Infantile COA angioplasty tips & pearls

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Anatomical variations of COA:

- isolated and discrete,
- long segment
- transverse arch hypoplasia.
Epidemiology

• accounts for approximately 4% to 8% of all congenital heart defects.
• More predominant in males,
• it is the fourth most common cardiac lesion requiring intervention during the first year of life.
• There is evidence for increased familial risk in congenital LVOT obstructive lesions, including CoA.
• Although most cases are sporadic, at least 21% to 35% of individuals with monosomy X or Turner syndrome (TS) have CoA, and at least 5% to 12% of females with CoA also have TS.
• CoA occurs in up to 21% of individuals with Kabuki and 5% of patients with Williams syndromes.
presentation

• The **timing and acuity of presentation** is dependent on the severity of stenosis and associated lesions.

• A neonate with undiagnosed critical CoA may present in cardiogenic shock and heart failure when the ductus constricts within the first 2 weeks of life.

• Inadequate tissue perfusion with global ischemia leads to **acidosis, multi-organ failure and death** unless definitive medical and surgical interventions are rapidly instituted.
Physical Examination

• pale,
• irritable,
• respiratory distress,
• tachycardia,
• dyspnea,
• diaphoresis,
• hepatomegaly,
• poor perfusion
• differential cyanosis
Physical Examination

• Discrepant arterial pulses and systolic blood pressure differences between the upper and lower extremities are the hallmarks of CoA.

• CoA results in an elevated systolic pressure in the ascending aorta with decreased pulse pressure and systolic pressure distal to the area of obstruction

• **Pulsus** parvus et tardus

• prominent **heave** in the cardiac apex

• The first and second **heart sounds** are usually normal by auscultation.

• **A gallop rhythm** may be heard in an infant with ventricular dysfunction. However, in the presence of severely impaired cardiac output, murmurs may be subtle and a gallop rhythm may be the only finding
Diagnostic Studies

• EKG
• C. X. R.
• ECHO
• C.T.
• M.R.I.
• Catheterization and Angiography
Cardiac Catheterization and Angiography In CoA

• Cardiac catheterization may be both diagnostic and therapeutic:

• The objectives of a diagnostic cardiac catheterization are:

  - to define the anatomy and severity of CoA,
  - identify associated lesions and arterial collateral circulation,
  - assess left ventricular function and pulmonary artery pressure and resistance.
MANAGEMENT

INFANCY

• HF >> immediate treatment
• inotrope, PGE1, mechanical ventilation
• Tx of acidosis, hypothermia, hypoglycemia, or anemia
• definitive repair
neonate with other cardiac anomalies: complete repair vs. palliation (PA banding)

1. CoA + VSD >>> CoA repair alone

2. Borderline small left heart structure + mild-moderate hypoplasia of the aortic or mitral valves >>> CoA repair alone

3. DORV, D-TGA, large VSD >>> complete intracardiac repair + CoA Repair
Symptomatic newborns: “too small” for surgical repair

1. PGE 1 >>> while awaiting growth to an “appropriate” operative weight

2. angioplasty with or without stenting has been performed in critically ill infants, irrespective of weight

3. Early surgery
neonates and infants: angioplasty or surgical intervention?

- remains debatable
- Angioplasty: recurrent CoA and need for reintervention
Native CoA

- BALLOON ANGIoplastY:
- AS palliative management for:
  - Sever ventricular dysfunction
  - Sever MR
  - Low C.O
  - Systemic disease affected by CoA
Indian Guidelines for Indications and Timing of Intervention for Common Congenital Heart Diseases: Revised and Updated Consensus Statement of the Working Group on Management of Congenital Heart Diseases.


Mode of Intervention
I. Neonatal presentation: Surgery (Class I). Aortic arch hypoplasia, if associated, should also be repaired.
II. Critically ill neonate who are considered high risk for surgery (shock like syndrome, severe left ventricular dysfunction): Balloon angioplasty to tide over the crisis (Class IIa).
III. Infants with native coarctation: Surgery (Class I) or Balloon angioplasty (Class IIa).
IV. Infants with re-coarctation: Balloon angioplasty (Class I).

V. Children 25 kg and adults with native coarctation: Catheter based stenting (Class IIa).
VI. Children <25 kg with recoarctation: Balloon angioplasty ± stenting (Class I)
VII. Children >25 kg and adults with native coarctation: Catheter-based stenting (Class IIa)

VIII. Children >25 kg and adults with re-coarctation: Catheter based stenting (Class I).
IX. Elective endovascular stenting of aorta is contraindicated.
Neonatal COA cath & angioplasty

• Pre cath:
  ➢ CNS,
  ➢ sepsis,
  ➢ Hematology (CBC- PT- PTT- INR)
  ➢ renal,
  ➢ extra cardiac anomalies,
  ➢ Acidosis
  ➢ Electrolytes
  ➢ Imaging
  ➢ Elective intubation
  ➢ Vascular access
  ➢ Surgical standby
  ➢ Intellectual consent
  ➢ .............
Neonatal COA cath & angioplasty

• Cath lab:
  - blanket
  - position (protect nerves, hip and limbs)
  - sedation
  - intubation
  - air way protection
  - monitoring (O2 sat, rate, rhythm, BP)
  - stock (suitable for procedure)

- staff (familiar by procedure)
- vascular access (Doppler probe)
- Anti coagulant
- antibiotic
- no rigid, more gentle
- be fast but accurate
- sheet extraction
Neonatal COA cath & angioplasty

• Post cath:
  ➢ sheet extraction
  ➢ hemostasis
  ➢ monitoring (rate, rhythm, BP, O2 sat., anemia, coagulation, limb perfusion)
  ➢ beta-blocker
  ➢ vasodilator
  ➢ echo (residue, aneurysm, dissection, AI, PE, LV function, PH)
  ➢ ex-tubation
  ➢ discharge
  ➢ follow up (residual or recurrent stenosis, aneurysm, LV size & function)
Maternal hyperoxygenation has been proposed as a novel treatment strategy for fetuses with borderline small left heart structures and CoA.

It is postulated to increase left-sided pulmonary venous return resulting in a greater blood volume delivered to the aortic isthmus.
FUTURE DIRECTIONS

• Small patient size and prematurity at the time of intervention remain significant risk factors both for aortic complications and early mortality.

• Improvement in technology, with smaller catheters and biodegradable stents will likely increase the efficacy of transcatheter intervention in younger and smaller patients.

• As transcatheter and percutaneous techniques evolve, a larger subset of CoA patients may benefit from nonsurgical treatment.
THANKS FOR YOUR KIND ATTENTION