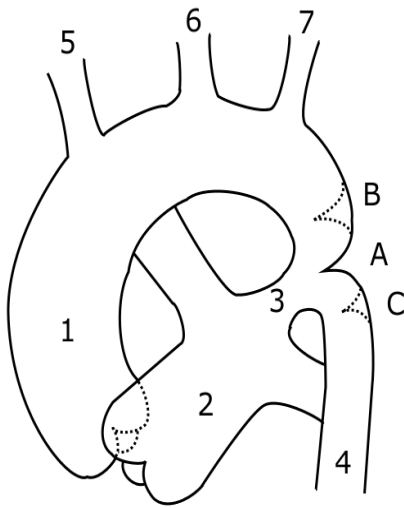


Coarctation of the Aorta - Screening using Newborn Pulse Oximetry

What is it?



Coarctation = constriction, specifically a narrowing of the thoracic aorta

Usually distal to left subclavian (7)

Can be pre-ductal or post-ductal (ductus arteriosus = 3)

Pre-ductal: Flow to distal aorta dependent on ductus arteriosus.

Ductal: can appear when ductus arteriosus closes

Post-ductal: even w/ flow from ductus arteriosus, blood flow to lower body impaired. Can present in adults. Probably due to muscular artery of ductus extending into elastic aorta and contracting when ductus arteriosus closes. ¹

Associations

- Bicuspid aortic valve – 30-40% coarctas present in tandem w/ bicuspid aortic valve (ejection click)
- Males – 2-5xs more common in males.
- Turners syndrome – significant # of females w/ coarctas have Turners. These are usually pre-ductal.

Why isn't a coarctation a problem in utero?

- If the coarctation is pre-ductal, the ductus arteriosus flow completely bypasses the narrowing.
- Ductal and post-ductal coarctations are often a postnatal development because the narrowing is often caused by the closing of the ductus arteriosus.
- Antenatal diagnosis is possible. 2 indications possible coarct are right ventricular dilation and disproportion in size of aortic arch (small) compared to main pulmonary artery.

Blood pressures in coarctation

- Classic picture is hypertension in upper extremities, diminished/delayed femoral pulses and low/unobtainable arterial BP in lower extremities.
- Usually the coarctation is distal to the left subclavian but occasionally it is proximal to the left subclavian so the left arm has a low BP.
- 3-4% of the time coarctation is proximal to both left and right subclavian so BPs are low in all extremities.

¹ Good summary of basic coarctation of the aorta presentation/trtmt: Rosenthal, Eric. "Coarctation of the Aorta From Fetus to Adult: Curable Condition Or Life Long Disease Process". Heart 2005. 91: 1495-1502.

Screening for Coarctation using Newborn Pulse Oximetry

Symptoms of Coarctation of the Aorta on Pulse Ox Screening

O2 sats in coarctation will depend on at least three variables: location of the coarctation (pre/post ductal), severity of the coarctation and patency of the ductus arteriosus

- Preductal/patent ductus arteriosus: While the ductus arteriosus is open there is right to left shunting through the ductus arteriosus since there is minimal flow from the aorta above the ductus where the coarctation is. The right to left shunting dilutes the oxygen concentration of blood to the lower extremities. Hence a preductal coarctation of the aorta with a patent ductus arteriosus presents with high upper extremity O2 sats and low lower extremity sats. This can be picked up when the requirement of <3% difference between right hand and foot sats is not met.
- Preductal/closed ductus arteriosus: If the coarctation is severe there will be no pulsatile flow to the lower extremities so no O2 sat could be recorded for the lower extremities.
- Ductal/Post-ductal: In this case regardless of whether the ductus arteriosus is patent or not there will be a diminished volume flowing to lower extremities. However saturations, if pulse sufficient to capture sats, would not differ between upper and lower extremities.

The variability of coarctations' presentation, which is dependent on location, severity and ductus arteriosus patency, is a major determinant of the limited sensitivity of pulse oximetry screening

Sensitivity/Specificity of Newborn Pulse Ox Screening for Coarctation of the Aorta

- According to the CDC, coarctation of the aorta is NOT one of the seven primary targets of pulse ox screening. The seven primary targets are hypoplastic left heart, pulmonary atresia, tetralogy of Fallot, total anomalous pulmonary venous return, transposition of the great vessels, tricuspid atresia and truncus arteriosus.
- Coarctation is a secondary target, however, thus classified due to lower sensitivity. The exact sensitivity of pulse ox screenings using current criteria is not well quantified not surprisingly since coarct presentation is so variable. One large Swedish study had 3 of 9 cases of coarctation present with abnormal O2 sats (33% sens).²
- A separate prior study by the same group that took a group 200 normal newborns and 66 infants with critical congenital heart disease (17 of whom had coarctation) found that "a difference of > 3% between pre and post ductal reads (which is 2xs the SD of measurement variability) gives a sensitivity of 82.4%, a specificity of 96.0%, a PPV of 63.6% and a NPV of 98.5% specifically for the diagnosis of CoA"³

² de-Wahl Granelli A et al. "Impact of pulse oximetry screening on the detection of duct dependent congenital heart disease: a Swedish prospective screening study in 39,821 newborns." [BMJ](#). 2009 Jan 8;338:a3037. doi: 10.1136/bmj.a3037.

³ de-Wahl Granelli A et al. "Screening for duct-dependent congenital heart disease with pulse oximetry: A critical evaluation of strategies to maximize sensitivity". *Acta Pediatrics*, 2005; 94: 1590-1 596.