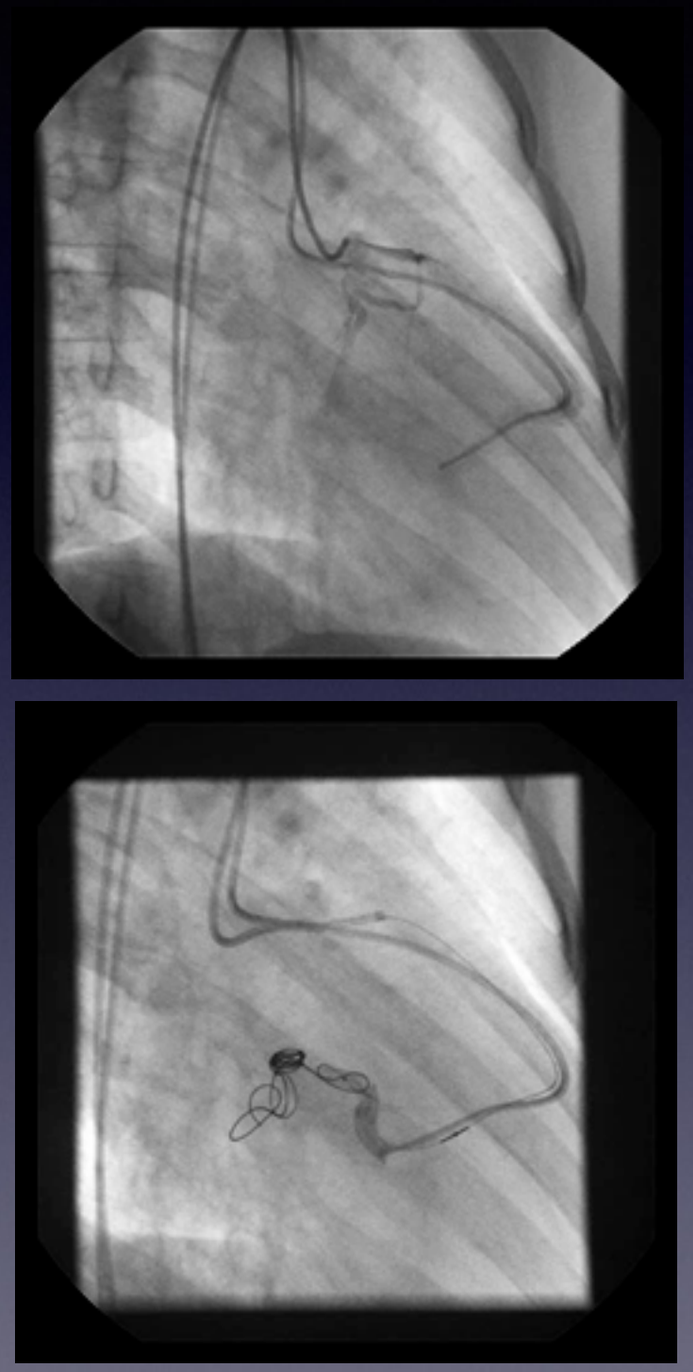
Controlled-release coils

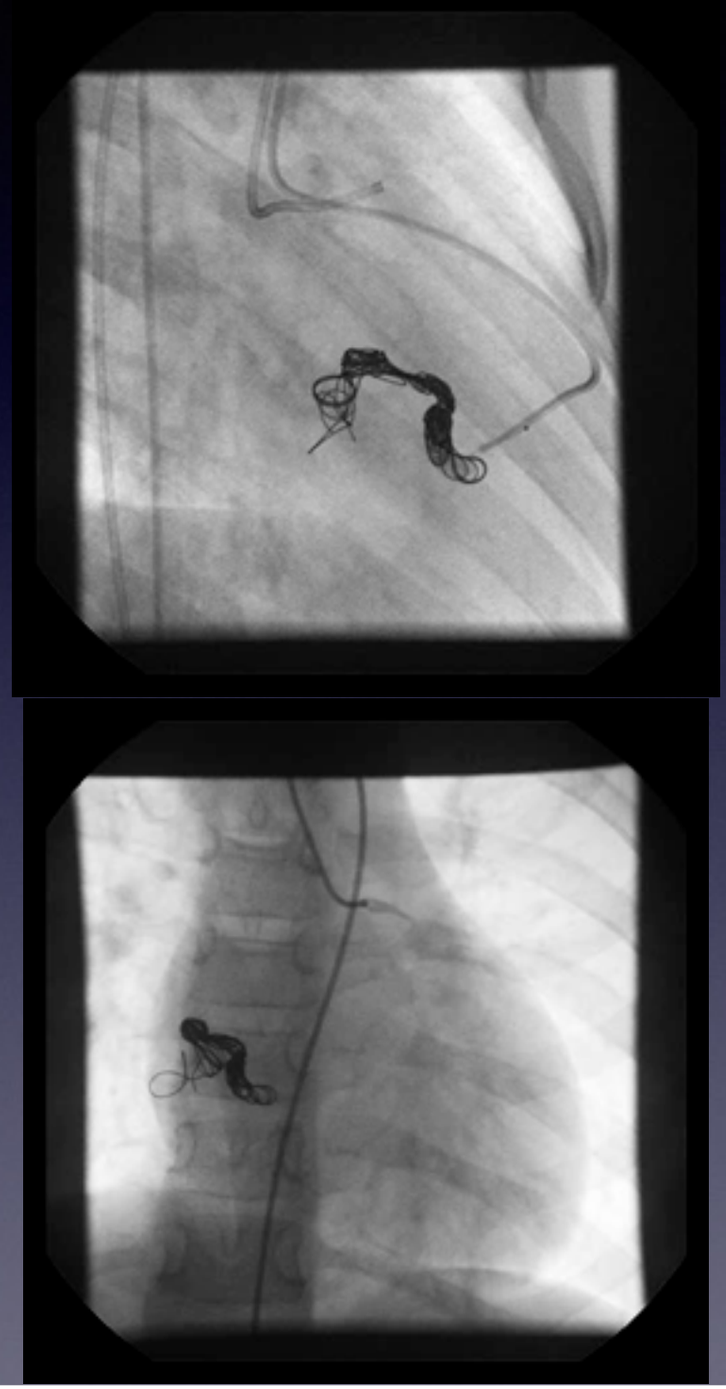
- Many bends (usually small fistulas)
- Guiding catheter or micro catheter passed to point of occlusion
- High flow in the fistula
- Stenosis at exit point present
- Coils packed to form a nest



Controlled-release coils

Numerous bends and smaller size vessels tend to have multiple feeding vessels





Micro-Ferret 3 Fr catheter and controlled-release DCS coils

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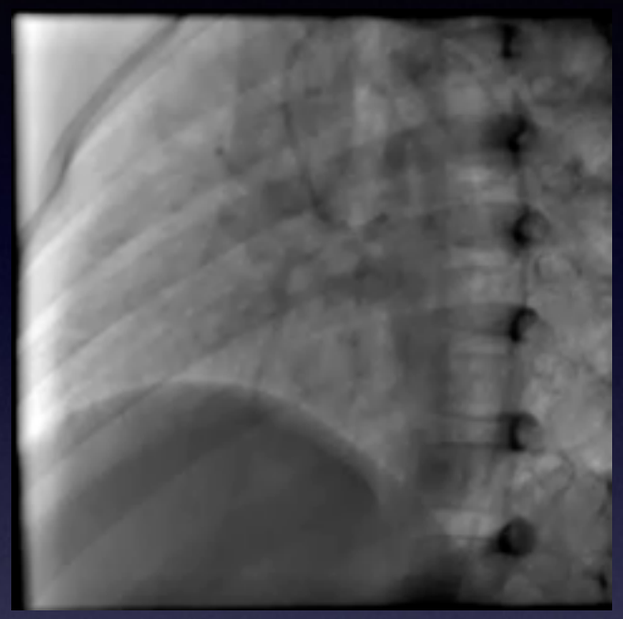
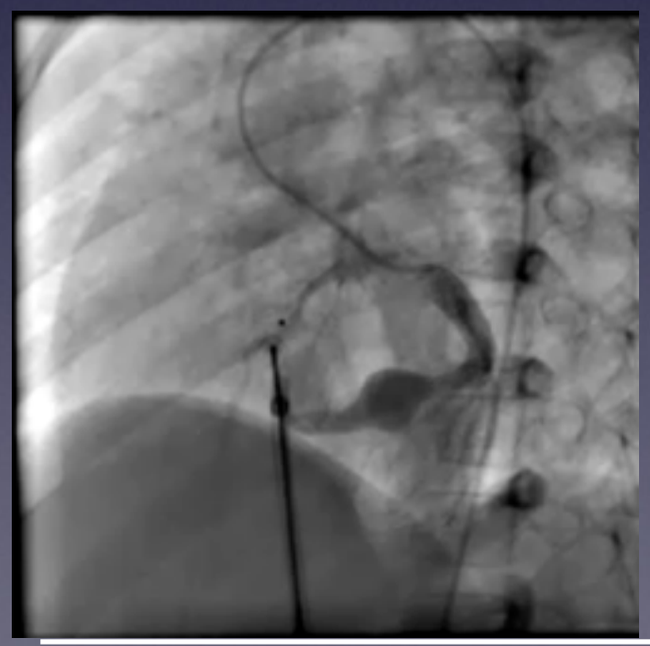
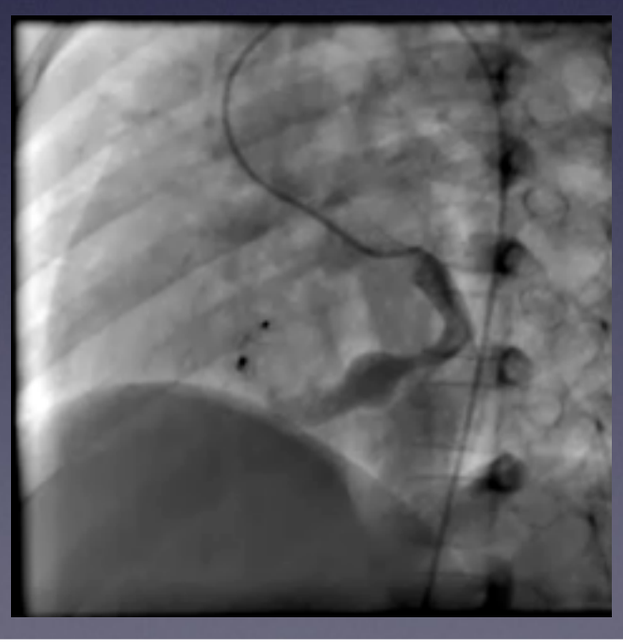
Vascular occlusion devices

