# PDA Stenting in Babies

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# **WHY?** *(Ductal Stenting in Babies)*

**Duct dependent pulmonary circulation**

**Duct dependent systemic circulation**

**Retrain the LV**

# **WHY?** *(Ductal Stenting in Babies)*

## Duct dependent pulmonary circulation

Duct dependent systemic circulation

Retrain the LV

### Surgery

Systemic to pulmonary shunt (SPS)

Neonatal mortality: 5-9.8% [1-3]
Shunt reintervention 17.8% [3]

### Ductal stenting

Early mortality: 5.4% [4]
Freedom from reintervention [4]
6 months 89%
12 months 55%

1.Tamisier D, et al. Ann Thorac Surg.1990;49:797-801.
2.Dirks V, et al. Eur J Cardiothorac Surg 2013;44:1096-102.
3.Dorobantu DM, et al. Eur J Cardiothorac Surg. 2016 Jan 13. pii: ezv435. [Epub ahead of print]
4.Alwi M, et al. J Am Coll Cardiol. 2004;44:438-445.

# **WHY?** *(Ductal Stenting in Babies)*

Duct dependent pulmonary circulation

Duct dependent systemic circulation

**Retrain the LV**

Late presentation of TGAIVS with LV mass involution

**Surgery**

Rapid two-stage repair
Atrial switch

**Ductal stenting**

Less invasive
More stable hemodynamic post procedure
Only case reports [1,2]

1.Sivakumar K, et al. JTCS 2006,132:1081-6.
2.Kothari SS, et al. Ann Pediatr Cardiol. 2011; 4:135–8.

# HOW? *(Ductal Stenting in Babies)*

1. **Pre-procedural care**
2. **Approach/Technique**
3. **Post-procedural care**

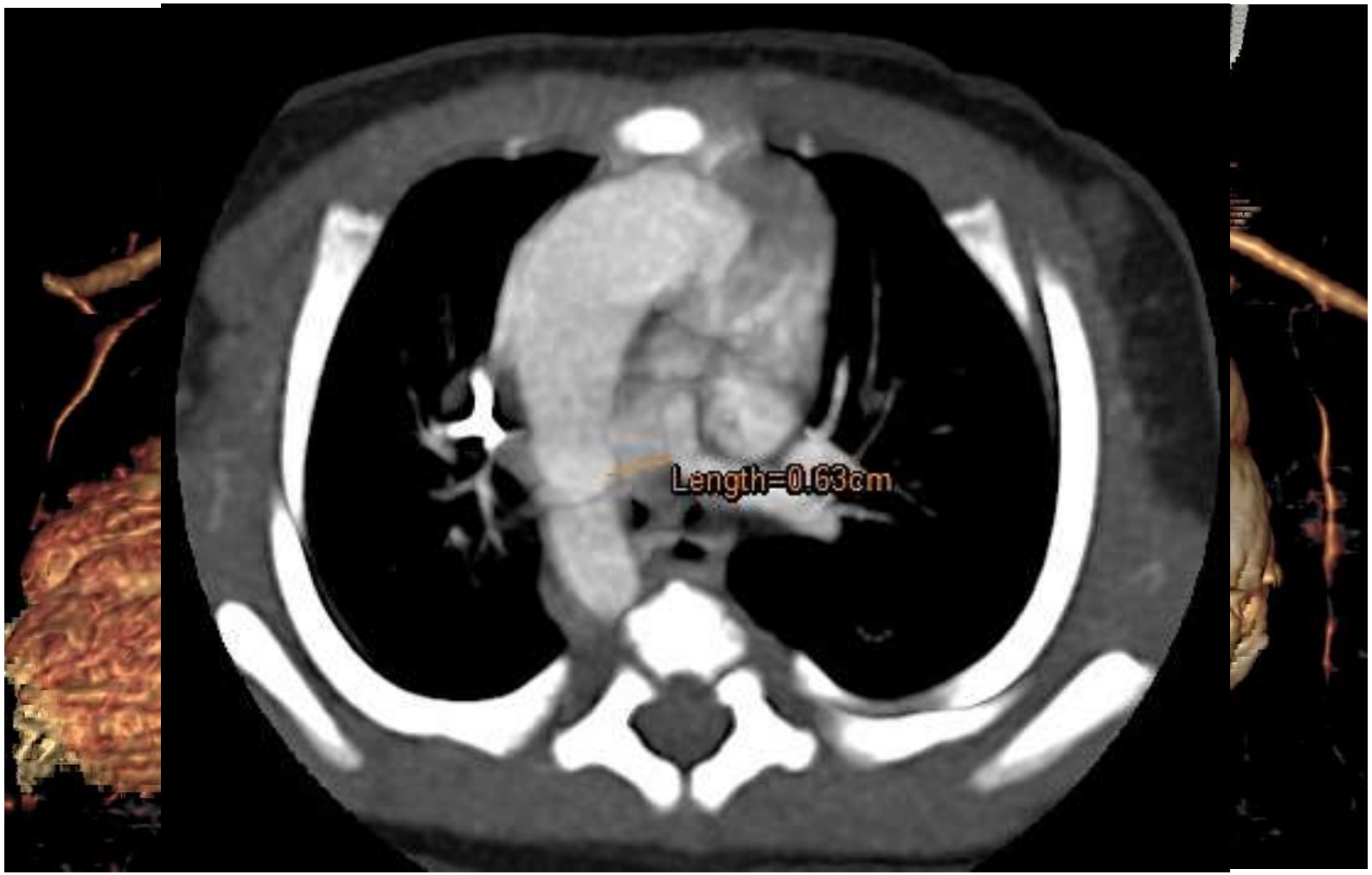
# **HOW?** *(Ductal Stenting in Babies)*

**1. Pre-procedural care**

**2. Approach/Technique**

**3. Post-procedural care**

# CTA Bilateral PDA



# Multidetector-Row CT Evaluation of Tortuous Ductus Arteriosus for Stent Implantation in Neonates with Duct-Dependent Pulmonary Circulation: Preliminary Experience in 4 Cases

*Ying-Jui Lin,[1] Chi-Di Liang,[1] Chih-Yuan Fang,[2] Hon-Kan Yip,[2] Shu-Hang Ng[3] and Sheung-Fat Ko[3]*

***Purpose:*** This study describes the preliminary experience of multidetector-row CT (MDCT) assessment of tortuous patent ductus arteriosus (PDA) for stent implantation in neonates with duct-dependent pulmonary circulation.

***Methods:*** Seven neonates with pulmonary atresia and PDA initially diagnosed with echocardiography who were scheduled for MDCT for evaluation for stent implantation were reviewed. The PDA size measured on MDCT and catheter angiography, stent size and outcomes were studied. The patients' ages at stent implantation and hospitalization duration were compared with those in 14 patients with Blalock-Taussig surgical palliation.

***Results:*** After MDCT, three patients were excluded from stent implantation; therefore, 4 neonates (1 girl, 3 boys; mean age, 12.8 days; range, 10-15 days) were included in the study. All four PDA appeared elongated and tortuous originating from the inferior surface of the aortic arch. The length of the tortuous PDA measured on angiography (mean, 13.8 mm; range 10.8 mm-15.8 mm) tended to be shorter than those measured on MDCT (mean, 15.0 mm; range 11.1 mm-17.1 mm). One PDA stent selected based on angiographic measurements was not adequate for total PDA coverage while the other three stents selected based on MDCT led to successful maintenance of pulmonary flow. Compared with patients underwent Blalock-Taussig shunt, patients underwent stent implantation were significantly younger (mean age 34.9 vs. 12.8 days, P = 0.018) and the hospital stay was significantly shorter (mean 63.5 vs. 20.0 days, P = 0.022). Follow-up MDCT clearly demonstrated the stent-related stenoses facilitating subsequent interventional treatment.

***Conclusion:*** MDCT may be a considerable alternative method for assessing duct-dependent pulmonary circulation for stent implantation and is also usefu complications.

Acta Cardiol Sin 2010;26:1118

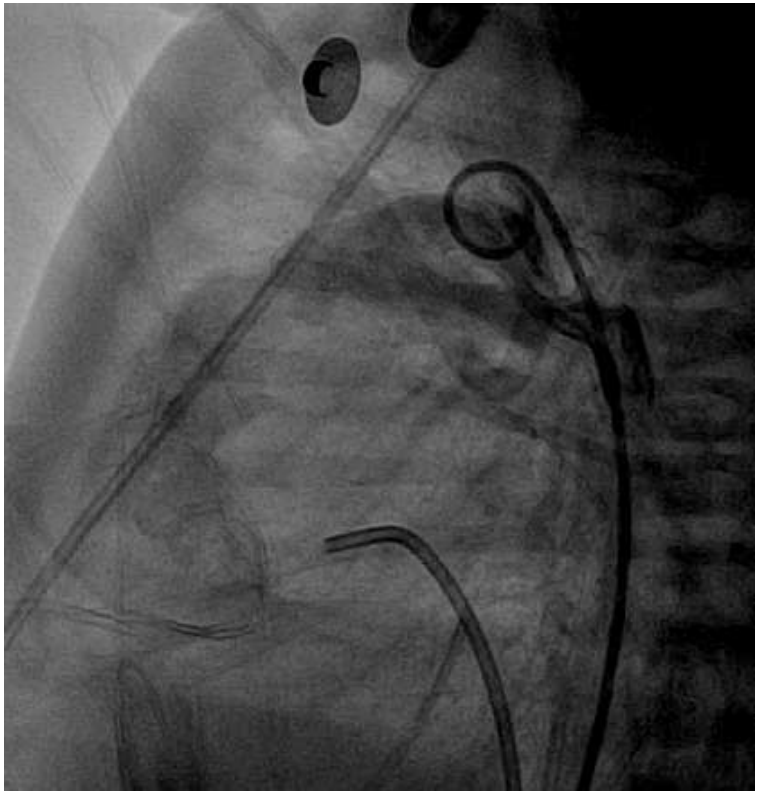
# CTA for PDA stenting

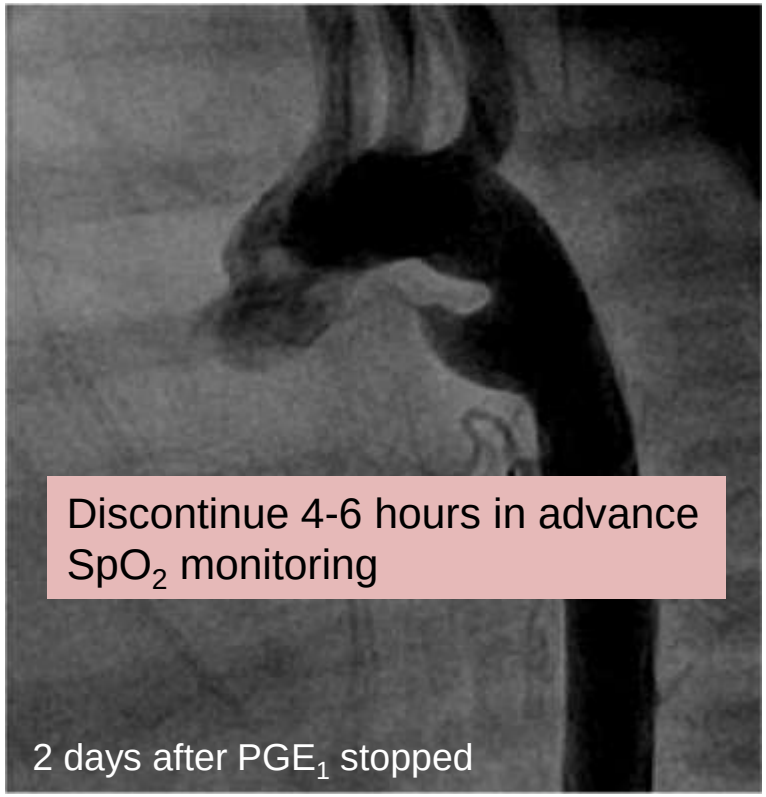
Useful in unusual PDA anatomy

Good tool to minimize the unexpectation(s)

# Stop $PGE_1$ before the procedure

Minimize risk of stent embolization






Circulating PG
Metabolized through the lungs
Metabolites excreted by kidney within 24 hrs.

