Catheter interventions in children

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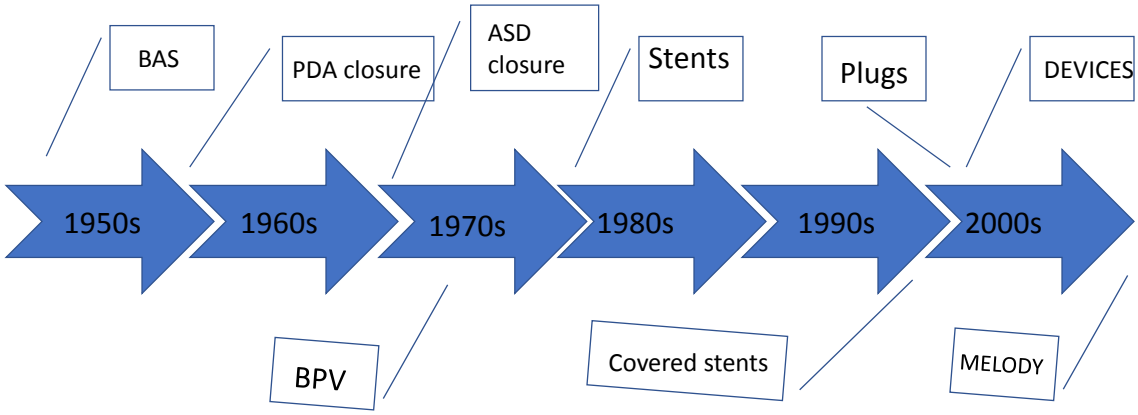
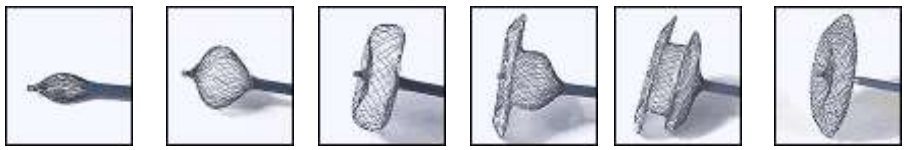
The field of pediatric cardiac interventions has witnessed a dramatic increase in the number and type of procedures performed.



Scope

- Interventional therapy has become an acceptable alternative treatment for many CHD, including closure of atrial defects, muscular ventricular septal defects (VSDs), patent ductus arteriosus (PDA), dilation of stenotic valves and vessels.
- The Nitinol or the Nickle – Titanium alloy has much of the credit of this expansion in the field of pediatric intervention .



The field of pediatric cardiac interventions

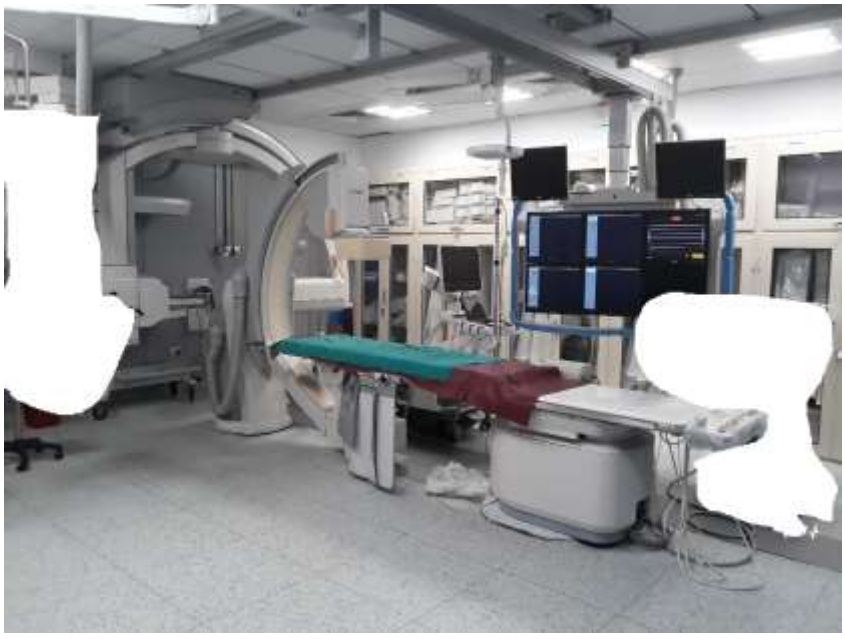
- Neonatal interventions
- Balloon valvuloplasty
- Aortic and pulmonary angioplasty
- Coarctation stenting
- Pulmonary artery stenting
- Pulmonary AV malformations closure
- Coronary AV fistula closure
- MAPCAS and veno- venous collaterals closure
- PDA coil and device closure
- ASD device closure
- PFO closure
- VSD closure
- Percutaneous pulmonary valve implantation
- & still expanding ----------