ADO or other devices need A-V guidewire circuit for delivery



Circumflex to RA fistula





Closed with ADOI

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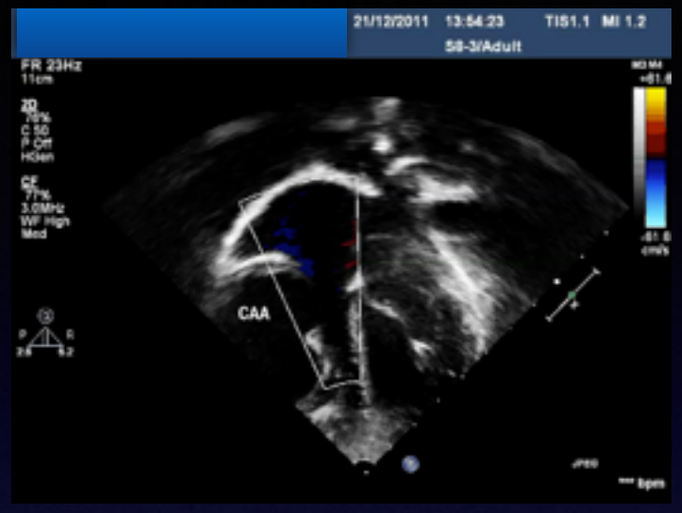
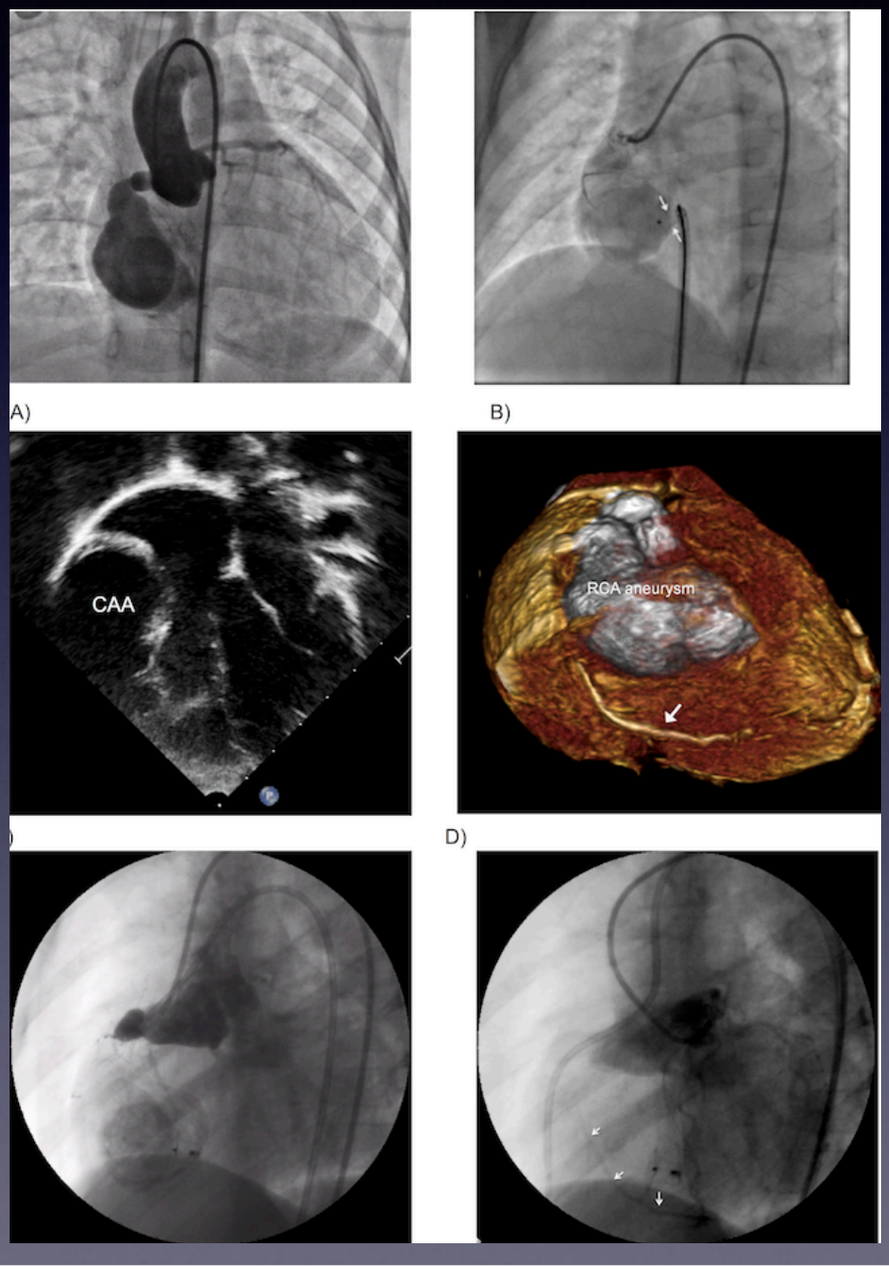
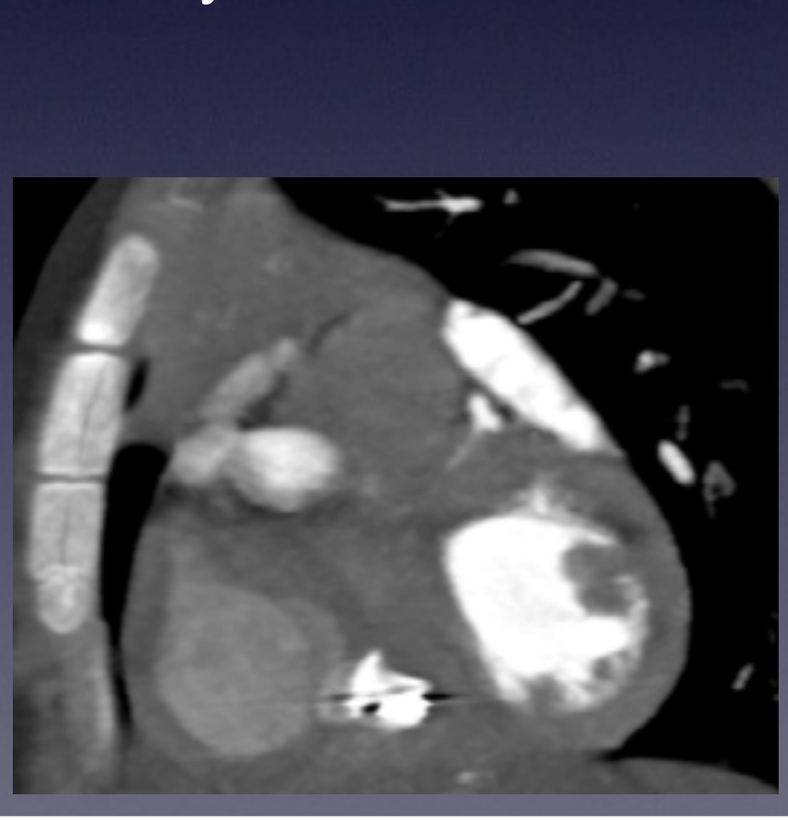
CAVF
Unusual progression of aneurysm



Such fistulas need the aneurysm to be excluded





Courtesy: Dr Worakan Promphan, Bangkok

CAVF with aneurysms
How to deal with these?

- 2 ADO I devices delivered towards the aortic end and RA end of the fistula
- This excludes the aneurysm

Courtesy: Dr Sivakumar, Chennai

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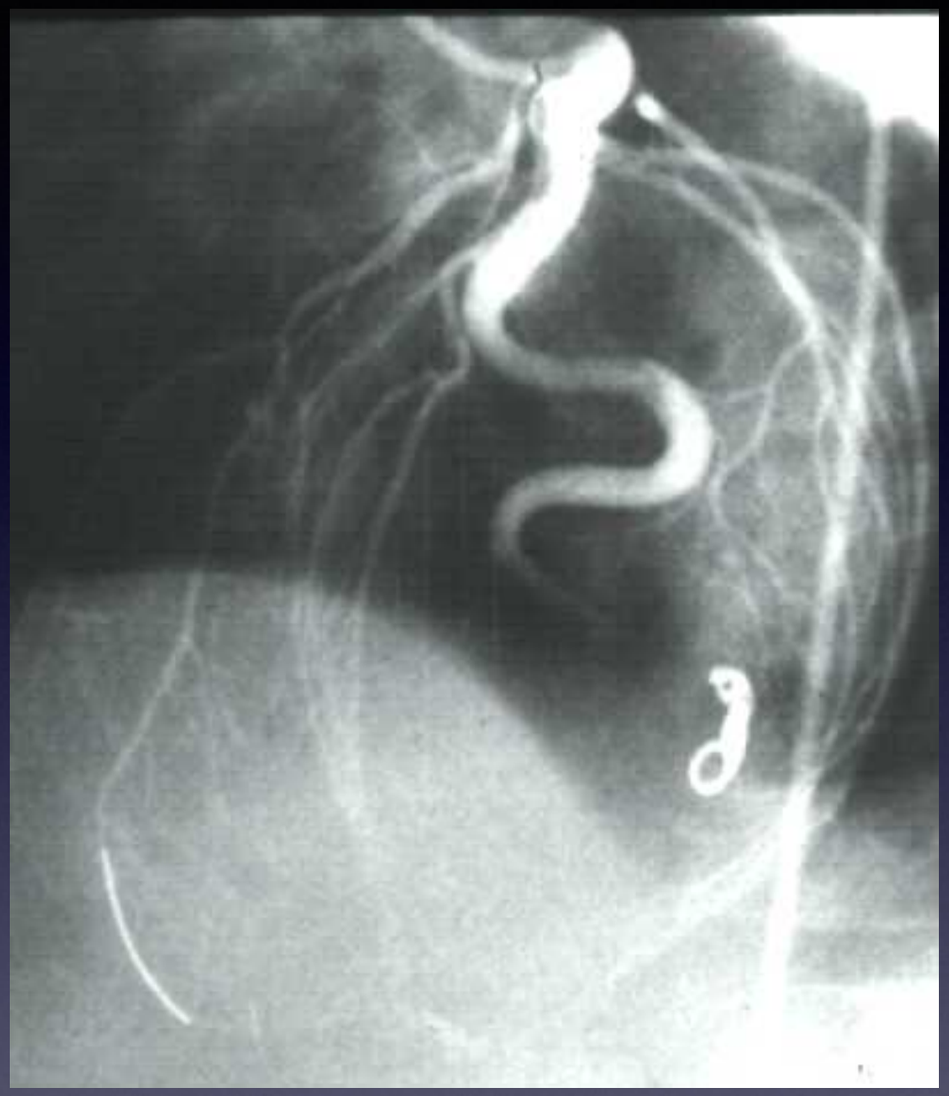
What happens to the coronary fistulas during follow up after closure with devices?