# HOW? *(Ductal Stenting in Babies)*

1. Pre-procedural care
2. **Approach/Technique**
3. Post-procedural care

# Tools

Catheters
- 4 Fr JR
- 5 Fr JR guiding
- 4-5 Fr Pigtail (may need to be cut)
- Microcatheters (Finecross, Progreat)

Guide wires
- 0.014 Hydrophilic (for crossing): Whisper (Abbott)
  Extra-support (for introducing stent): Ironman (Abbott)
  CTO (for crossing in atretic duct); Cross-it (Abbott), Conquest (Asahi)

Coronary stents Diameter 3.5, 4.0, 4.5 mm
Lengths 8-18 mm

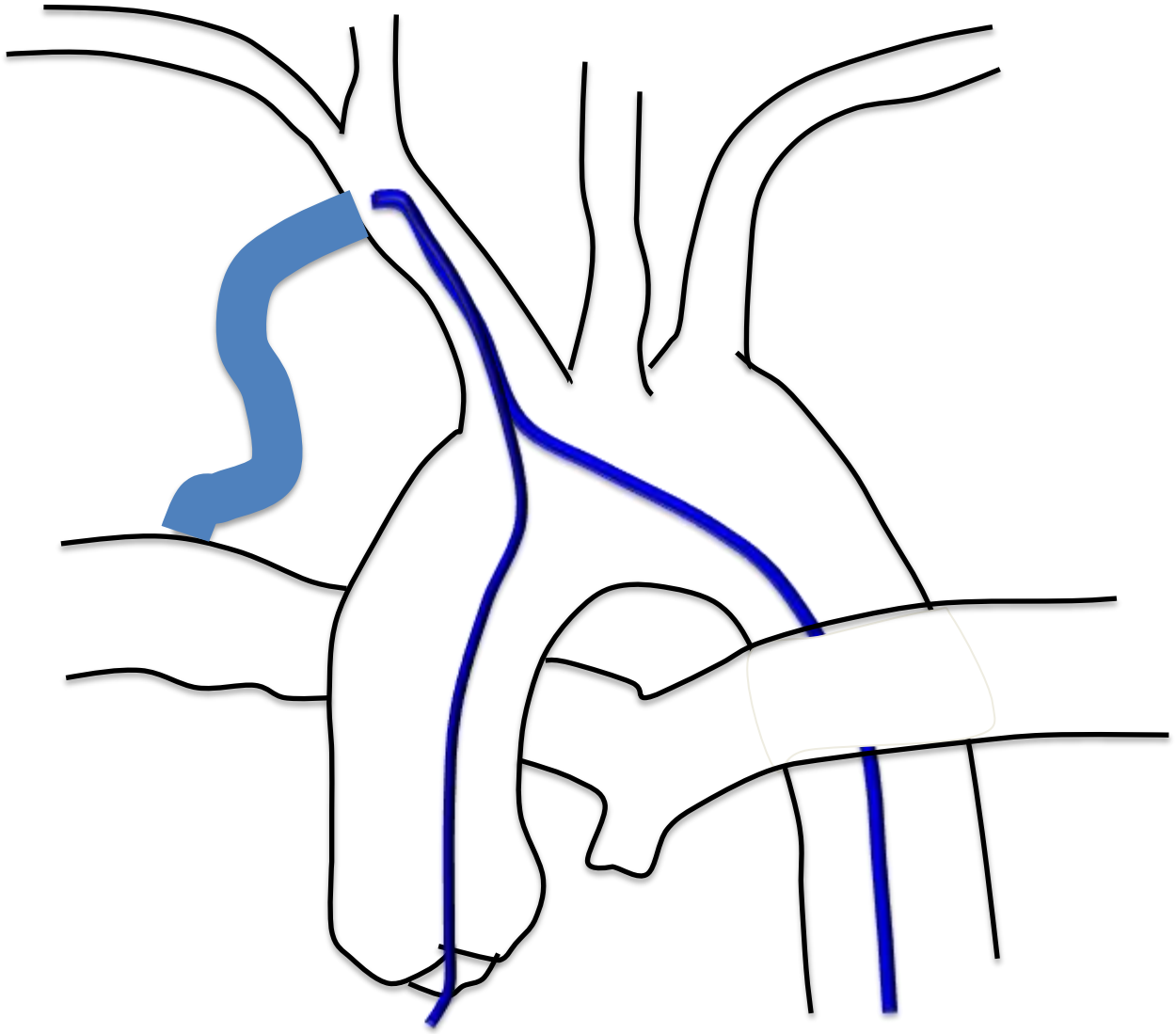
Coronary balloons: 2.5-4.5 mm

# Selected stent diameter

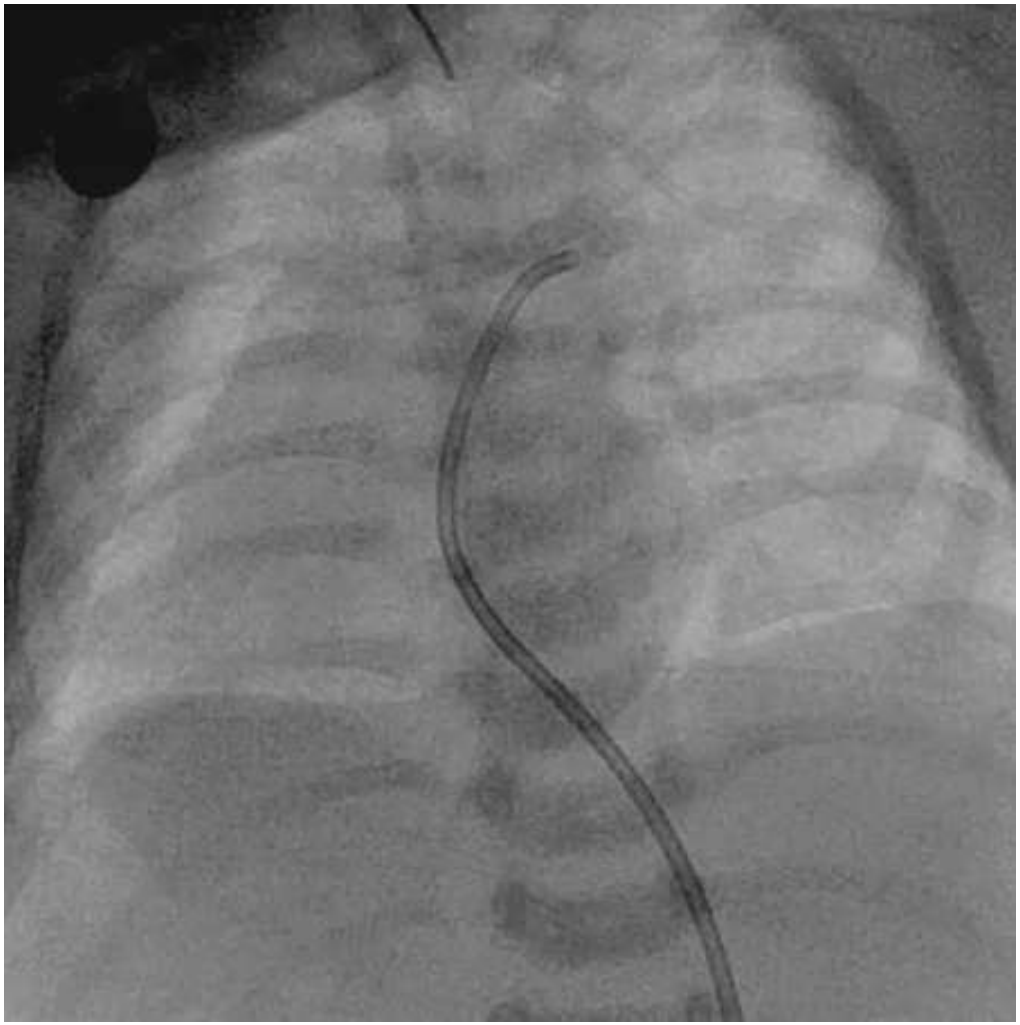
Body weight*

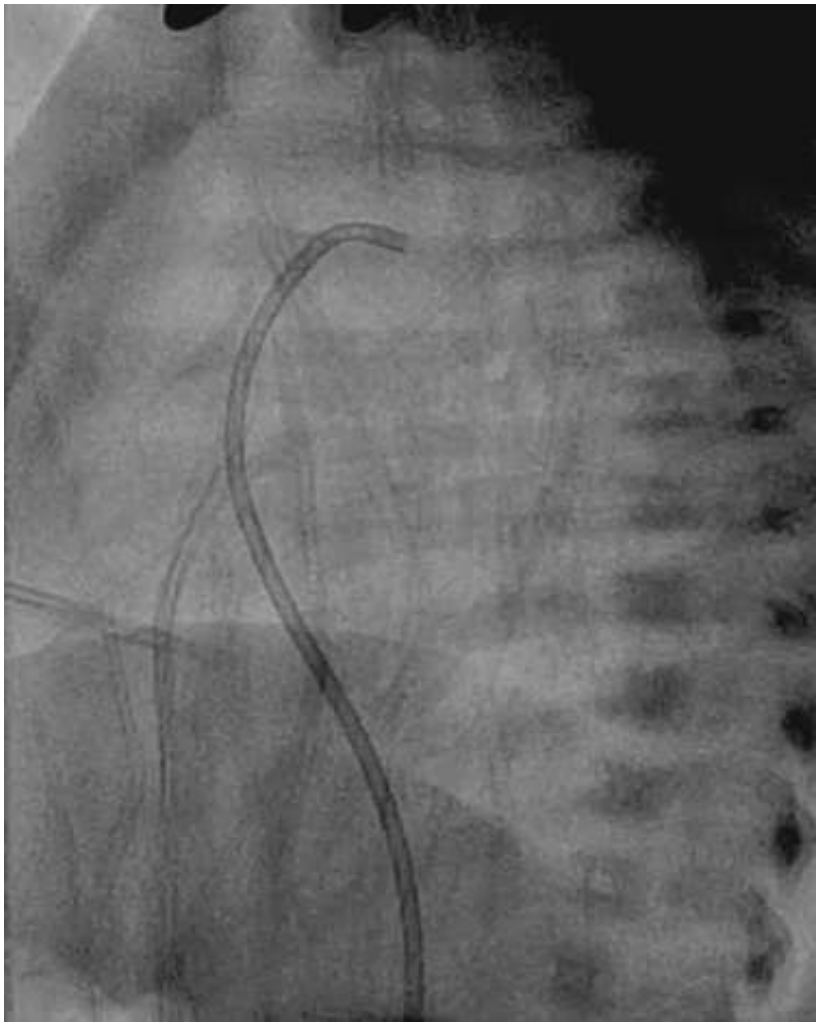
| | |
|---|---|
| < 3 kg: | 3.5 mm |
| 3-5 kg: | 4 mm |
| > 5 kg: | 4.5 mm |

* Alwi M, et al. J Am Coll Cardiol 2004;44:438-445.