General requirements

- Only trained pediatric/ congenital cardiologists with expertise in interventional therapy should perform such complex procedures.
- Fully equipped catheterization laboratory including anesthesia, injector and echo/TEE guidance
- On shelf equipment for possible retrieval of embolized devices and covered stents to guard against perforations
- Surgical backup

Ideal settings

- Biplane cath- lab to minimize need of contrast injection
- Rotational angiography, road map and echo-navigation
- Low radiation protocols to minimize risk of radiation exposure
- CT overlay and dedicated software for percutaneous valve implantation
- Hybrid cath- lab suites for difficult cases



Indications and prerequisites

Indications
ASD
Isolated secundum ASD with a pulmonary/systemic flow (Qp/Qs) ratio >1.5:1, signs of right ventricular volume overload
PFO
Cryptogenic stroke and evidence of right to left shunt*
Contraindications (absolute or relative)
Patent foramen ovale or small ASD with Qp/Qs <1.5:1 or with no signs of right ventricular volume overload
A single defect too large for occlusion (>38 mm)
Multiple ASDs unsuitable for percutaneous closure
Defect too close to the superior vena cava, inferior vena cava, pulmonary veins, atrioventricular valves, or coronary sinus
Anterior*, posterior, superior, or inferior rim <5 mm
Abnormal pulmonary venous drainage
Associated congenital abnormality requiring cardiac surgery
ASD with severe pulmonary arterial hypertension and bidirectional or right to left shunting
Intracardiac thrombi diagnosed by echocardiography
History of severe allergy to iodinated contrast agents

*Controversial.

*Circ Cardiovasc Imaging. 2009;2:141-149.

Indications are usually based on expert consensus

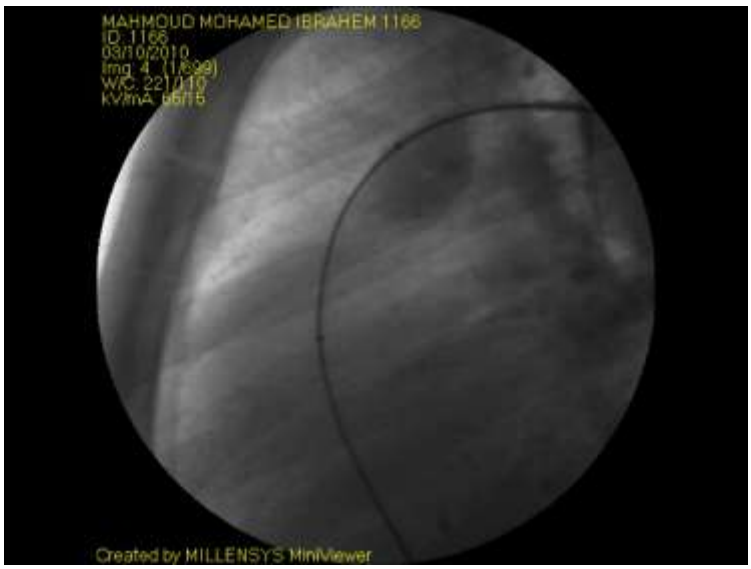
AHA Scientific Statement

Indications for Cardiac Catheterization and Intervention in Pediatric Cardiac Disease