Long term follow up after closure of CAVFs



Immediate result

8 year later

Some remodelling of the coronary artery has occurred

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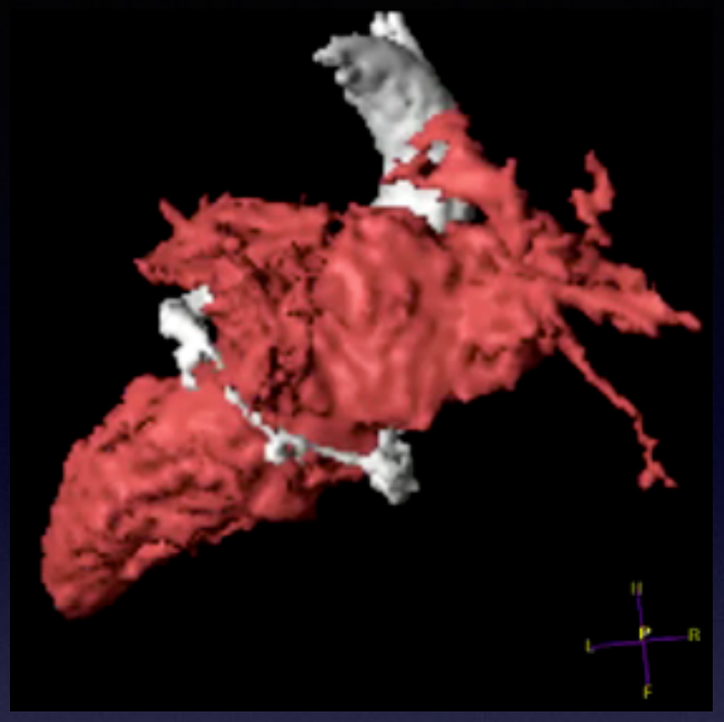
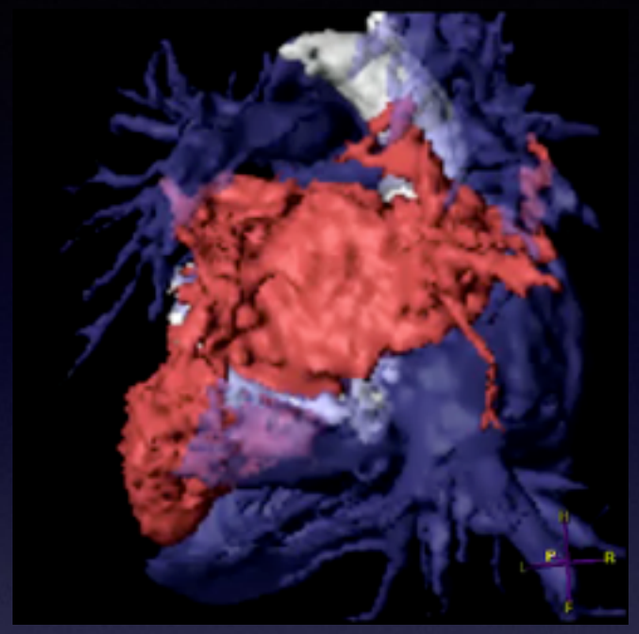
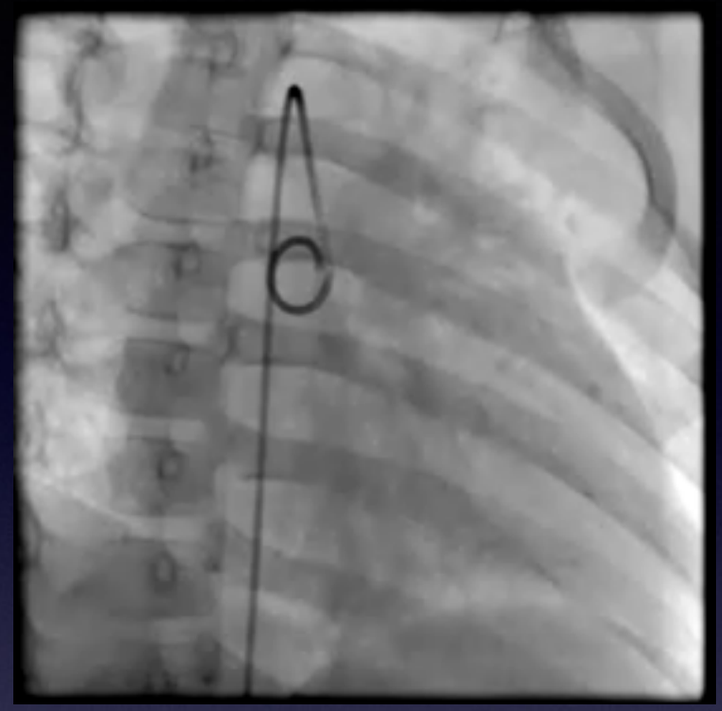
Circumflex to RA fistula







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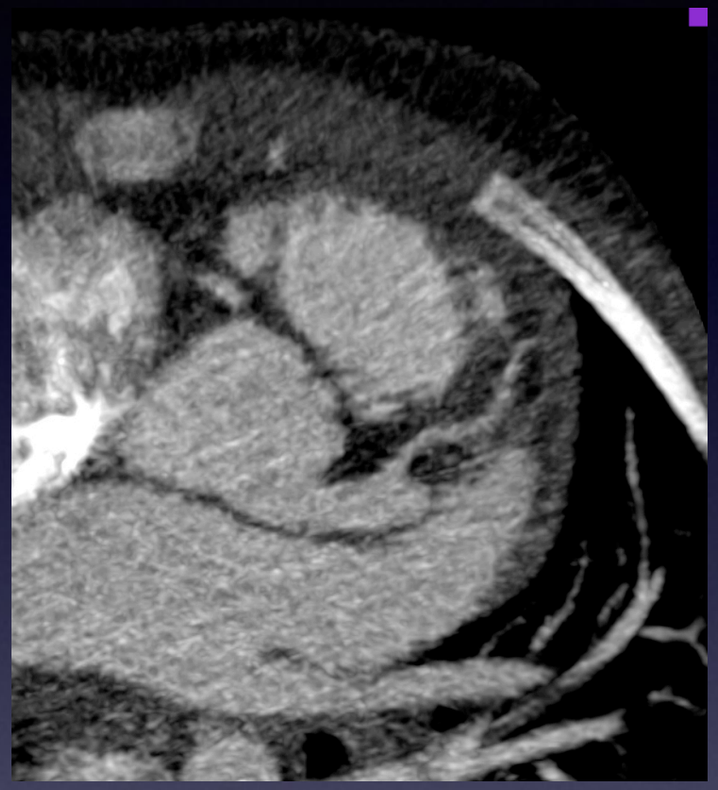
Circumflex to RA fistula
Post closure - follow up 1 year later



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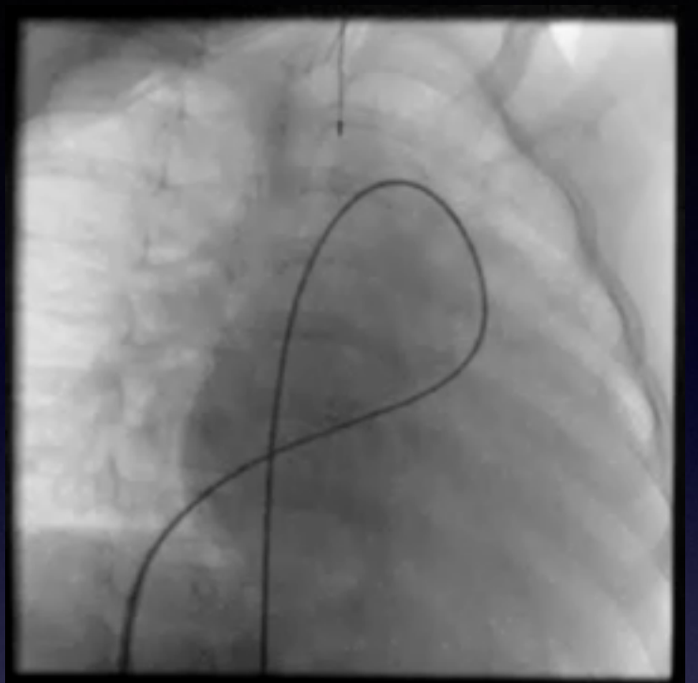
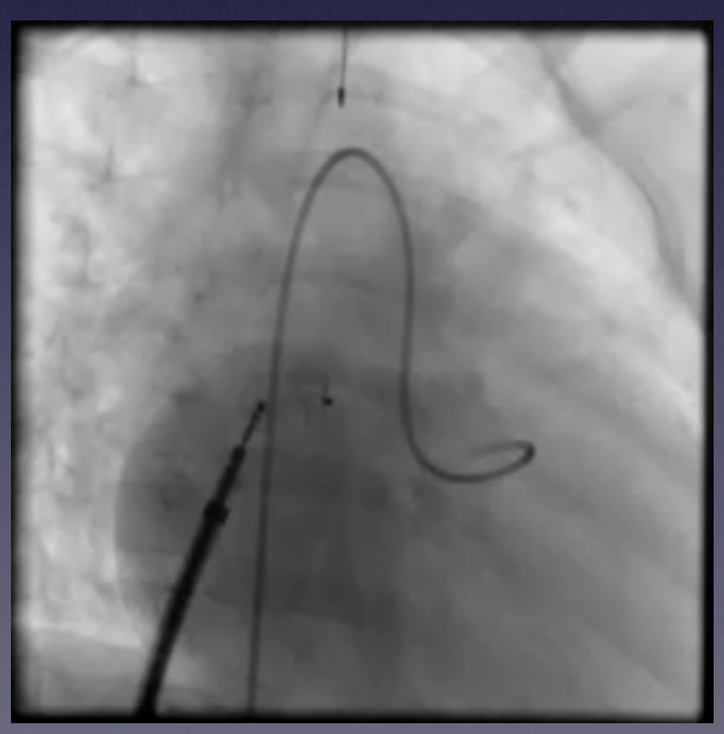
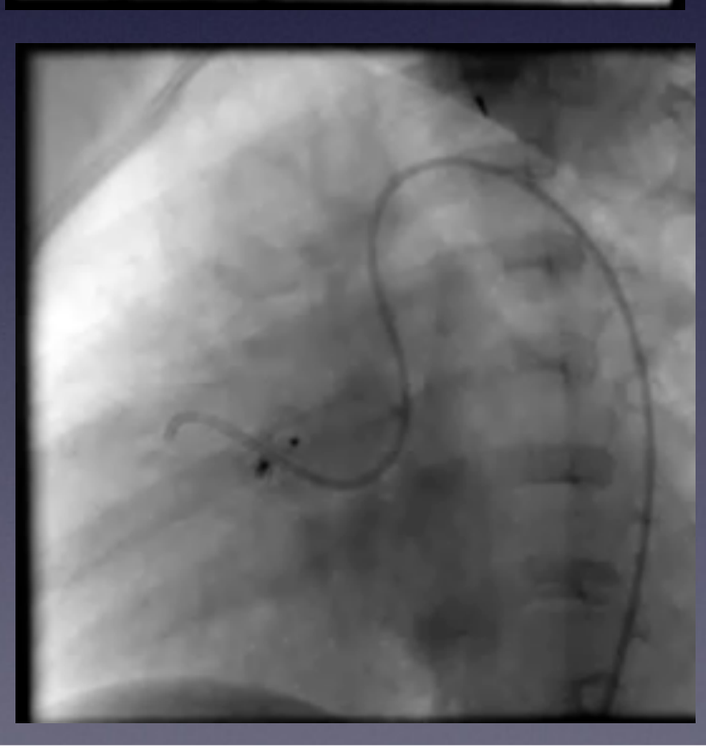
RCA to RA fistula
Closed with ADO I