# Approach from femoral vein

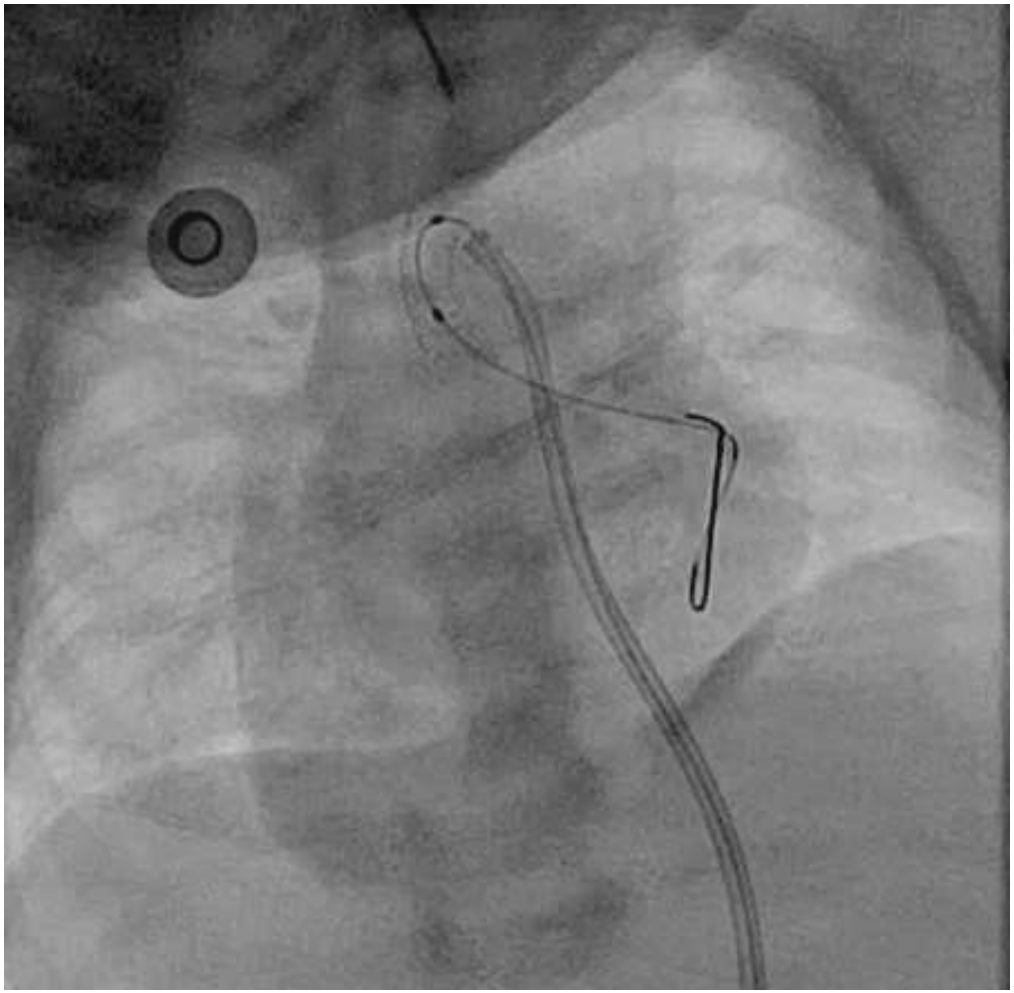


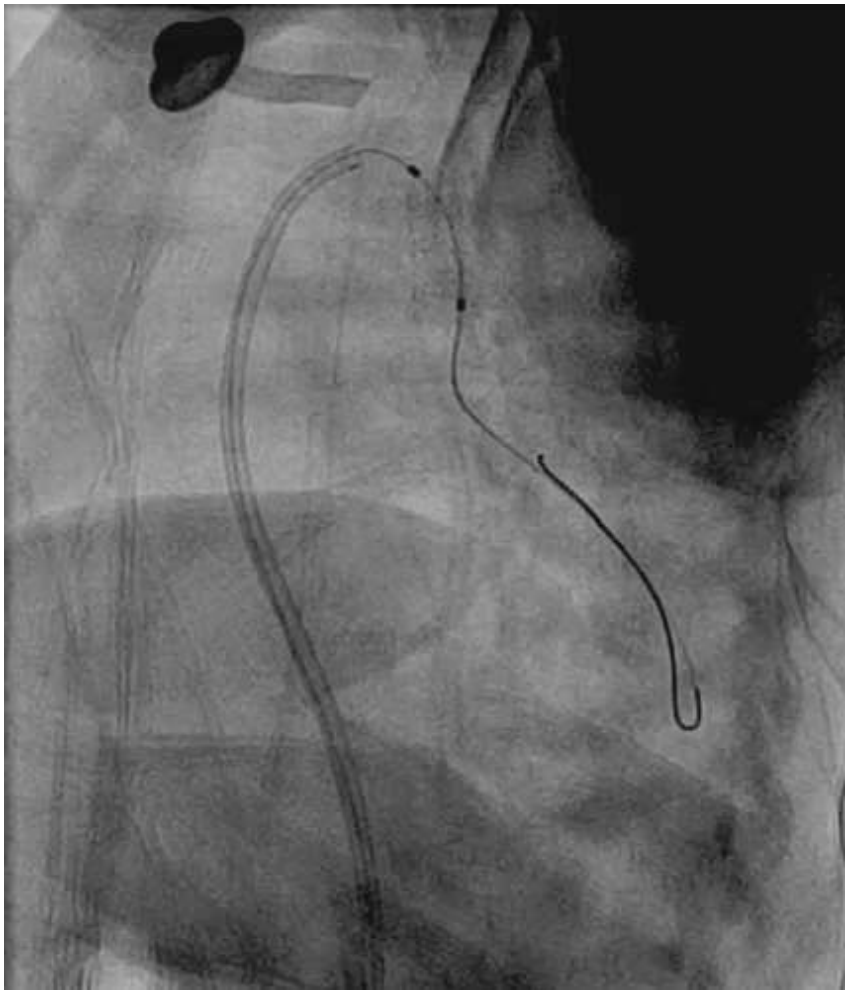


2.4 kg . Dextrocardia, PAVSD.PDA

# Approach from femoral vein

Abbott Multi-Link Vision, 4x12 mm





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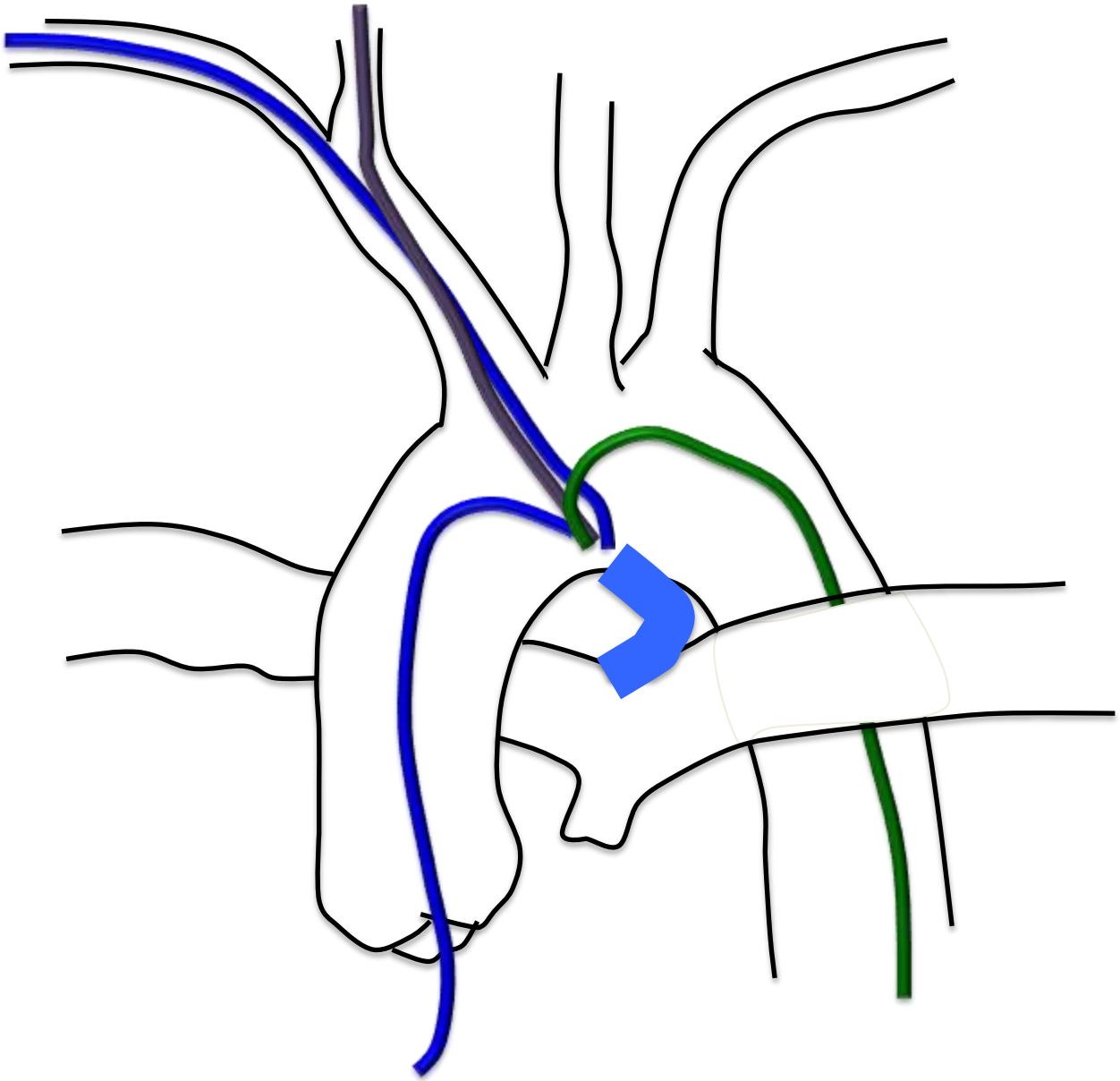
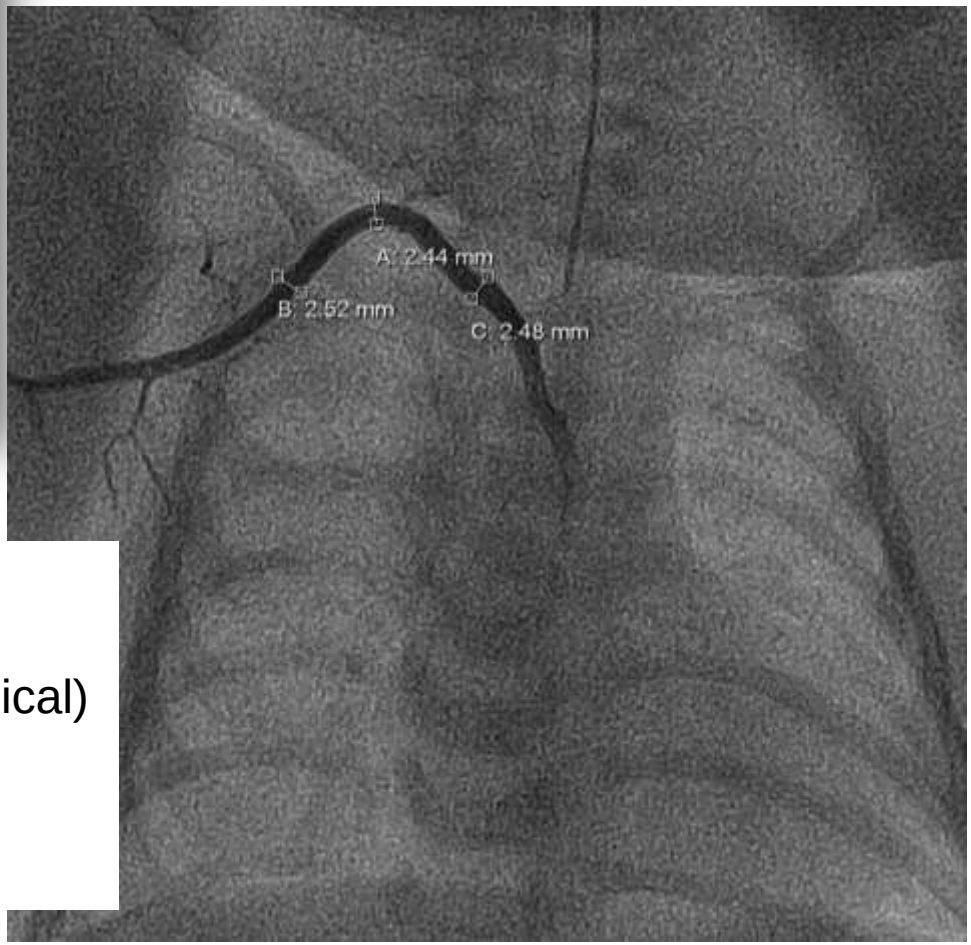
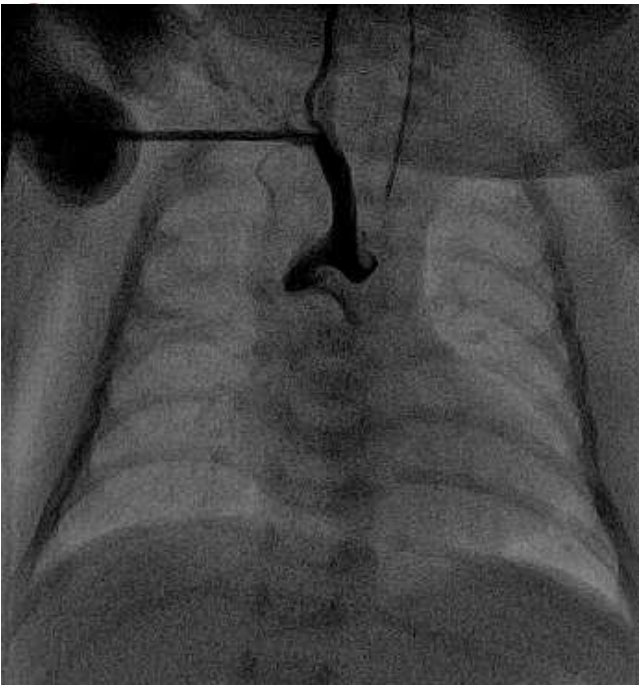
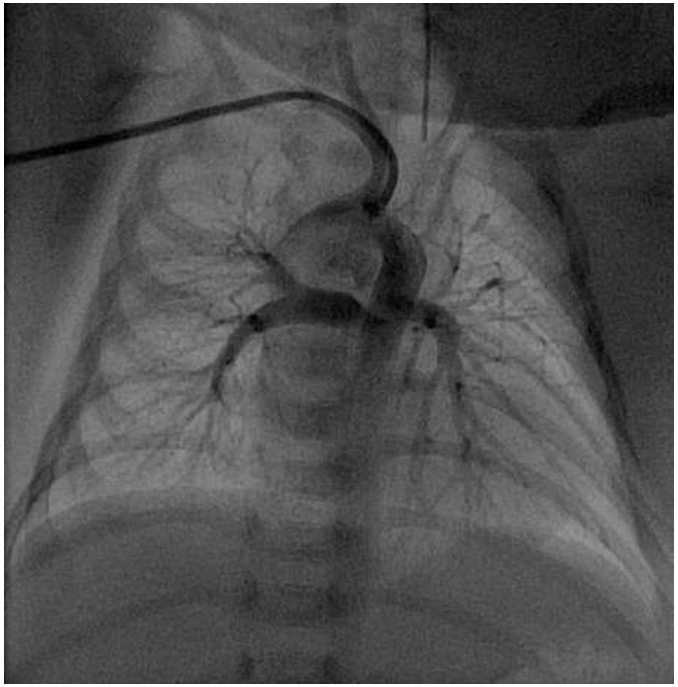
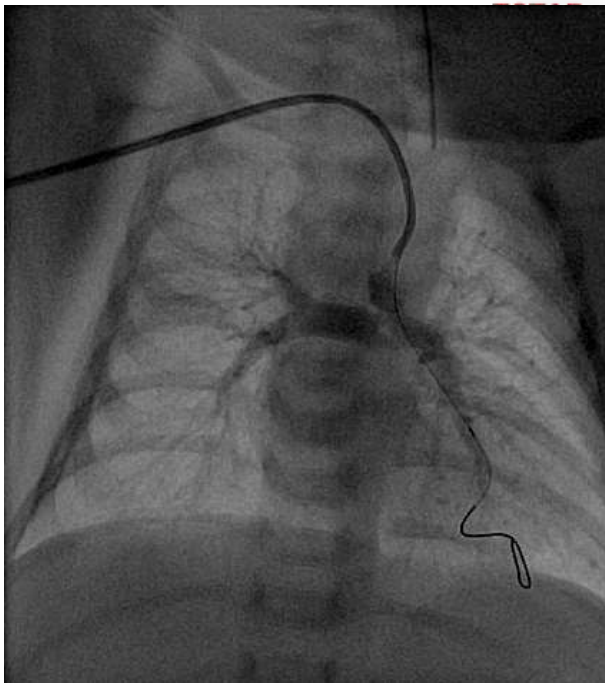