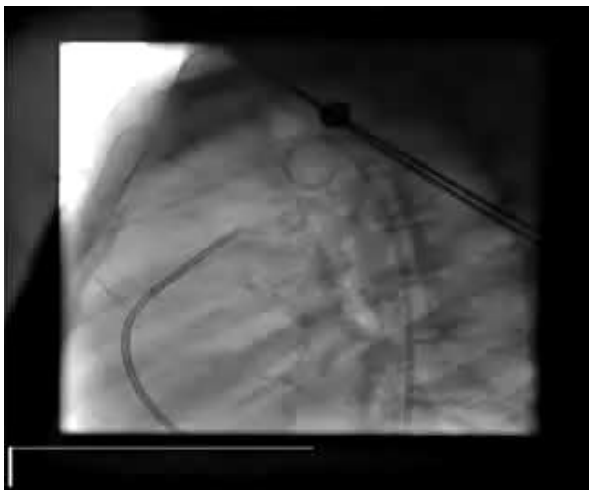
A Scientific Statement From the American Heart Association

Endorsed by the American Academy of Pediatrics and Society for Cardiovascular Angiography and Intervention

BPV



PDA Closure



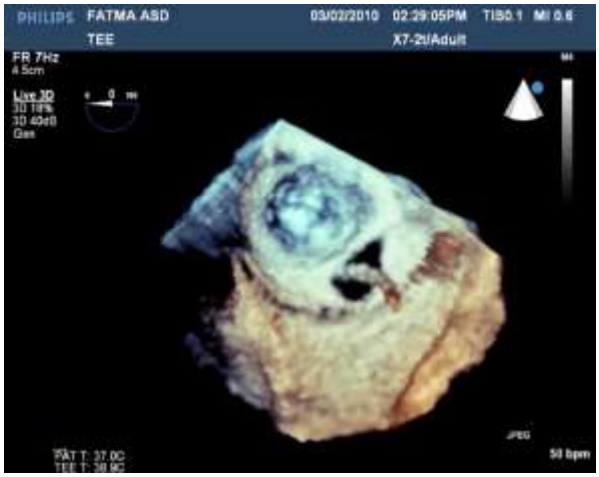
COA stenting

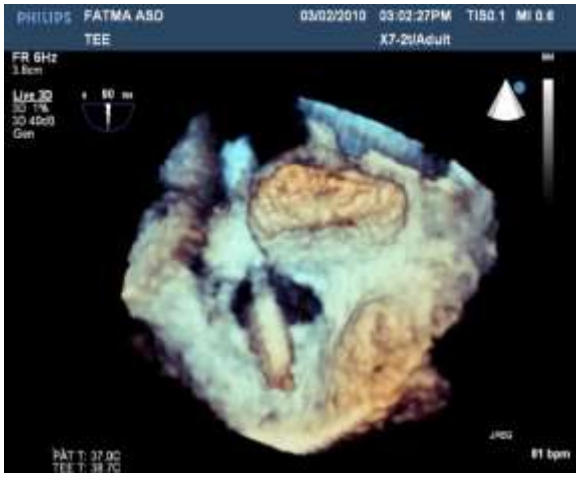
ASD closure

VSD closure

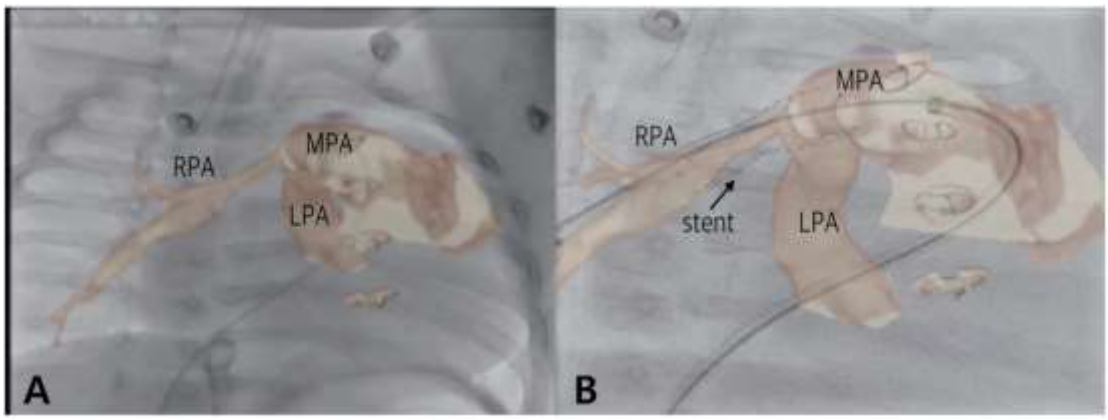
Out of the box interventions

Innovations and recent advances





CT overlay



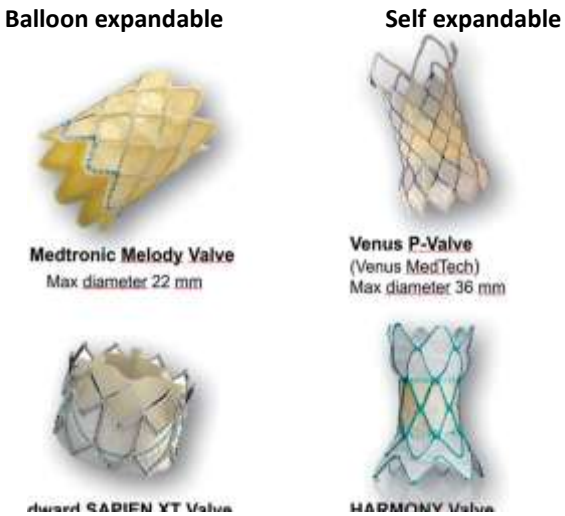
Severe narrowing of the proximal right pulmonary artery is evident on live fluoroscopy with Vessel Navigator (fusion imaging with computed tomography and fluoroscopy) (A), which offers a good 3-dimensional roadmap image for stenting without additional angiography (B)

Bio absorbable septal occluders

- The CBSO employs a poly lactic-co-glycolic acid (PLGA) framework with polyester patches.
- In this FIH trial, only ASD with atrial rims 5mm or PFO tunnels 4mm are treated
- Advantages:

1. No metal left behind,
2. No erosion,
3. Future access to left atrium for AF ablation, LAA occlusion, Mitral valve intervention,....)

Percutaneous valves



Hybrid approach

- A hybrid approach could be used in a number of cases wherever the percutaneous method is problematic or the patient still needs repair of additional related cardiac abnormalities