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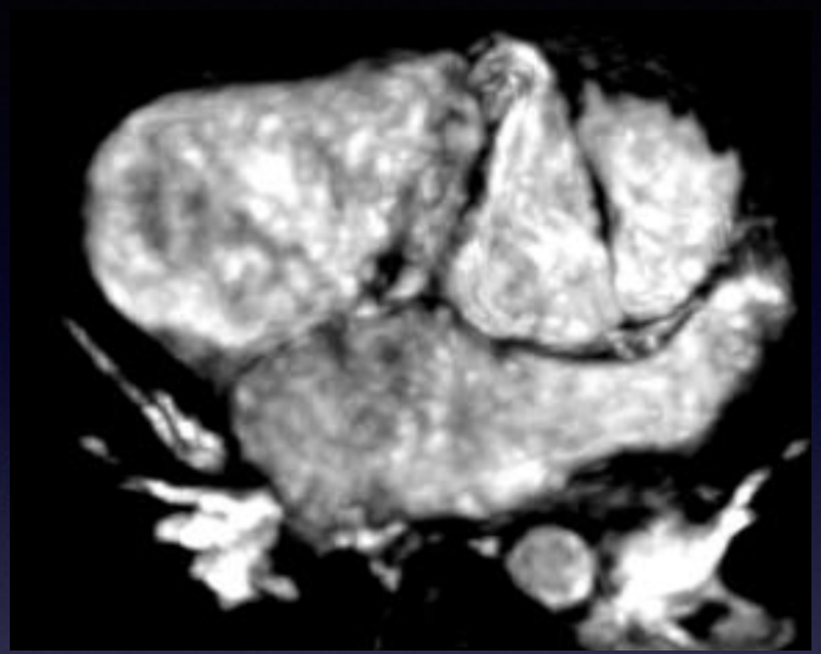
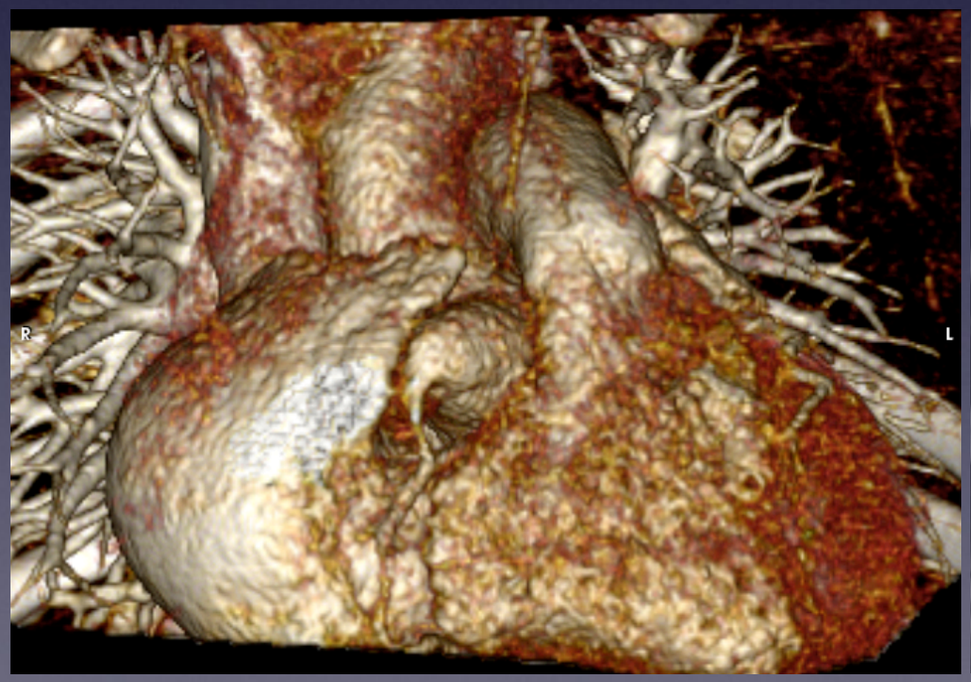
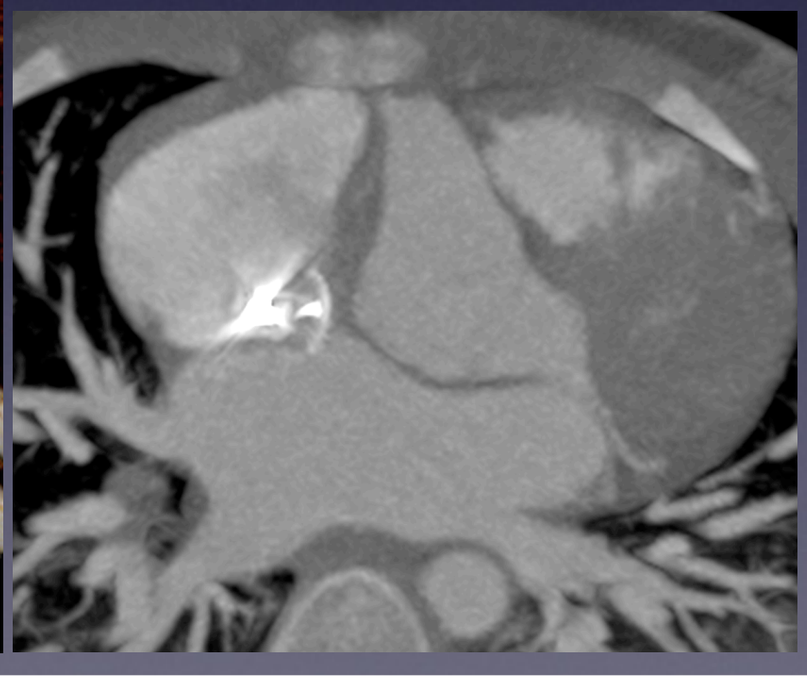
RCA to RA fistula
Closed with ADO I



Pre closure





Post closure with ADO I
9 months later

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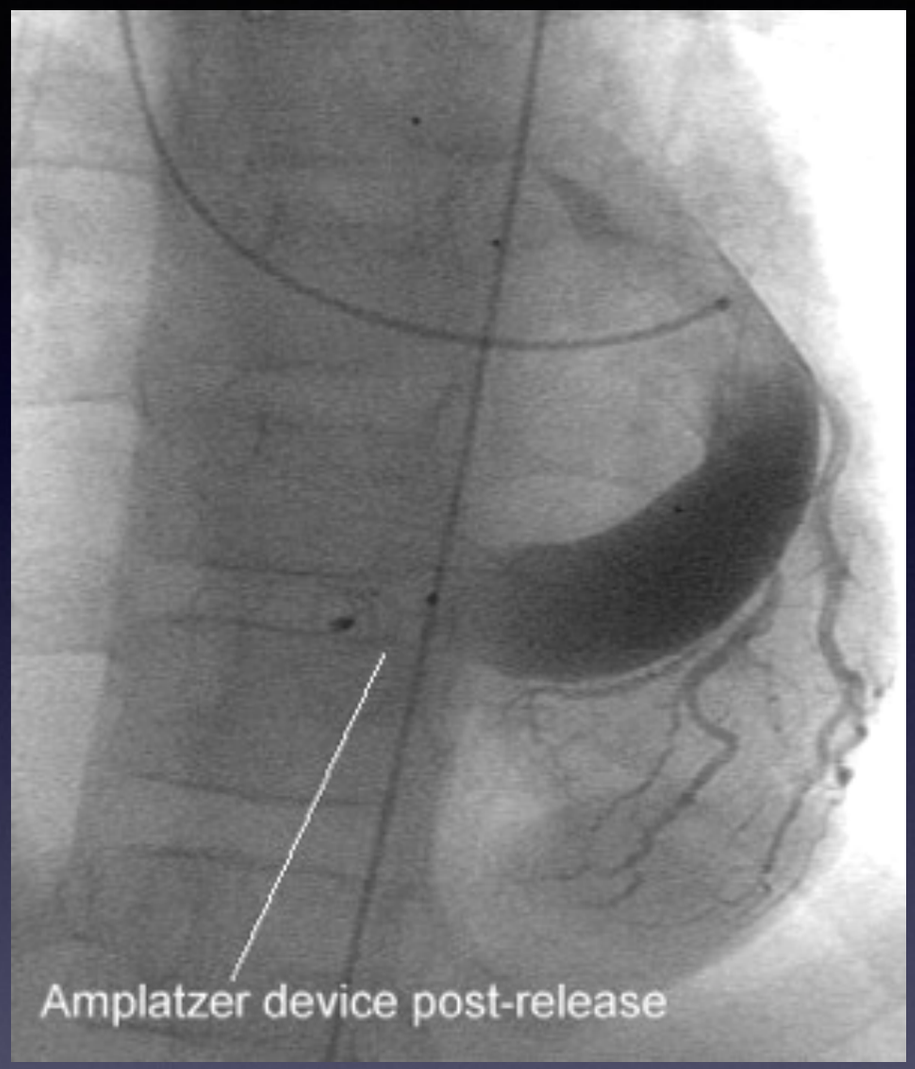
Follow up of CAVF closure
RCA to RV closed with AVP II

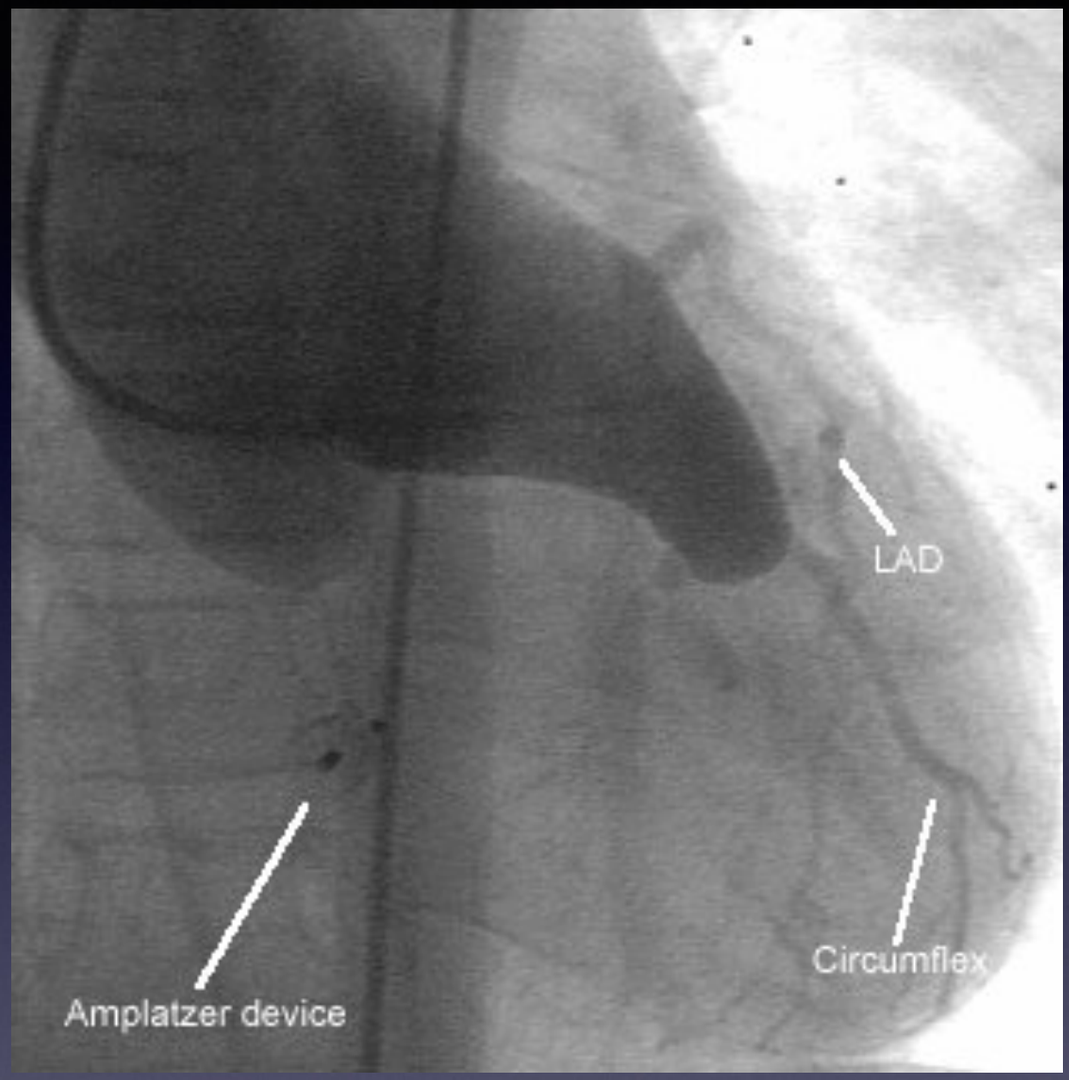
Some propagation of thrombus occurs 1 year later