- **Ultrasound guided puncture is useful**
  (Learn from the masters @ your center)
- **22-24G IV catheter** (Jelco®:Smiths Medical)
- **0.014-0.018 soft tip introducing wire**
- **Glidesheath Slender®** (Terumo)

4 days old, 2.9 kg, PA,VSD,PDA

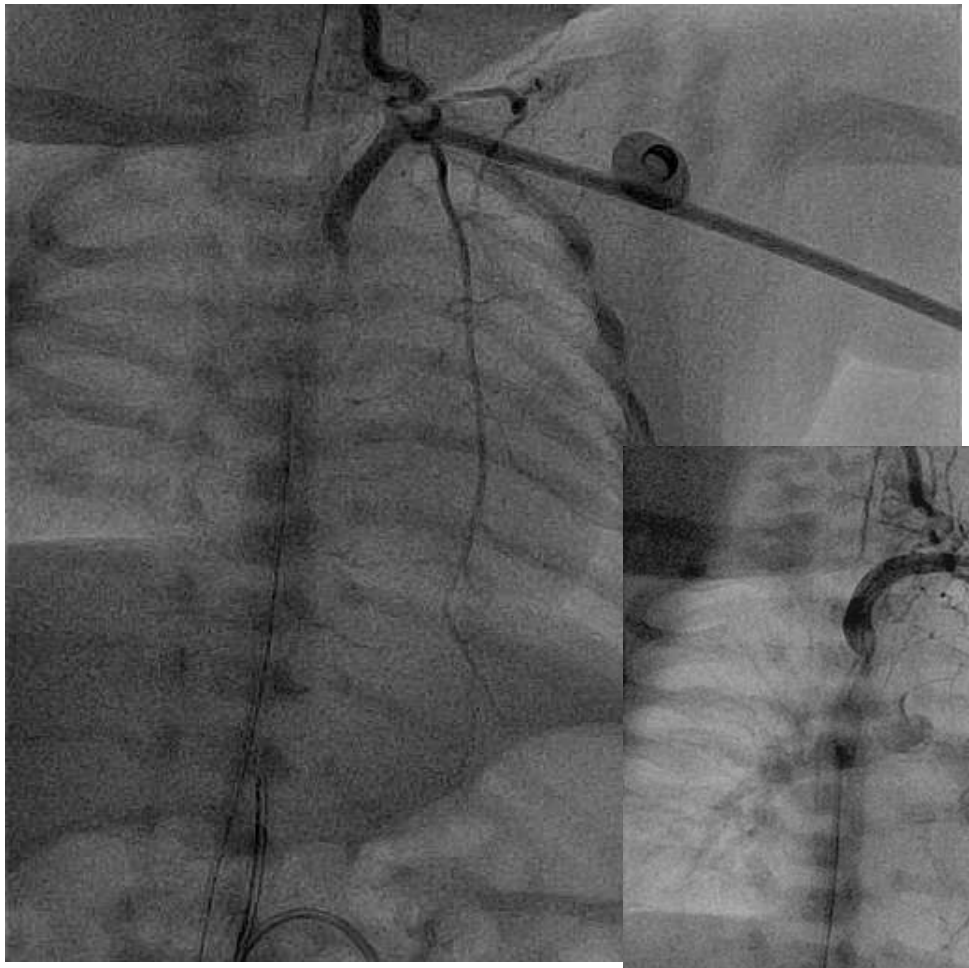
**Left aortic arch**

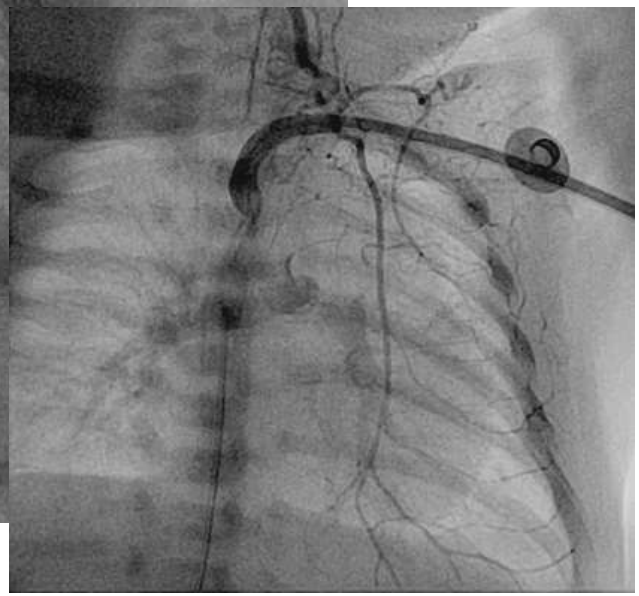




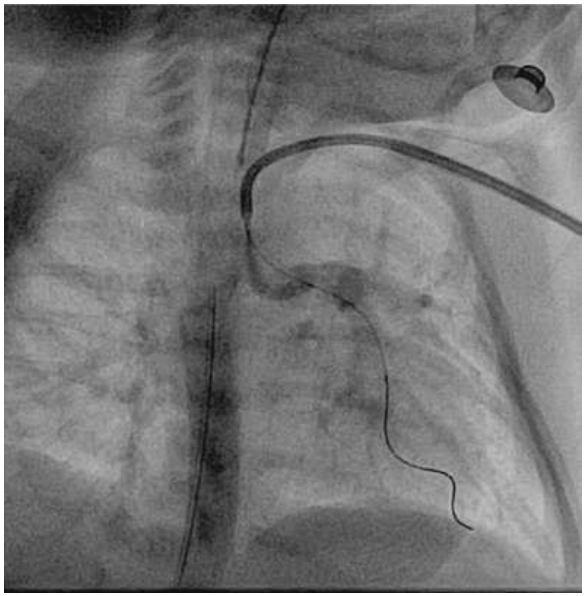
4 days old, 2.9 kg, PA,VSD,PDA

**Left aortic arch**

# Approach from left axillary artery





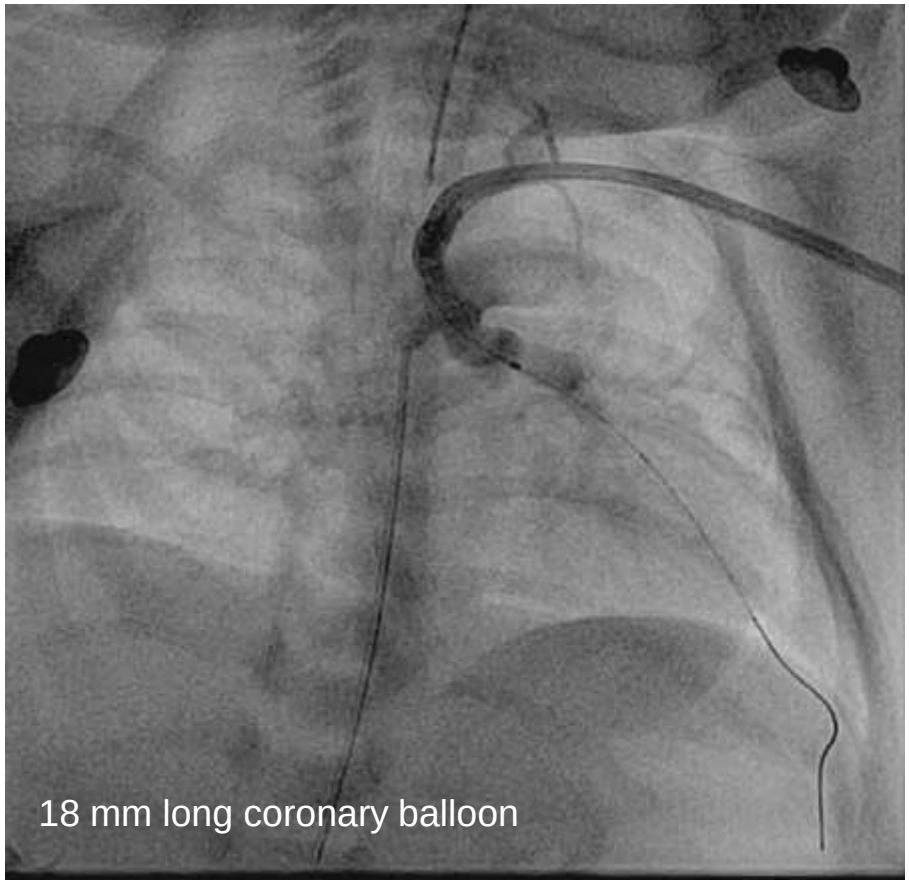


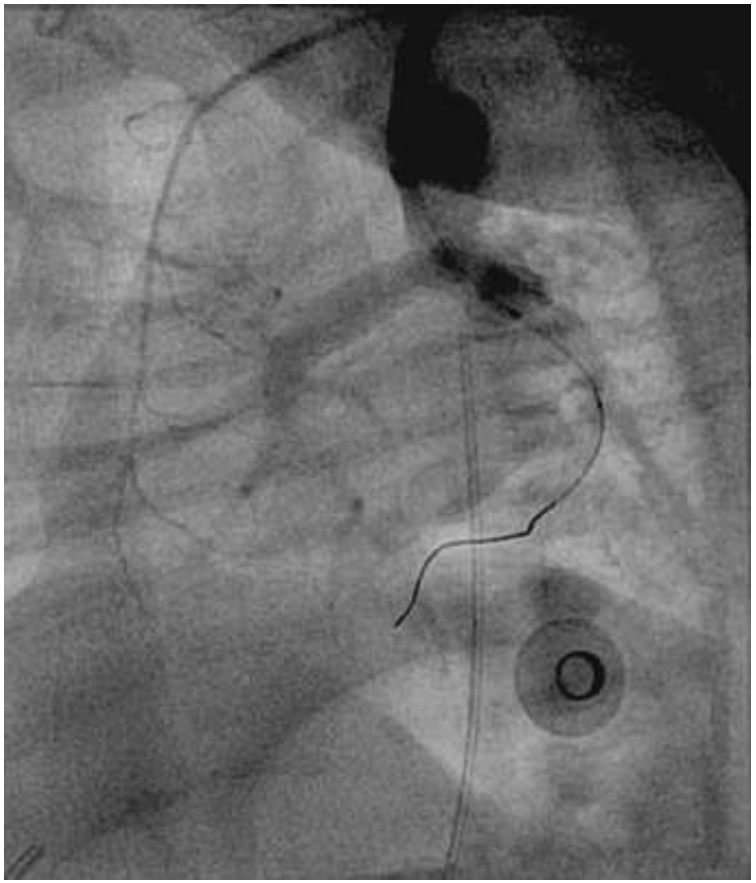
7 days old, 2.7 kg, single ventricle with PA,PDA

