

**CARDIAC CATHETERIZATION STUDIES
AND TRANS-THORACIC /
TRANS-ESOPHAGEAL ECHOCARDIOGRAPHY**

This is done in the Angiography suite located next to the Paediatric Major OT.

In our institution, cardiac catheterization studies, TTE and TEE in children are done under GA. They can be diagnostic or interventional. Interventional procedures include PDA coiling, Amplatzer closure of ASDs or balloon valvuloplasties.

Preoperative Assessment

The congenital heart disease ranges from simple lesions e.g. PDA and ASD to complex heart lesions. Cyanotic Heart Lesions include Tetralogy of Fallot, Pulmonary Atresia/VSD or single ventricle pathology e.g. hypoplastic right ventricle lesions.

During the preoperative evaluation, the effects of the cardiac lesion on the general health of the child (e.g. failure to thrive, functional status, URTI) should be assessed.

The effects of concomitant drug therapy should also be noted and relevant drugs continued up to the day of cardiac studies. Drugs include anti-failure drugs e.g. digoxin and diuretics or β blockers for cyanotic spells in FT.

Review previous GA and surgeries e.g. palliative shunts.

Establish the presence of co-existing congenital diseases.

Investigations and preoperative instructions

FBC, U/E/Cr, PT/PTT, CXR, GXM and ECG for those undergoing cardiac catheter studies.

In children having *only* TEE, investigations will only be done if indicated (by history, physical examination).

Previous Catheter and 2D Echo results should also be noted.

Blood should be cross matched and available in the OT blood fridge for interventional cases.

IV fluid hydration must be ordered and commenced for all cyanotic patients from the time of fasting.

Angiography suite preparation

Drugs:

- Appropriate anaesthetic drugs should be drawn
- Resuscitative drugs are drawn according to the patient's cardiac disease and general condition e.g. phenylephrine and esmolol in Tetralogy of Fallot with cyanotic spells or adrenaline in critically ill babies.
- Antibiotics are not routinely but when required, AHA guidelines are to be followed.
- Heparin may occasionally be requested by the cardiologist; be sure to confirm the doses with the anesthesia consultant and cardiologist.

Fluids:

- Lactated Ringers is the default solution with an extension tubing and 3 way tap attached.
- In neonates and patients at risk of hypoglycemia, a dextrose maintenance drip may be required.
- Albumin or boluses of normal saline are usually given for unexpected blood loss if the original haematocrit is acceptable. Otherwise, blood loss should be replaced with cross matched blood (packed cells).

Equipment:

- The anesthesia machine and drip stand should be positioned within the red floor markings to avoid obstructing the movement of the C-arm of the fluoroscopy machine.
- The physiologic monitors should be positioned such that a clear view of patient parameters is obtained at all times.
- Ensure proper taping of ETT to prevent dislodgement during TEE and kinking by antero
- posterior arms of the X-ray machine. If TEE is to be carried out, a mouth guard / bite block should be put in before securing the ETT.

- Discuss if nitric oxide might be required to assess reversibility of pulmonary hypertension.

Positioning of patient:

The arms of the patient are positioned on either side of the head, so that unobstructed images of the heart may be obtained. Avoid over-stretching of the brachial plexus in the older patients by supporting the arms with a pillow, gamgees or sponge. All pressure points should be protected.

Temperature management:

When the anticipated procedure time is long or the patient is a small infant, a plastic sheet should be used as an occlusive drape to keep the patient warm. If a Bair Hugger is used, ensure proper positioning of warm air hose to avoid thermal injury. Temperature should be monitored.

Conduct of anaesthesia:

Following an intravenous or inhalational induction, anaesthesia is continued with a volatile agent supplemented with boluses of fentanyl (0.5-1 mcg/kg) and an IPPV/muscle relaxant technique is used.

The FiO_2 used depends on the pathophysiology of the patient and whether or not the cardiologist wishes to sample blood for calculation of intra-cardiac shunts. In these cases an air/ O_2 mixture as close to 21% is often required. IV paracetamol may be used as an analgesic adjunct.

Reversal:

Ensure that the cardiologist is satisfied with haemostasis of the femoral puncture sites and pressure bandages are applied before reversing the patient.

Recovery

Patients are transferred to the Major OT Recovery Room for monitoring and thereafter to either the cardiac step down unit (CSDU) or the general ward.

If the patients are transferred directly to CICU intubated, you may require an air/oxygen blender to avoid high FiO_2 during transfer. (High FiO_2 may cause pulmonary vasodilatation hence flooding of the lungs in patients with single ventricle physiology).

Hybrid Procedures

Closure of certain heart defects like VSD may be carried out in Major OT by the cardiologist in an open chest setting. Preparation should be as for open heart surgery with the additional provision of Transoesophageal Echocardiography.