Courtesy: Worakan Promphan

Long term follow up after closure of CAVFs



LCA to RA fistula closed with ADOI



Follow up angiogram 4 years later

Liang et al, 2006

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Long term follow up after closure of CAVFs

- 41 pts had surgery over 30 yr period from 1968 – 1997
- Mean age 23 years, range 2.3 – 58 yrs
  - Symptomatic 28 (68%)
  - Continuous murmur 41 (100%)
- No operative mortality
- Morbidity:
  - post-cardiotomy syndrome in 4 (10%),
  - transient myocardial ischaemia in 3
  - No myocardial infarction occurred

Cheung et al, 2001

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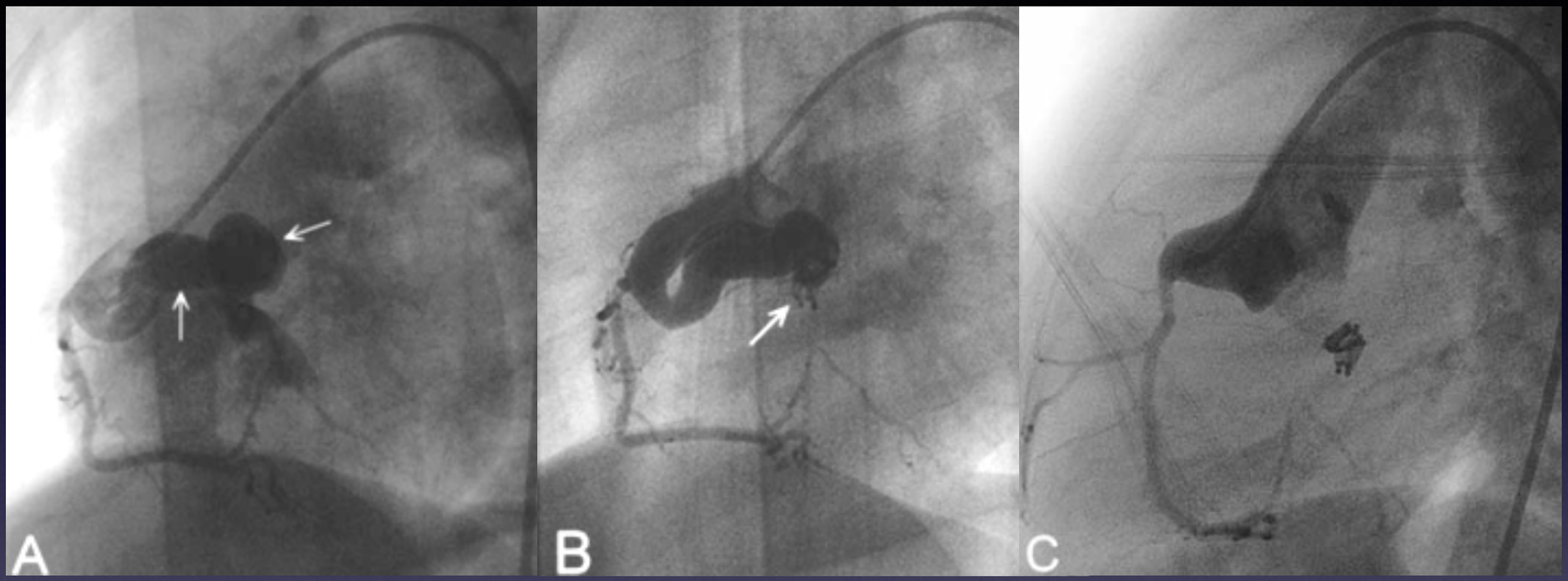
Long term follow up after closure of CAVFs

- Follow up angiography in 21 (50%) pts
- Proximal & distal coronary artery normal in 1
- Proximal coronary artery dilated; distal coronary artery normal in 10 patients
- Proximal coronary artery dilated; distal coronary artery thread-like/ completely thrombosed in 4 patients
- Proximal coronary artery thrombosed stump; distal coronary artery filled by collaterals in 2 patients
- Proximal coronary artery dilated; distal coronary artery recurrent/ residual fistula in 4 patients

Cheung et al, 2001

Long term follow up after closure of CAVFs



Aneurysms obliterated and normal RCA at follow up angiography

Liang et al, 2006

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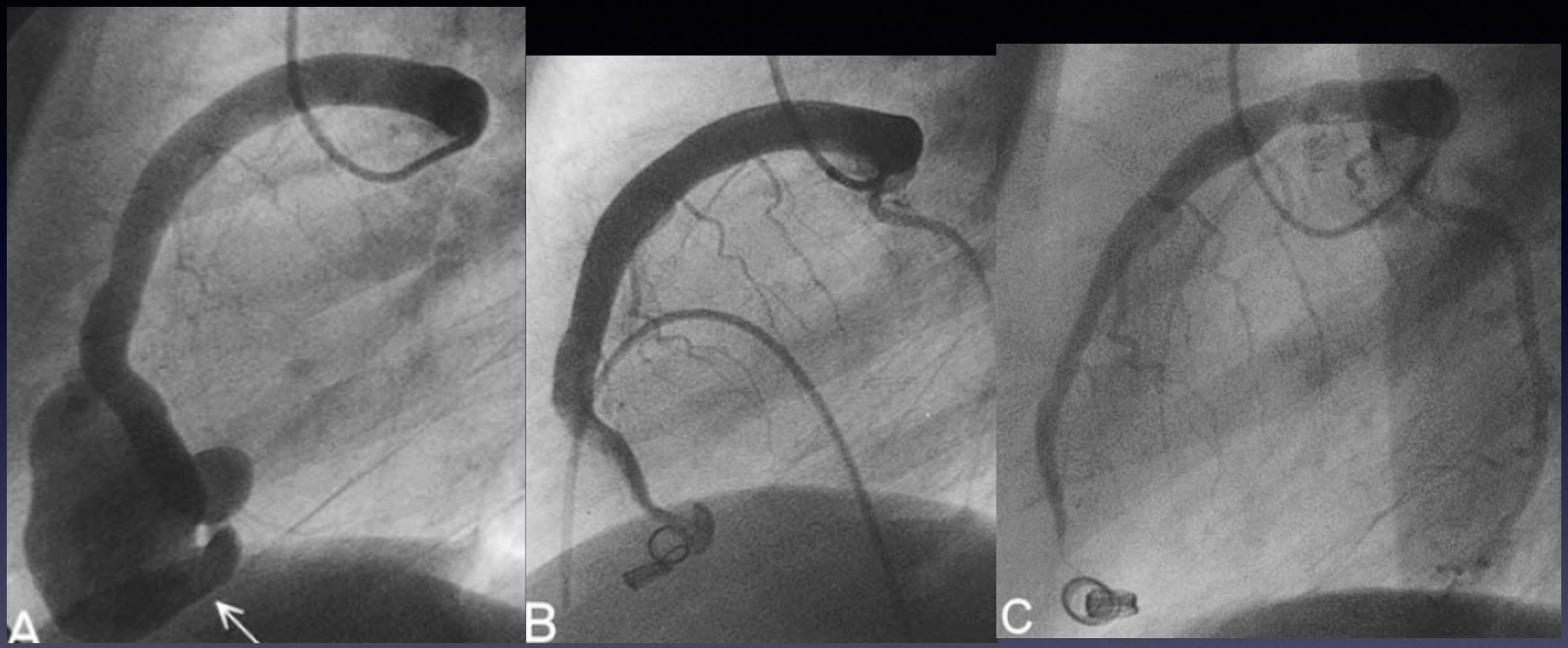
Long term follow up after closure of CAVFs