**Right aortic arch**

# Approach from left axillary artery

1. PDA is always stretching (more or less) when the wire is in
2. PDA length must be re-interrogated



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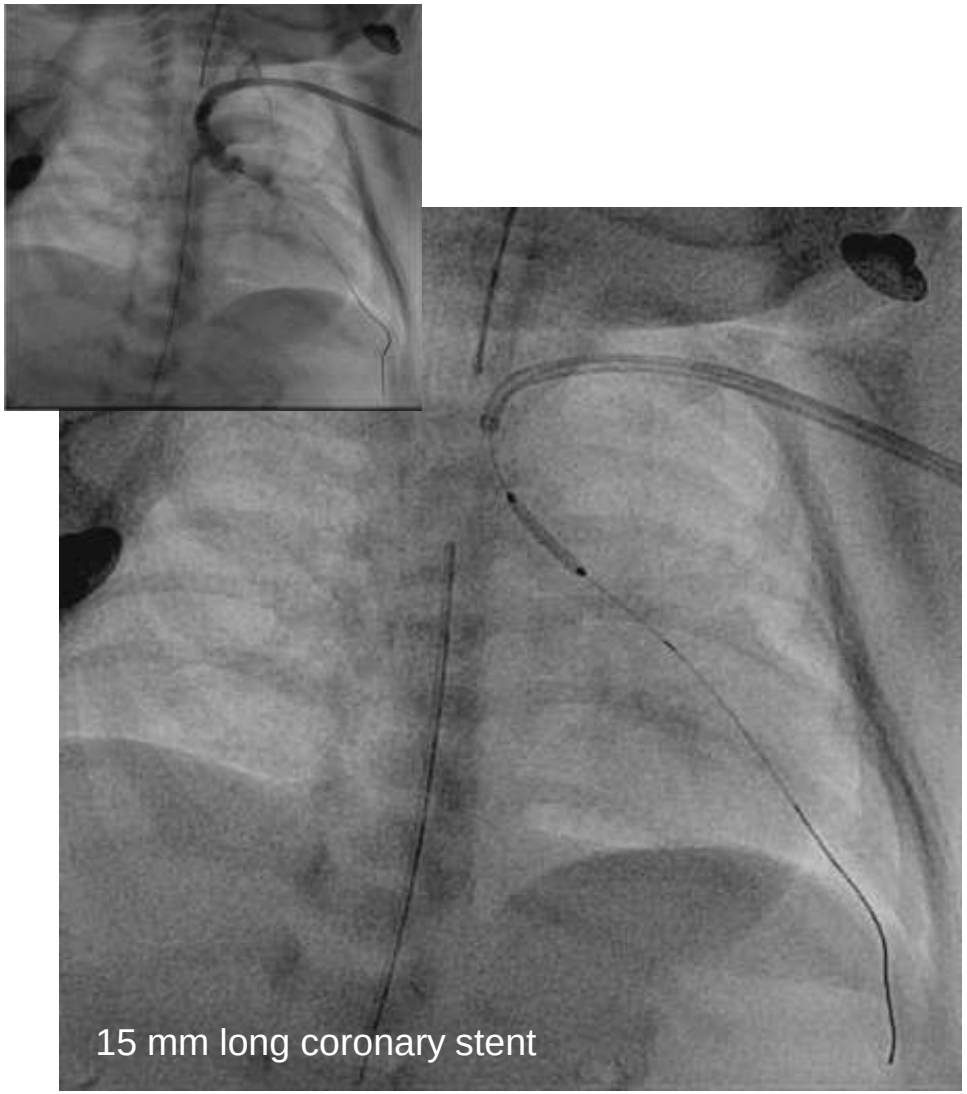


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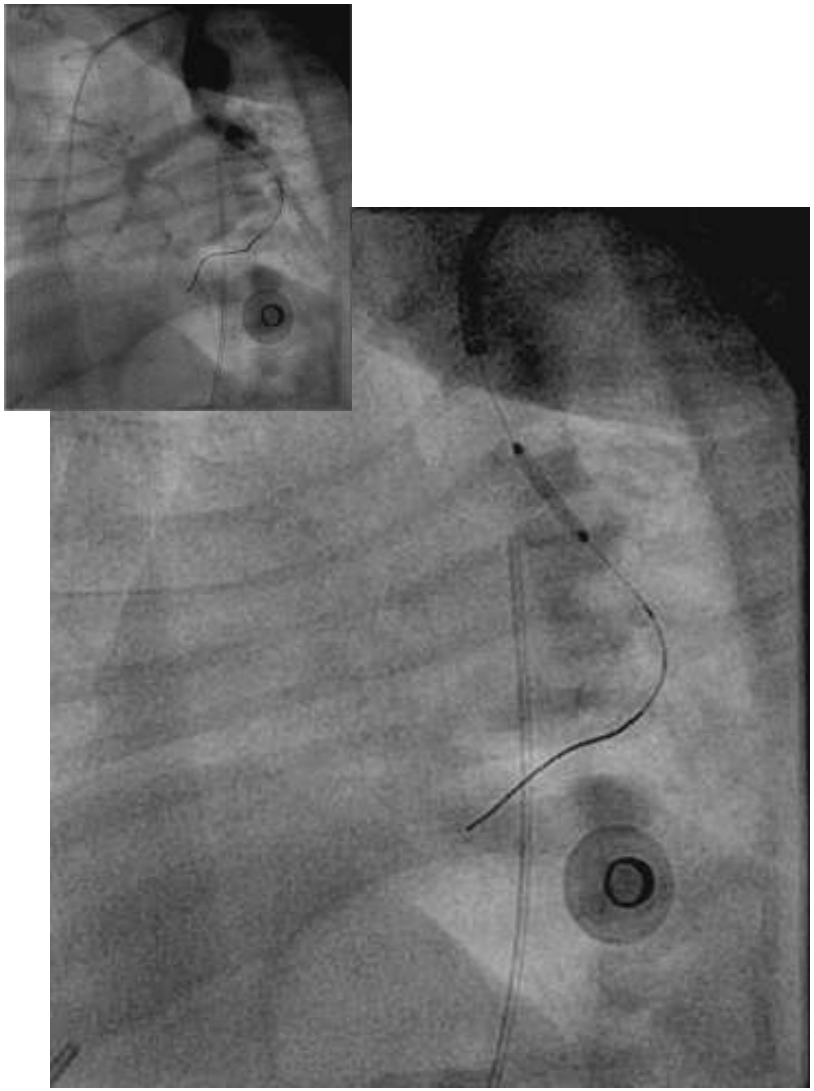

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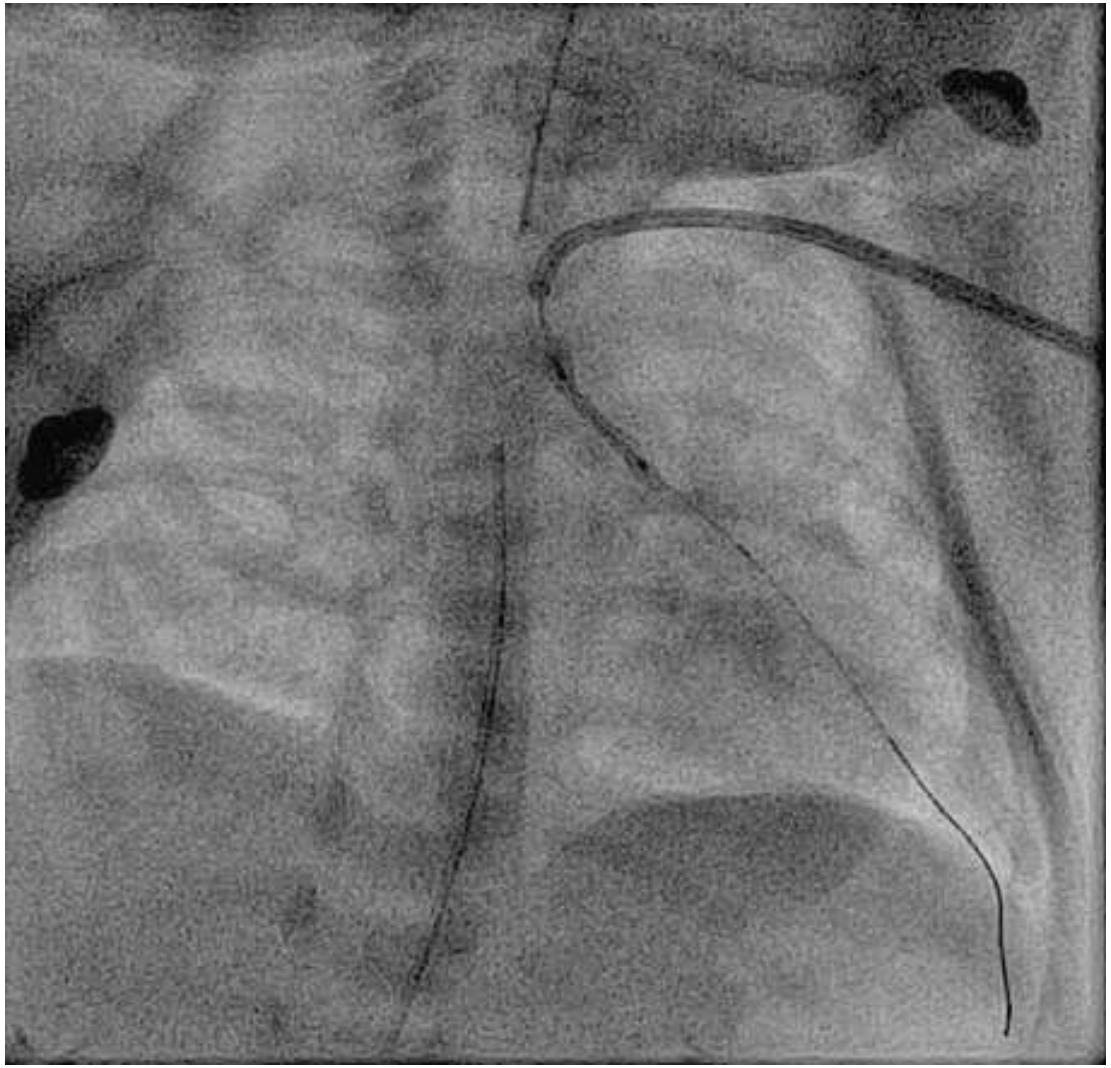

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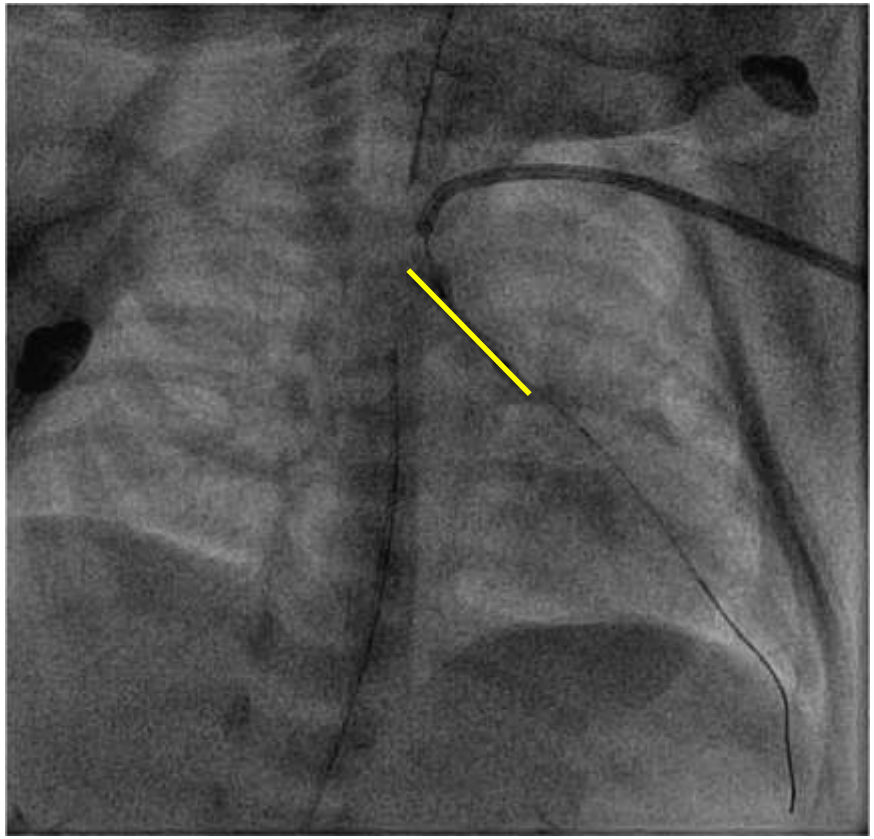