Complications

- Access related complications
- Anesthesia related complications
- Procedure related complications
- Device related complications

Original Article

Factors affecting vascular access complications in children undergoing congenital cardiac catheterization

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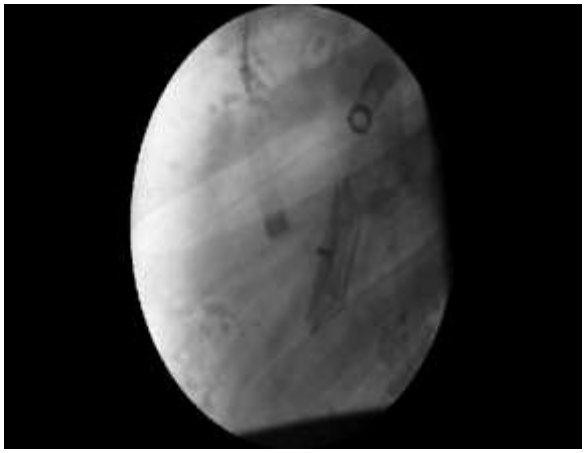
Device embolization

- The incidence in every day practice varies in the literature from 1.5 – 5%
- Nevertheless it remains the most common device related adverse event in the **Manufacturer and User Facility Device Experience (MAUDE) data** issued by the FDA.

- In the survey conducted among AGA proctors, 71.4% of the embolized devices were retrieved using a trans-catheter approach.
- On the other hand in the MAUDE database the device was retrieved surgically in 77.2% of cases.



Take home message

- Catheter interventions in children include a wide and continuously expanding number of procedures
- Team work to ensure proper decision making requires cooperation between the interventionist, the imager, the anesthetist, technician and nursing staff
- An experienced operator reduces morbidity and mortality during complex interventions

Thank you