Aneurysms obliterated at 1 year follow up angiography

Liang et al, 2006

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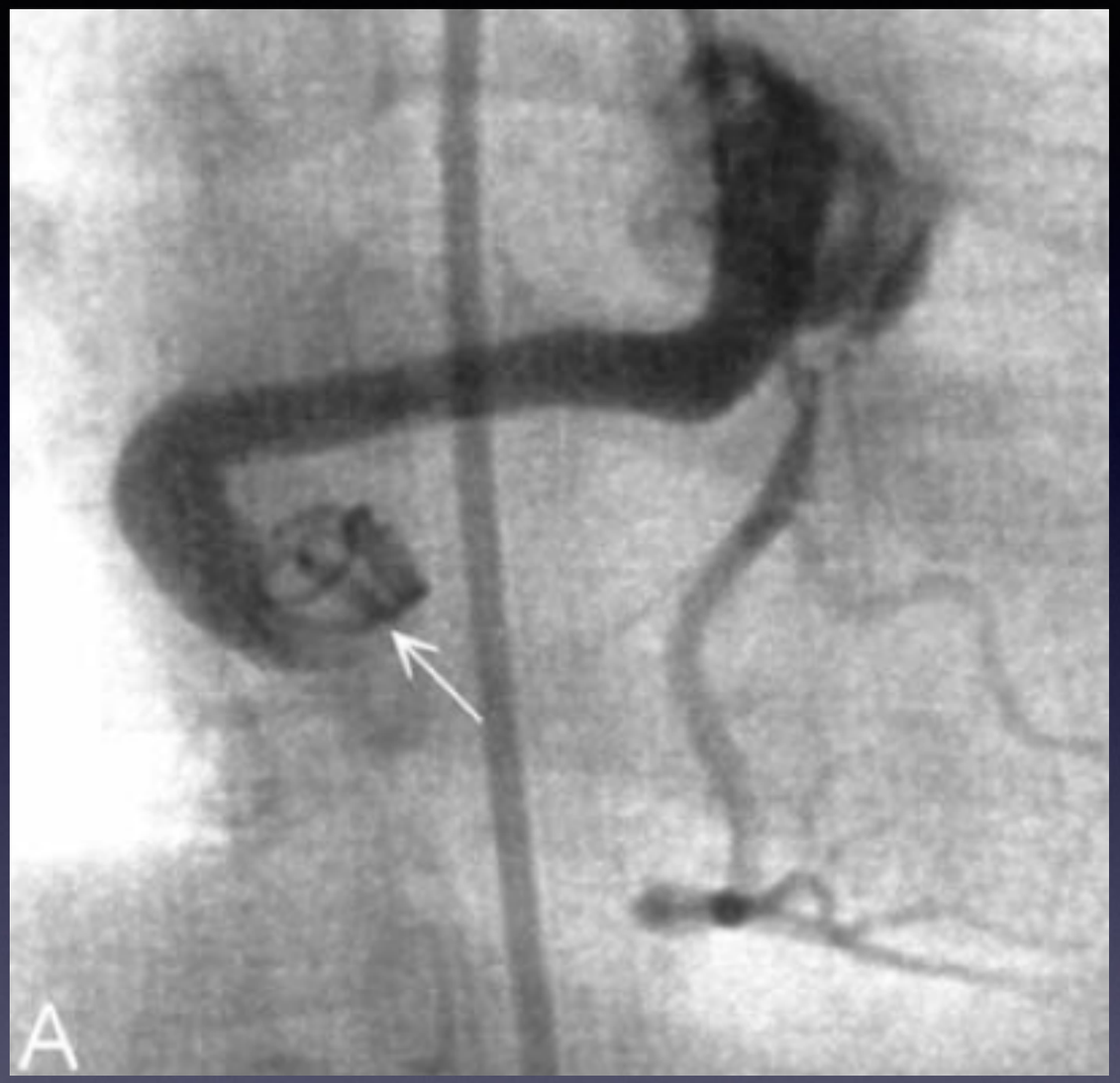
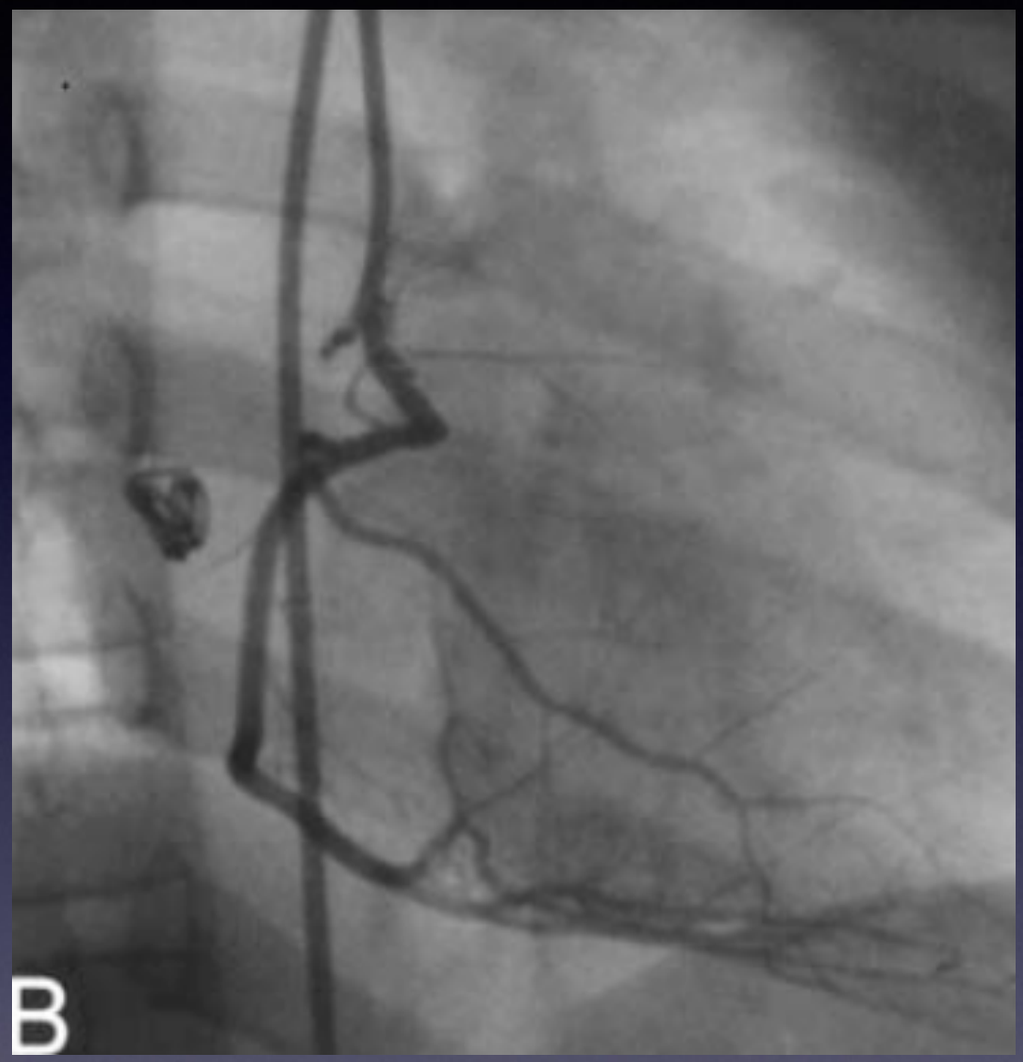
Long term follow up after closure of CAVFs





RCA to RA fistula closed with coils
Angiogram at follow up 6 yrs later showing normal RCA

Liang et al, 2006

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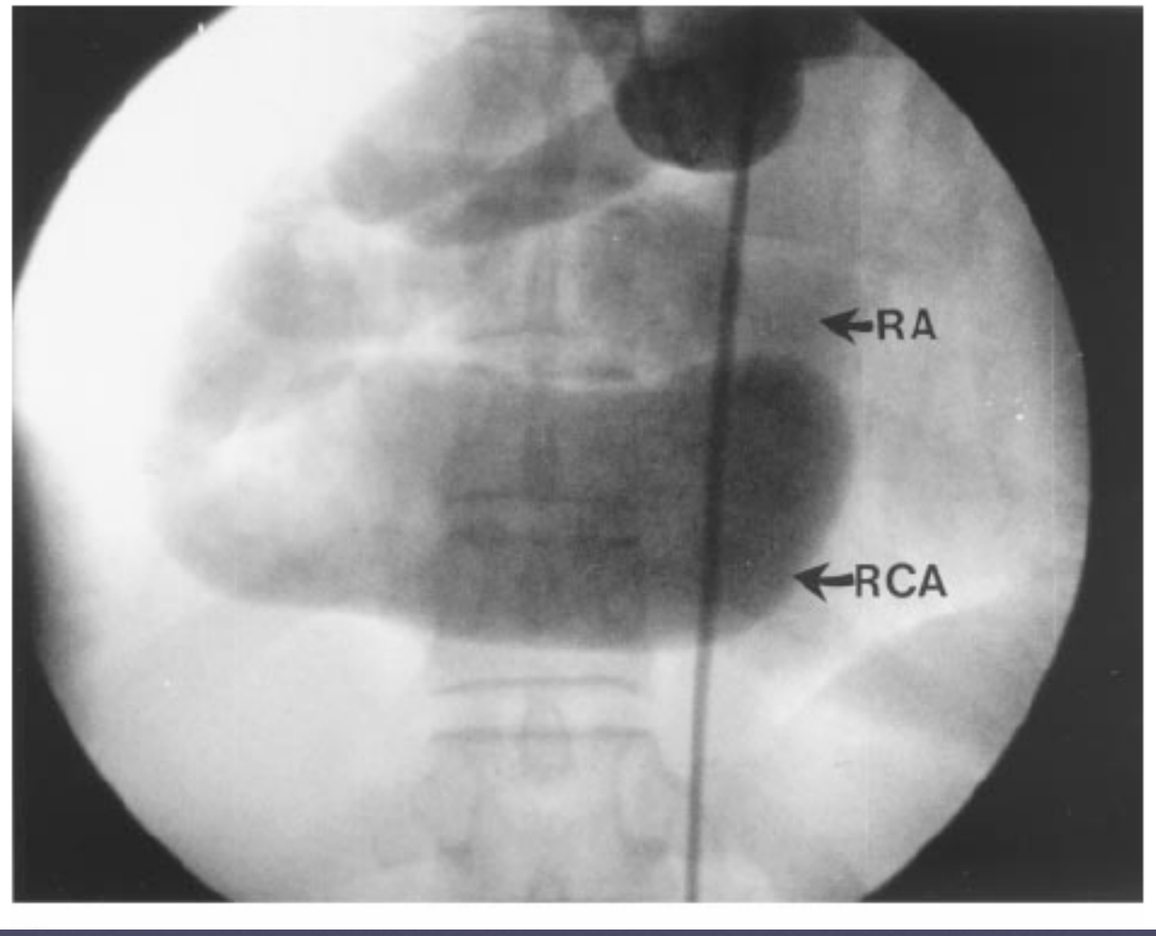
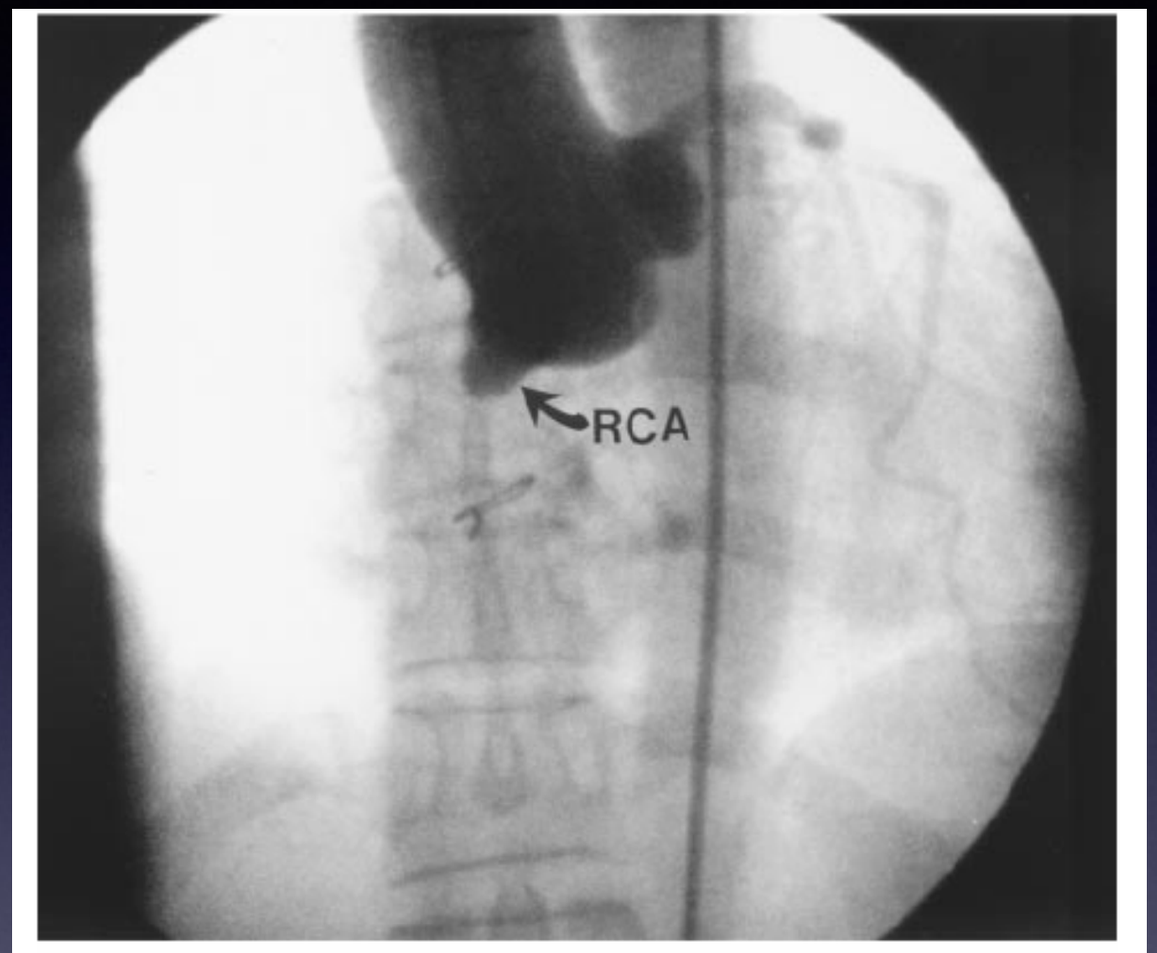
Long term follow up after closure of CAVFs