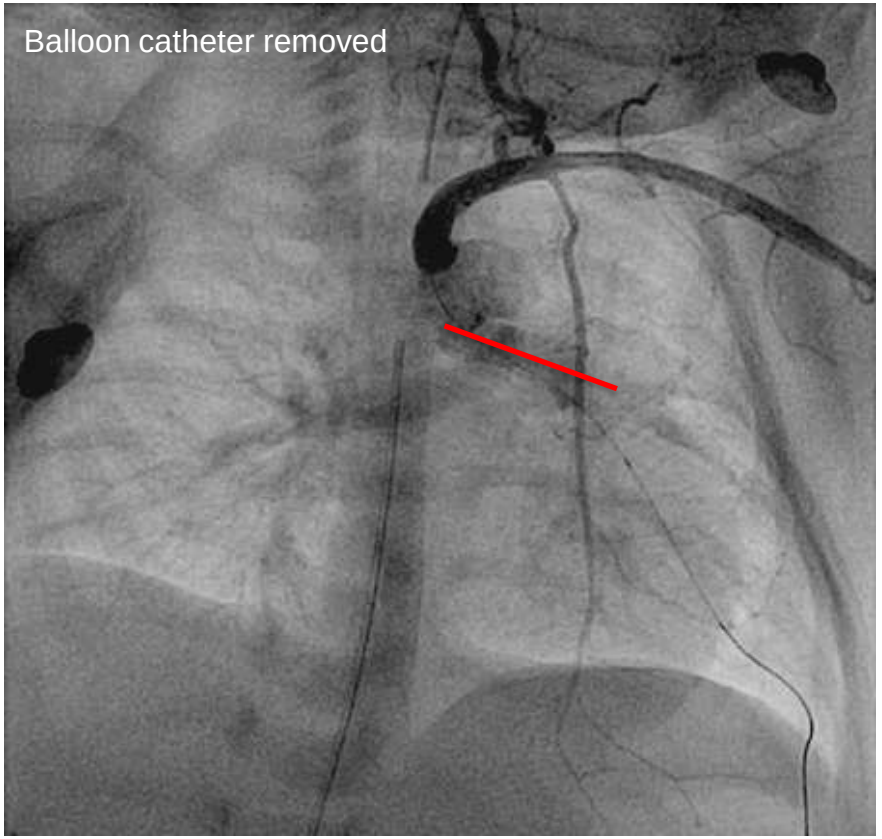


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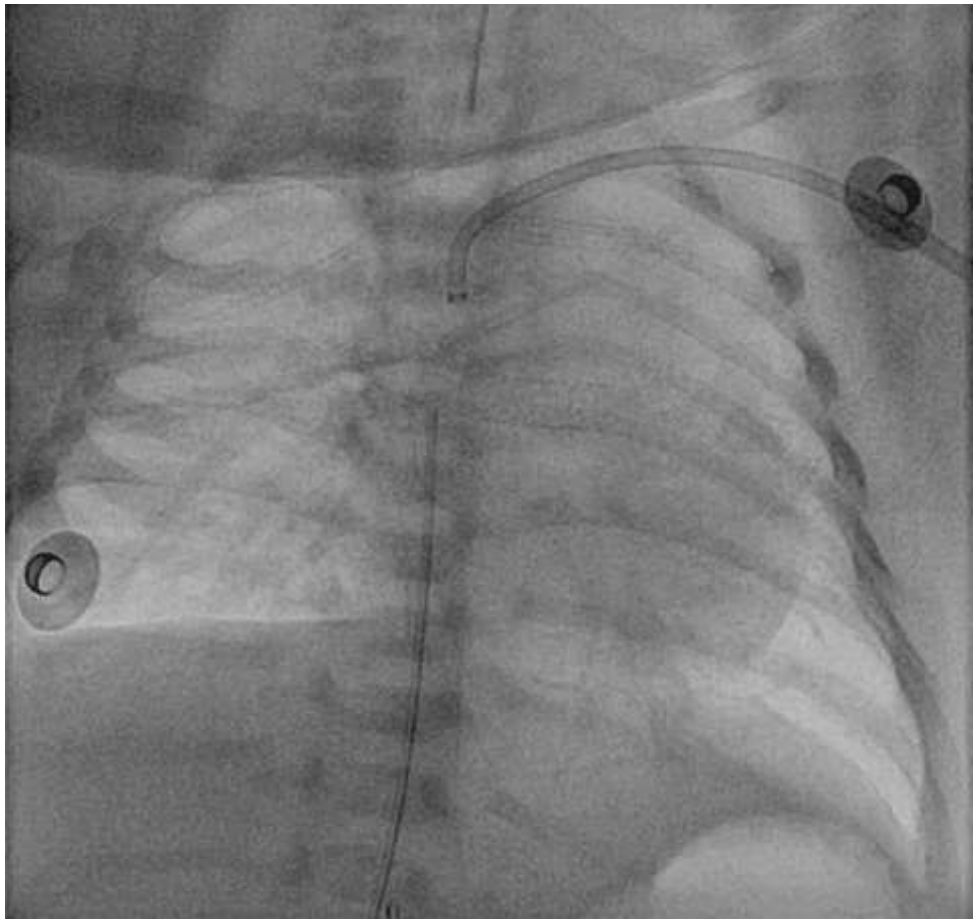

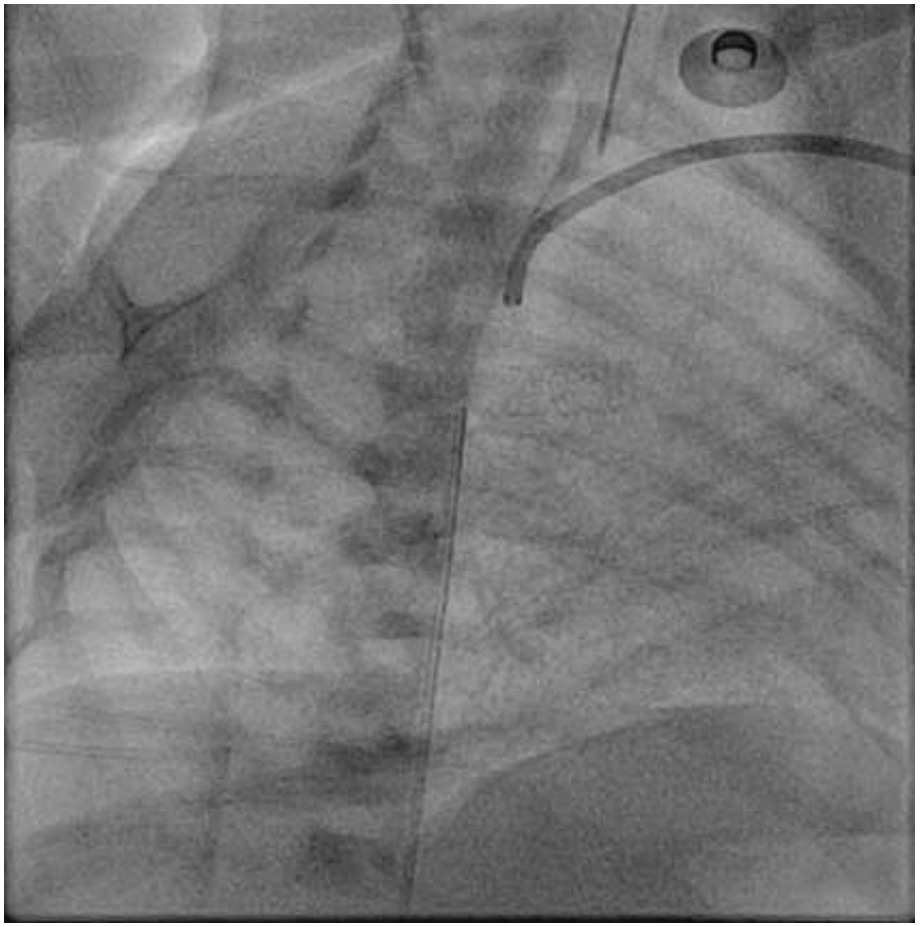

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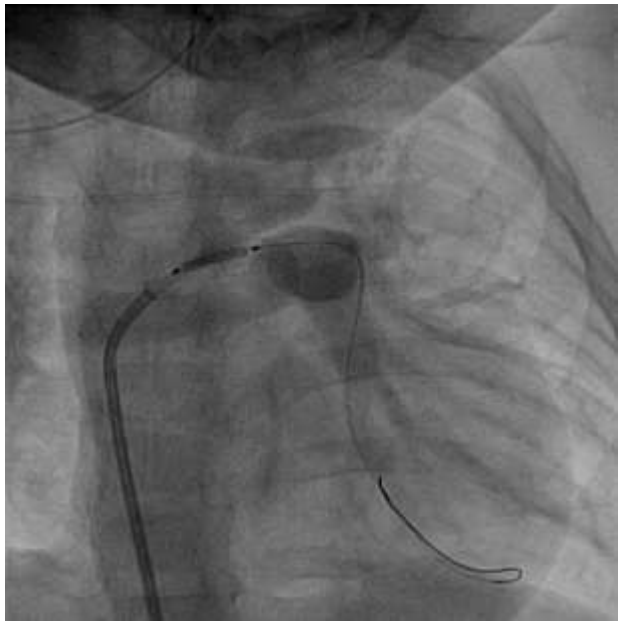
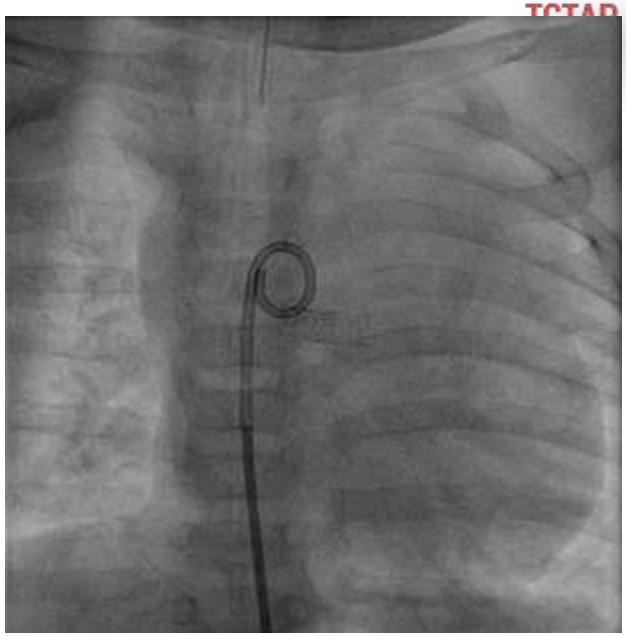
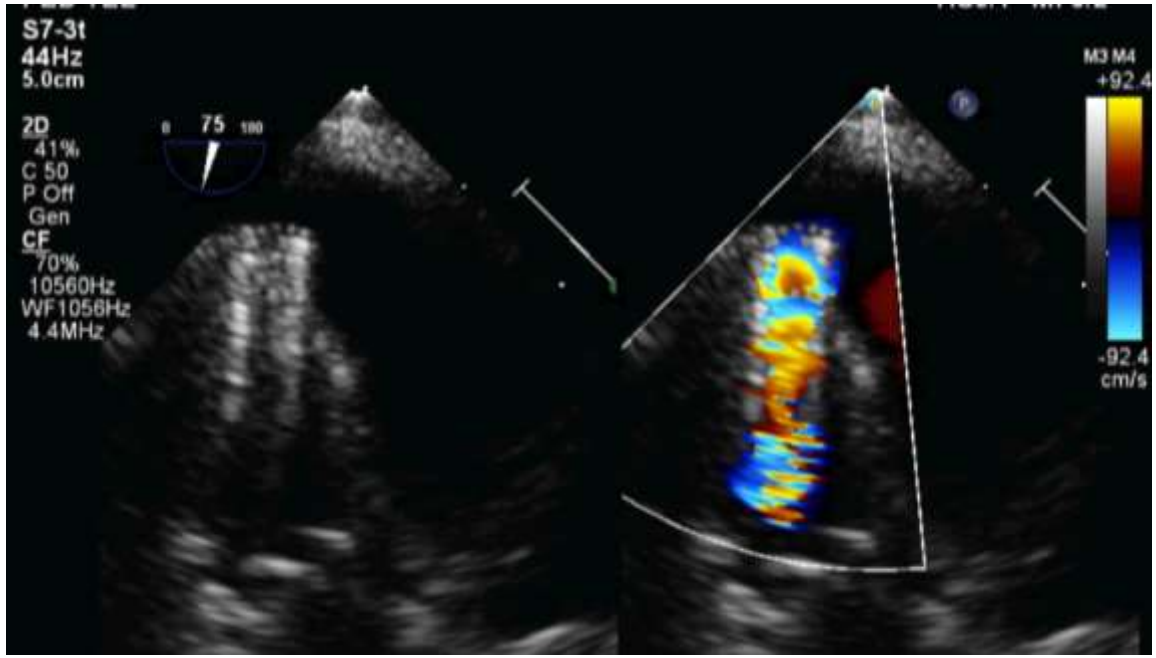