Surgically ligated



RCA has completely thrombosed leaving a short stump

Liang et al, 2006

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Closure of CAVFs

- 18 children with coronary artery fistulas
- 14 had attempted intervention (10 successful) and 4 no intervention
- Closure with PDA occluder
- 3/4 CAVFs in non-intervention group were small LCA to PA fistulas
- At median follow up of 36 months, the maximal coronary diameter decreased from mean 9.66 mm to 7.82 mm

Wang et al, 2014

Closure of CAVFs

- 29 patients had 36 catheter closure procedures
- Median age 49 years
- Successful device delivery in all pts, with immediate complete closure in 89%
- Follow up angiography in 18 (62%) patients median of 1.5 years later
- 10/18 had no recanalisation, 4 had trivial recanalisation and 4 had significant recanalisation
- Repeat closure performed in these 4 pts

Jama et al, 2011

Closure of CAVFs
Long term outcomes

- Small residual leaks in <10% of patients after catheter closure
- Persistent dilation of the coronary artery
- Late stenosis in tortuous vessels
- Late occlusion of dilated or tortuous coronary arteries with or without myocardial infarction
- Evaluation 4-40 years after surgical closure of CAVFs had thrombosis of the entire coronary artery (Latson's unit). So dilated coronary arteries are a cause for concern
- These patients should receive anticoagulation or anti platelets for life

Larry Latson, 2007

Closing coronary artery fistulas

- In symptomatic newborn or infant, large fistulas may need to be closed early
- In asymptomatic children, can delay closure until child is old enough to make the procedure technically easier
- In adults, large fistulas need to be closed to treat symptoms or to prevent complications

Closing coronary artery fistulas

- Most coronary arterial fistulas (whether simple or complex) can be closed by catheter techniques
- Aneurysms in these fistulas need to be excluded by devices on either side
- Sluggish blood flow in the dilated fistula vessel remains a concern about late sequelae
- In most cases, the late results are good
- Remodelling of the coronary artery often occurs during follow up
- More serial studies with follow up angiography and other detailed evaluation are needed

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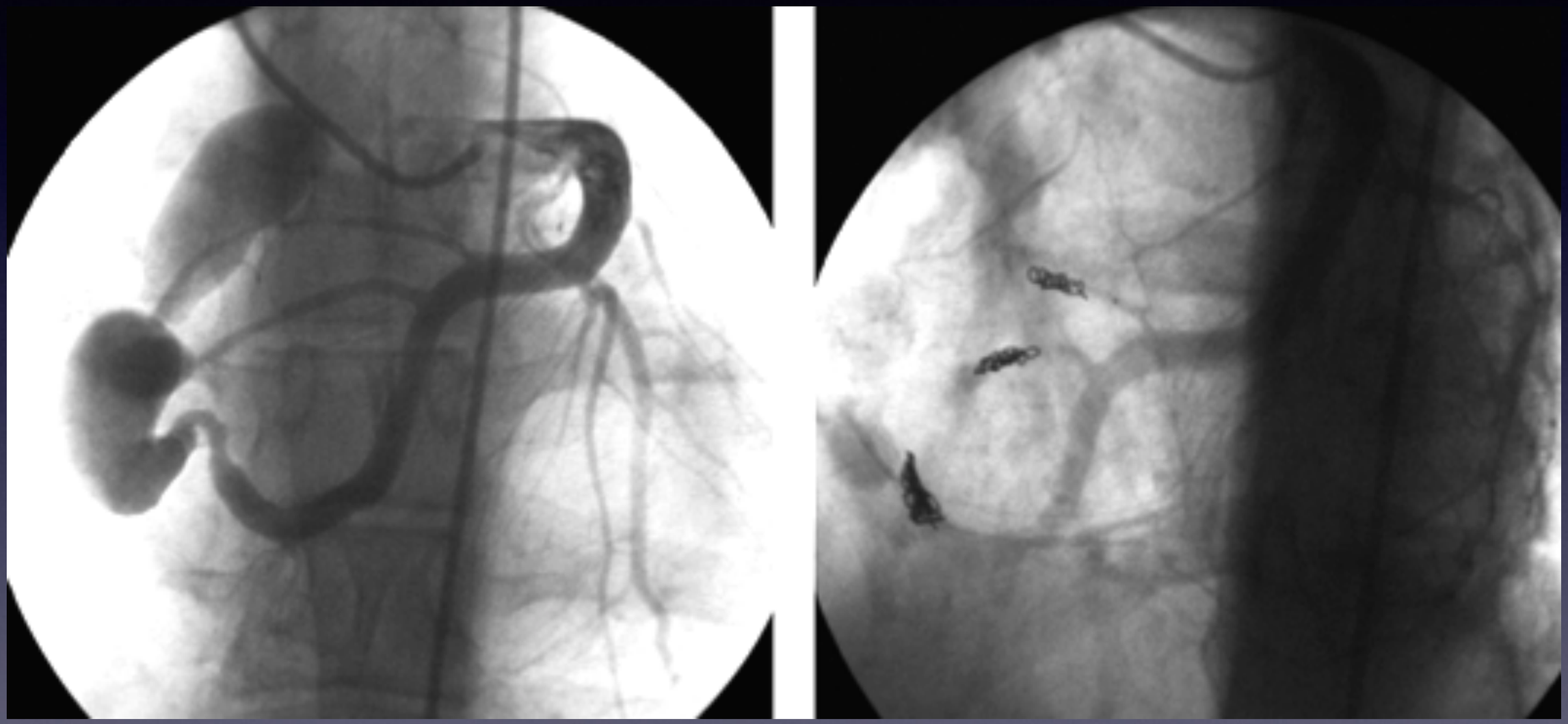
Closure of CAVFs



Jama et al, 2011

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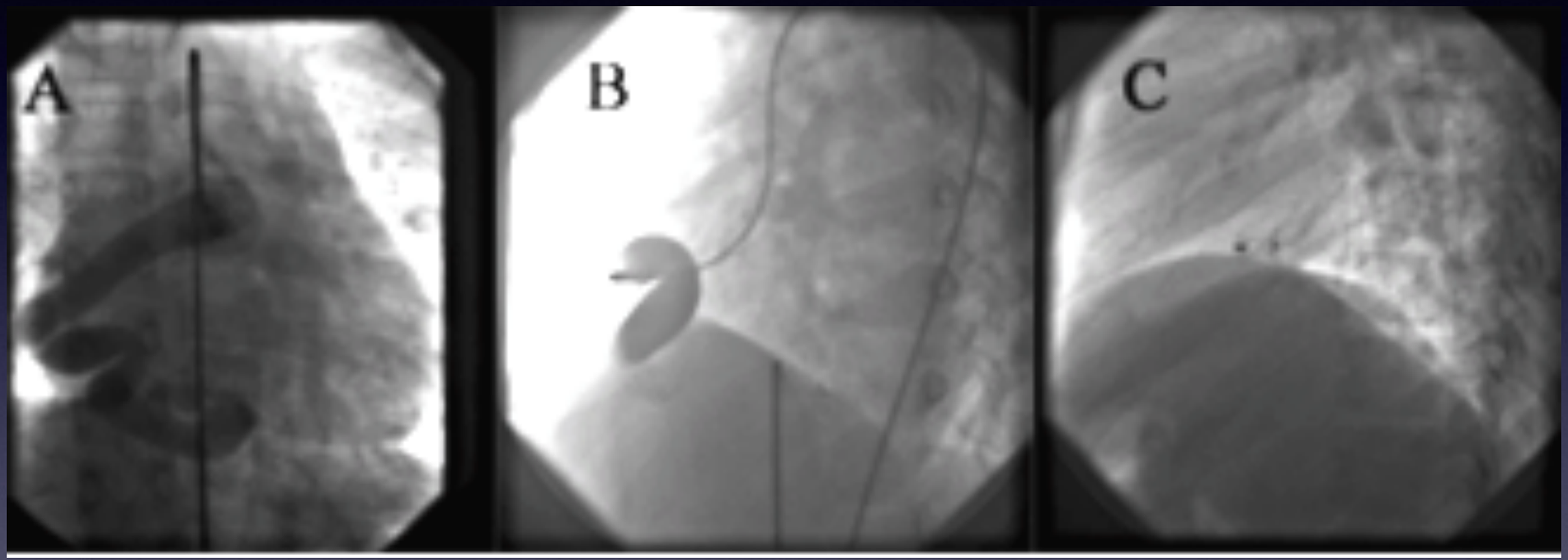