6 months later

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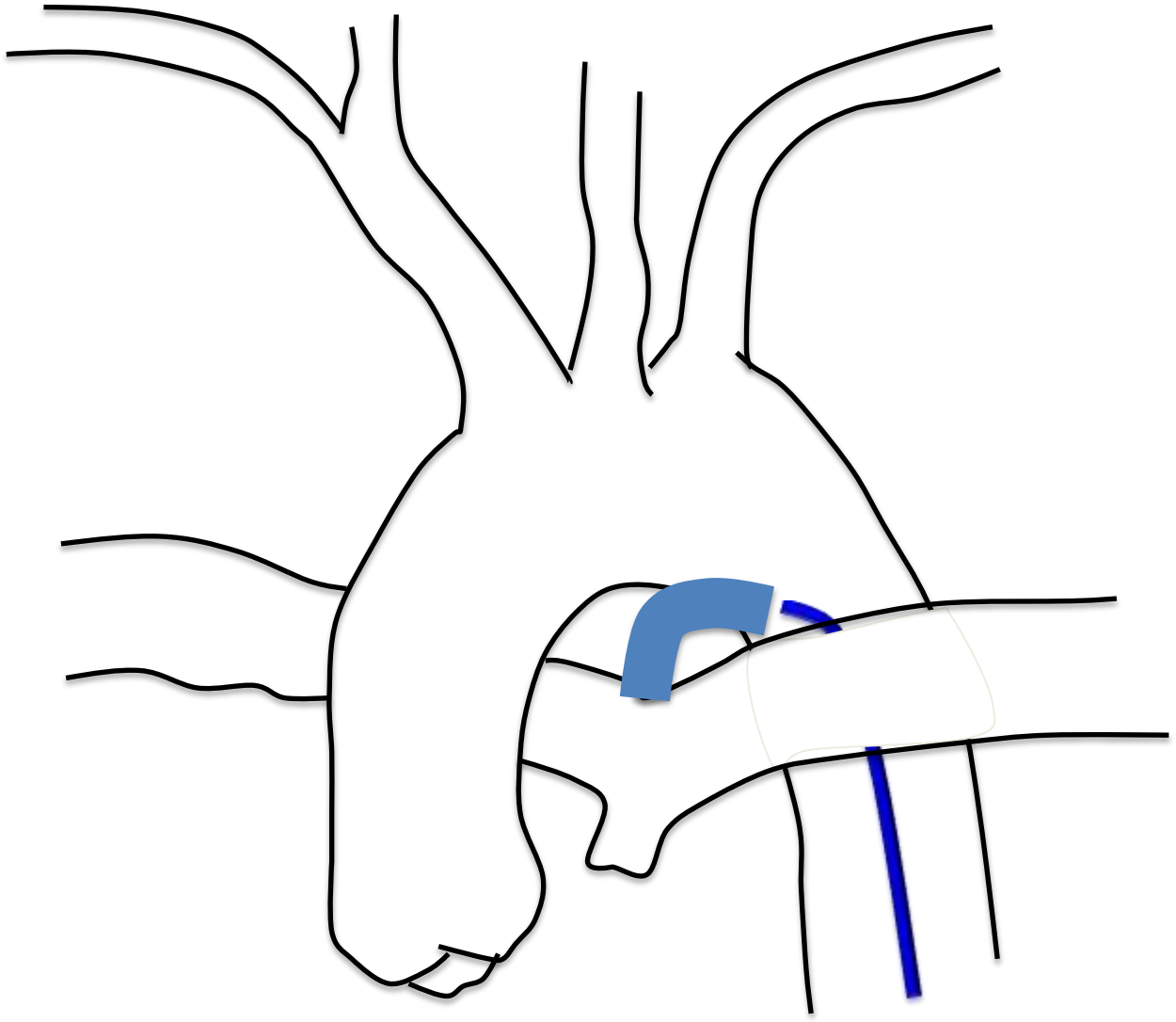
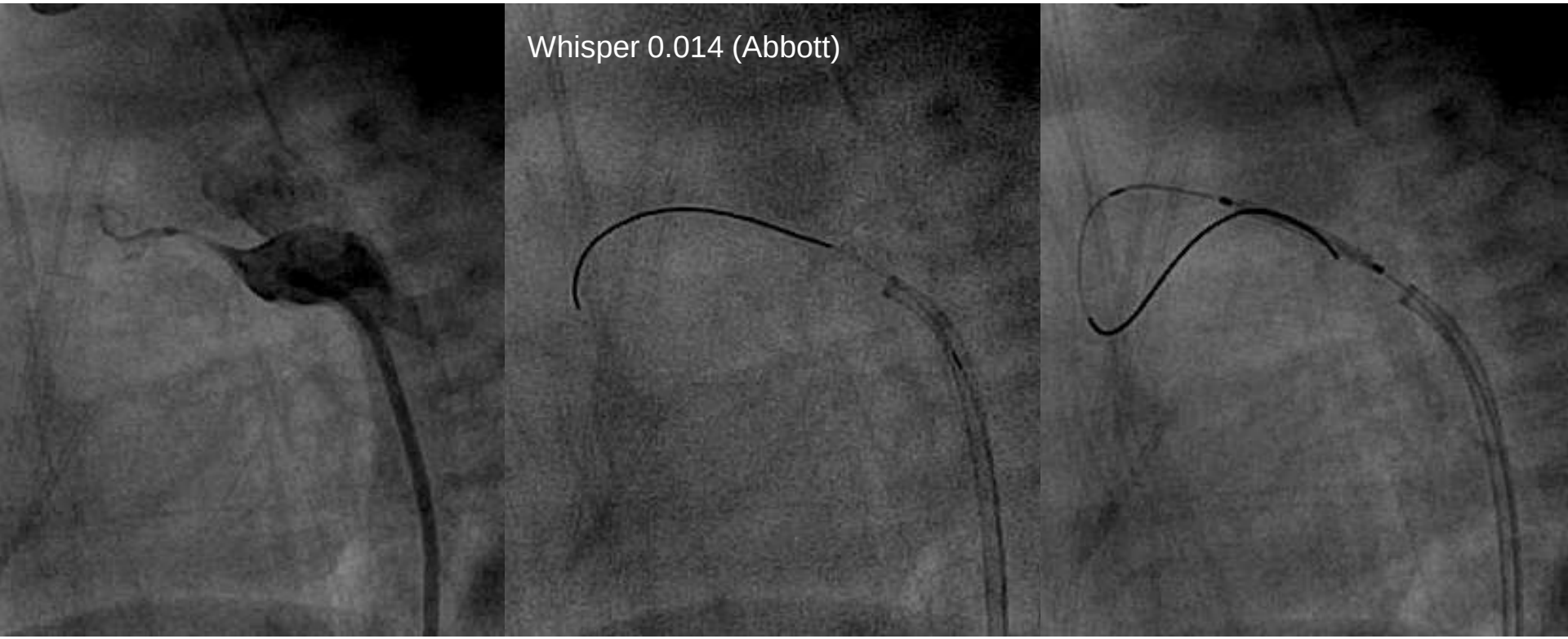
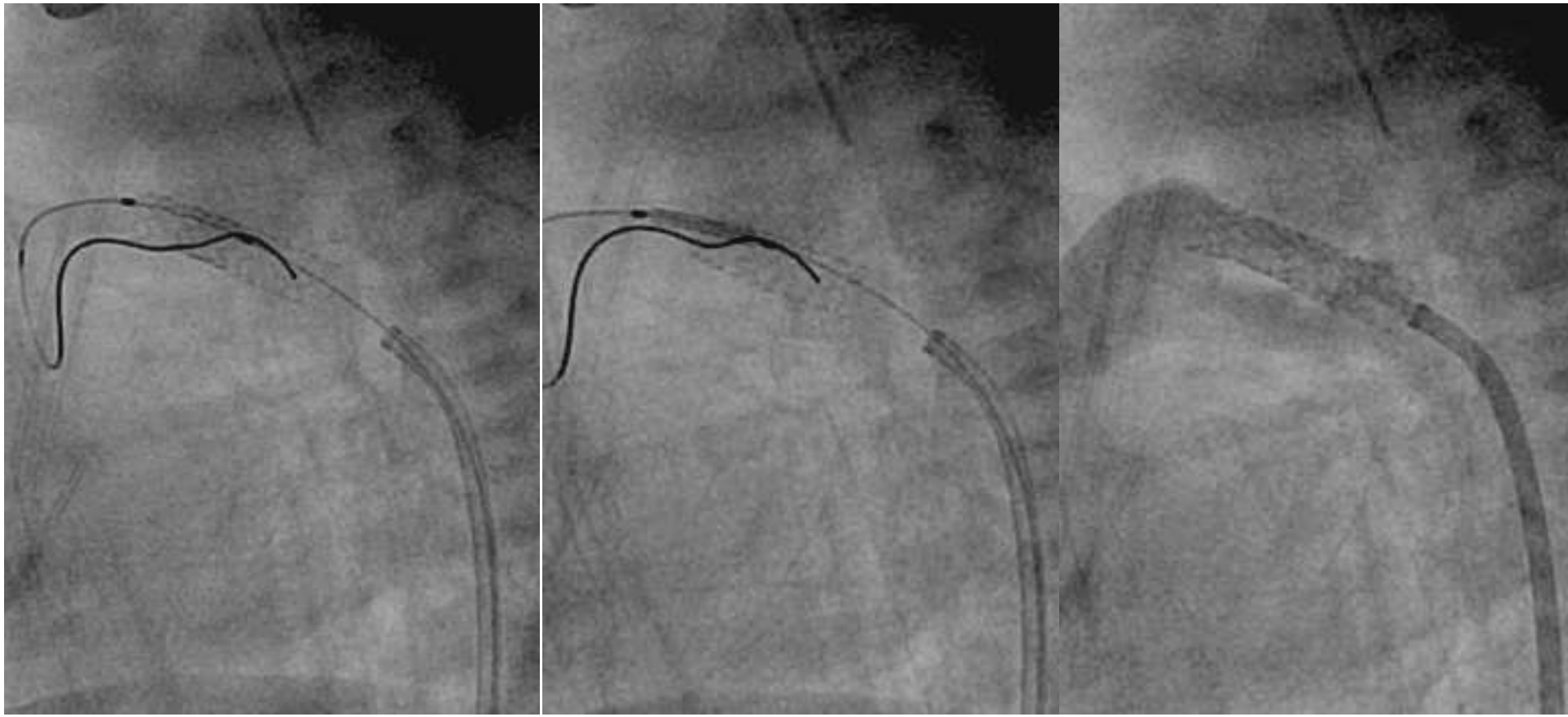