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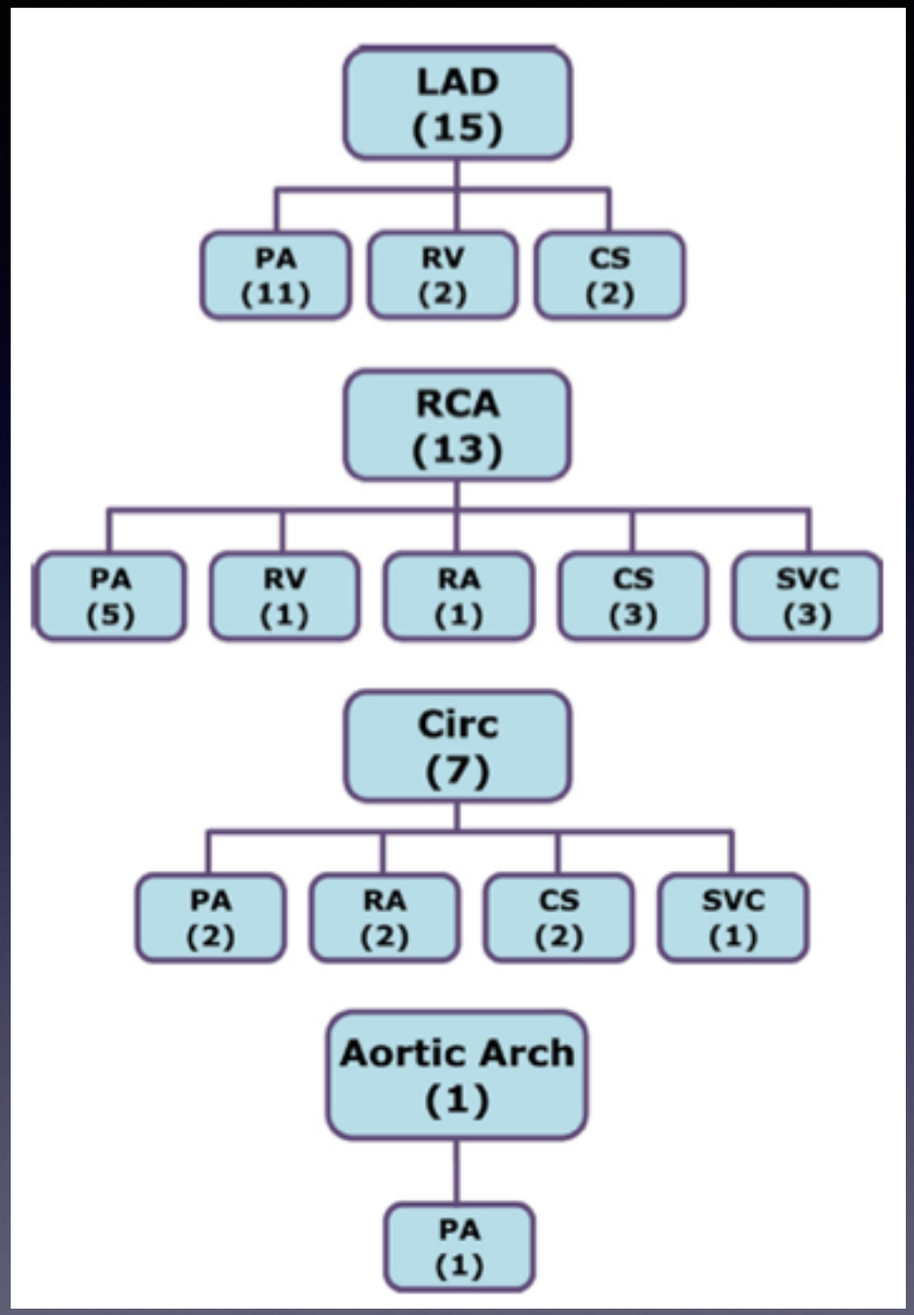
Closure of CAVFs

- Drainage to PA was common in this adult population

- Majority were closed with coils (31/36 procedures)



Jama et al, 2011

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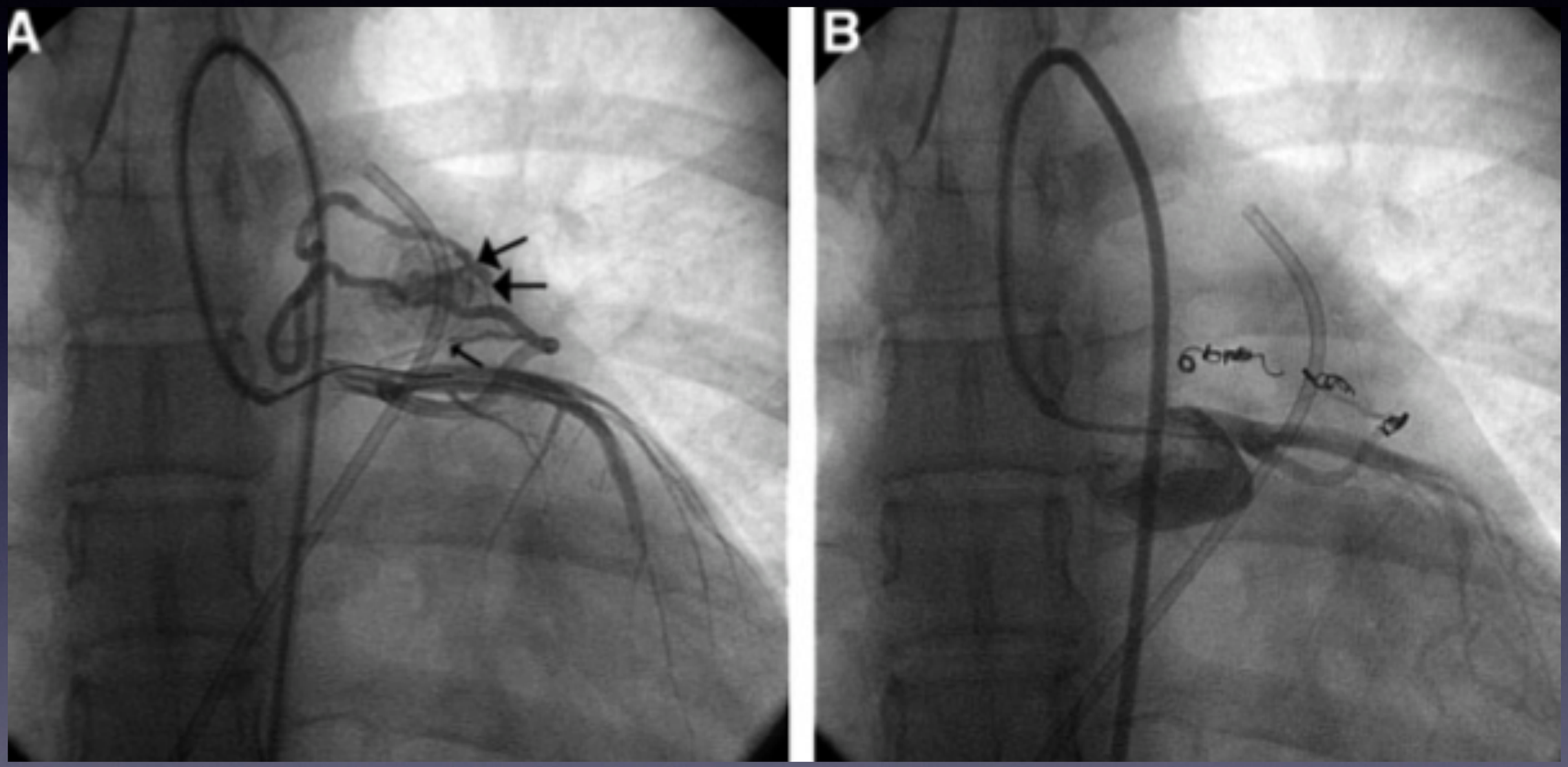
Closure of LCA to MPA CAVFs



Larry Latson, 2007

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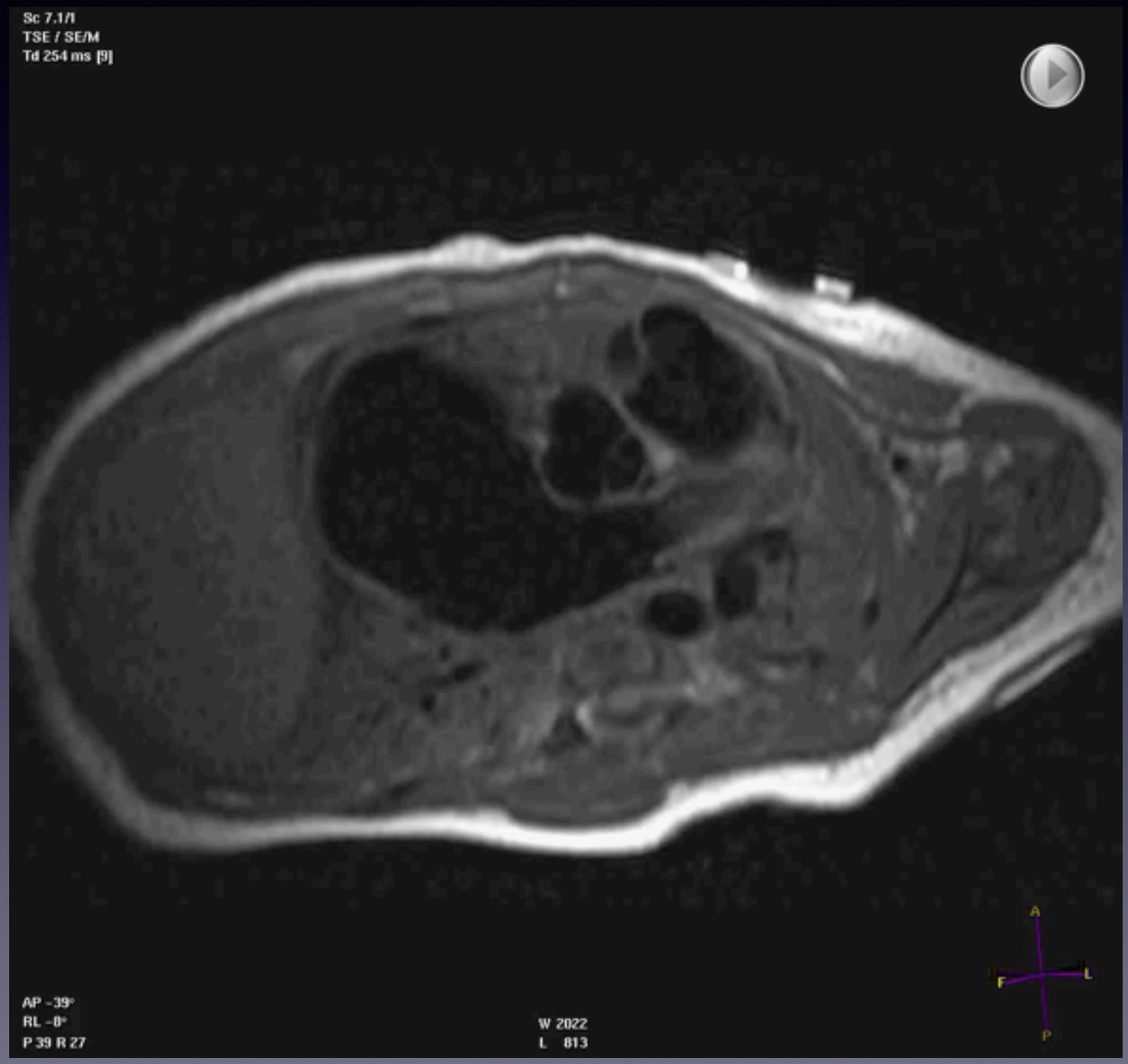
Long term follow up after closure of CAVFs

- N = 41 pts
- Follow up angiography in 21 (50%) pts
- Native coronary artery either remained dilated and tortuous, or more frequently had thromboses with a short proximal stump
- None of these patients had evidence of myocardial ischemia
- 4/21 (19%) patients had demonstrable recurrence of fistula without haemodynamic disturbance

Cheung et al, 2001

MRI scan assessment
RCA to RA coronary fistula in 1 week old



Coronary artery fistulas

- **72% fistulas: large 5 – 20mm diameter**
  - 95% single feeding vessel, less tortuous
  - 44% originated from RCA, 56% from LCA
  - 61% drained into RA, 28% into RV, 11% to LV

- **28% fistulas: small <5mm**
  - 88% multiple feeders and more tortuous
  - 88% originated from LCA, 12% from RCA
  - 66% drained into RV, 34% into PA