# Approach from femoral artery




8 days old., 2.6 kg, critical PS, relatively small RV
s/p PBPV with desaturation

# Approach from femoral artery



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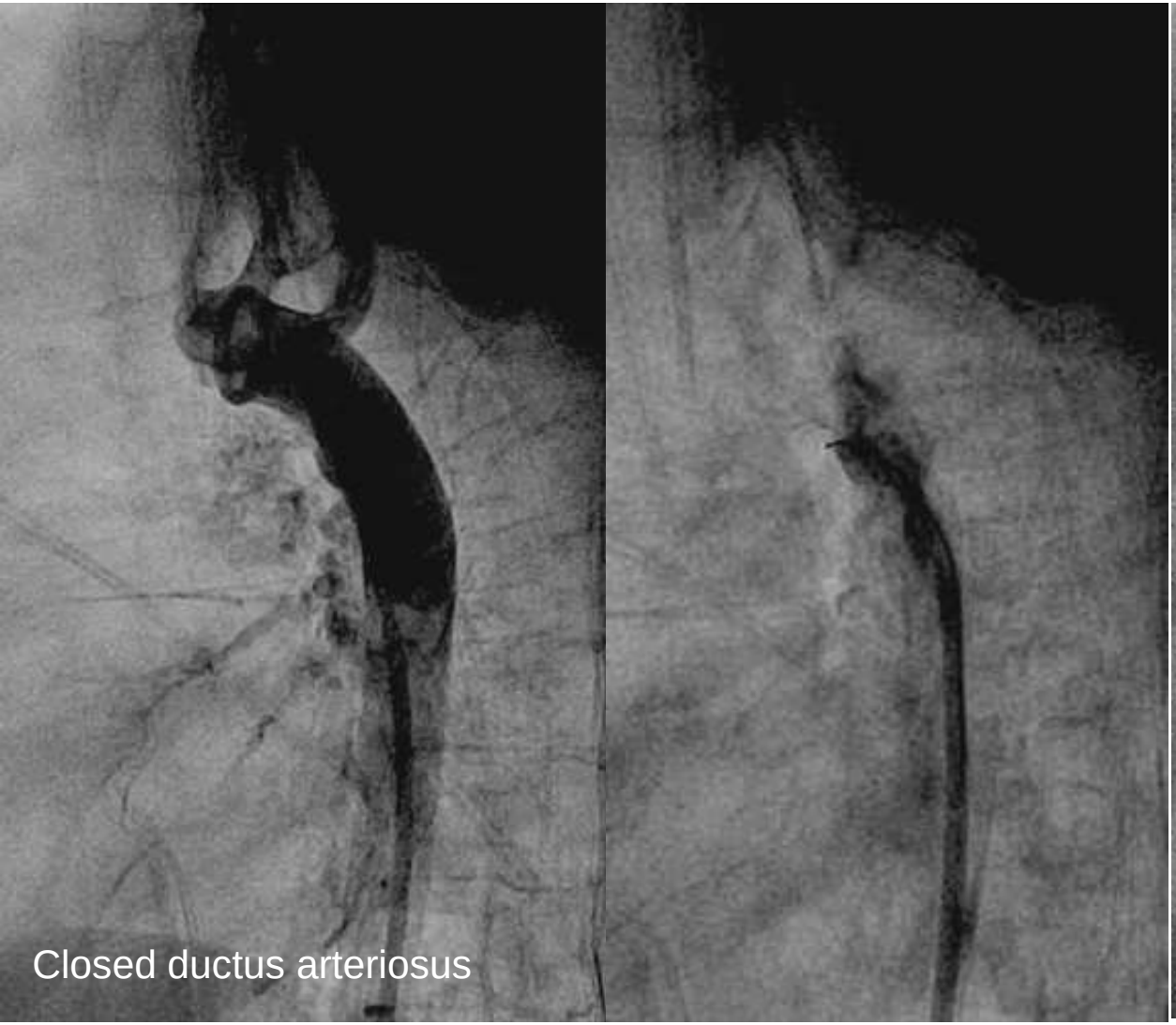
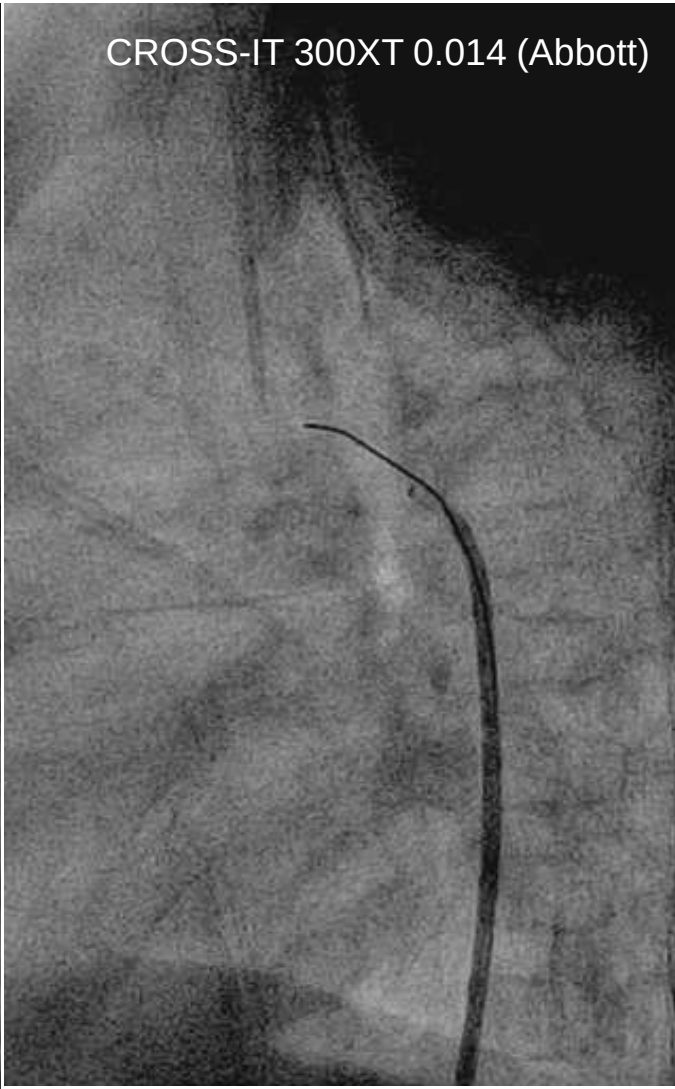
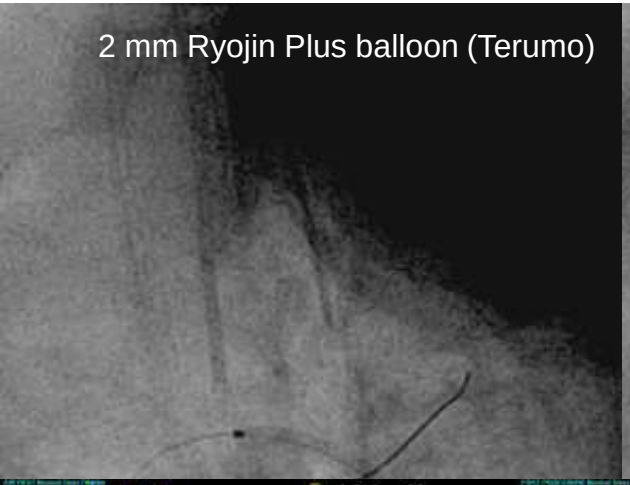
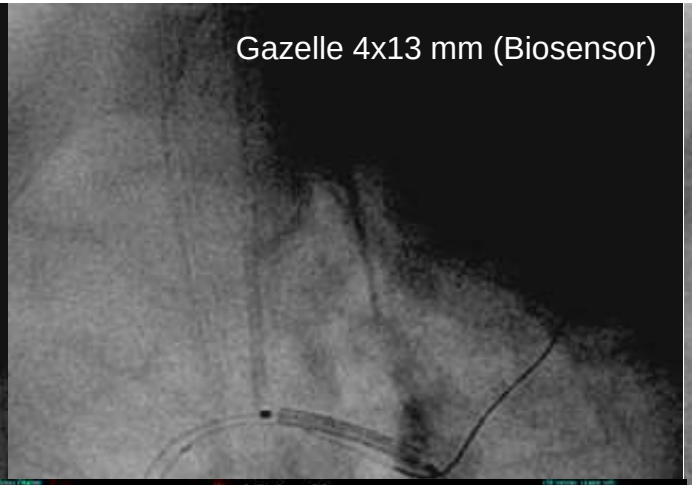


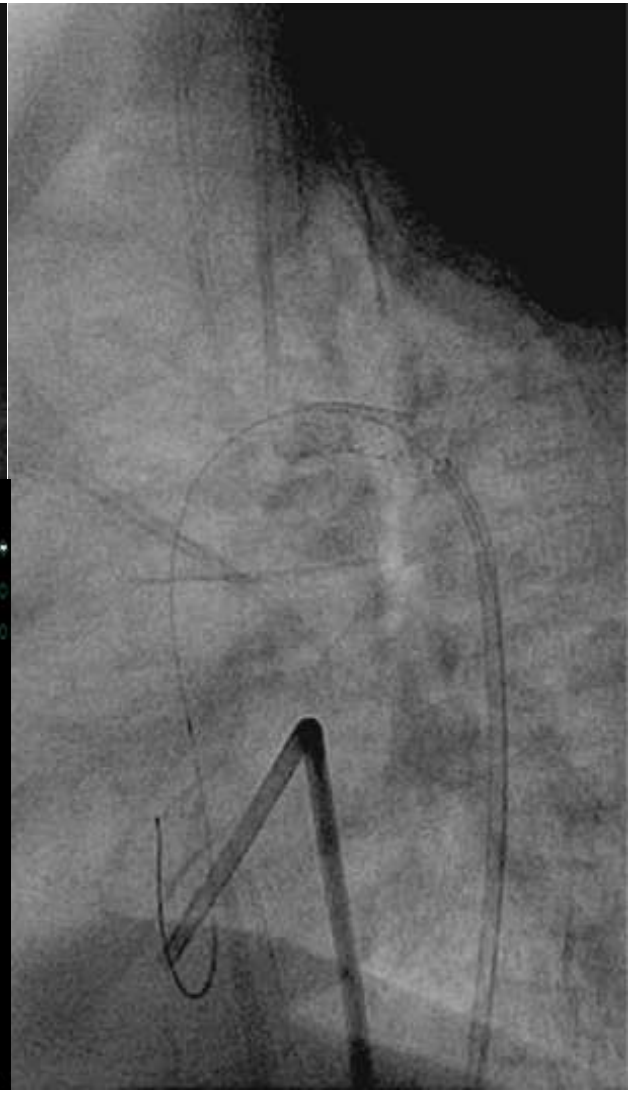



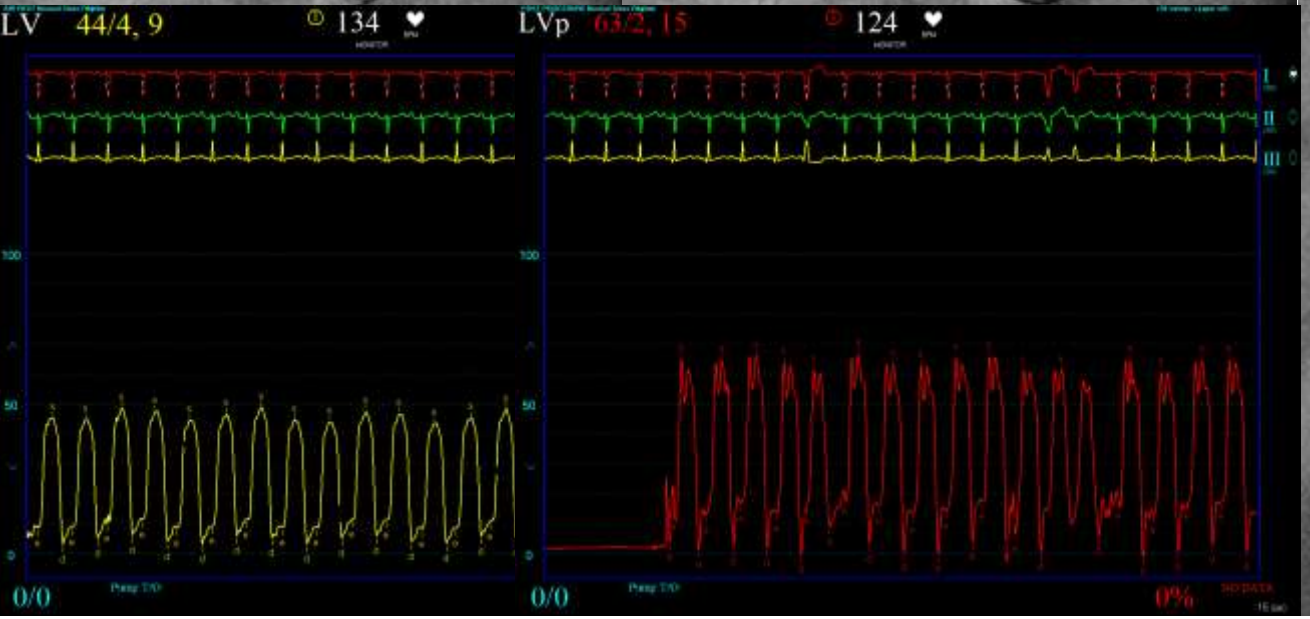

9 mo., late presentation of TGAIVS, small ASD, SpO2 68-72%

# Approach from femoral artery



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# HOW? *(Ductal Stenting in Babies)*

1. Pre-procedural care
2. Approach/Technique
3. **Post-procedural care**

# Post-procedural care

- Heparin IV infusion 15-25 U/kg/hr for 48-72 hrs
- Aspirin 3-5 mg/kg/day
- Clopidogrel 0.2 mg/kg/day *
- Look for possible complications: CHF, stent thrombosis, ductal spasm (uncovered ductal tissue), stent migration

* Li JS, et al. Circulation 2008;117:553-9.

# Which ducts should not be stented?

- Tortuous ducts (>2 bends)
- The diameter of vascular access site ≤ 4F sheath)
- Tri-furcation stenosis??

# PDA stent in babies

- The more tortuous the duct, the more challenge the procedure
- Ask your (in-house) experts for helps
- Right plan and approach save your day and baby's life