Paediatric Chest CT

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Key messages

*Children differ from adults with regard to chest CT in 4 key ways*

1) Children are more radiation sensitive than adults
2) Children are less co-operative than adults
3) Children have higher intravenous contrast requirements than adults
4) Children have different pathologies than adults
Dose sensitivity

- Dose sensitivity is a function of both higher mitotic activity in children and a longer life expectancy.
- Radiation doses from CT, and the risks thereof, are poorly understood by the wider medical community
- The key principle to dose reduction is learning to tolerate noisy images
- Dose reduction should employ reductions in both kV and mA
- Other imaging modalities should be considered including MRI and ultrasound
- If a study is likely to be non-diagnostic, it should not be performed

Co-operation

- Children have different levels of co-operation at different ages
- Babies can often be scanned following feeding and swaddling (feed and wrap), although this is less effective after about 2-3 months
- A trial of sedation with chloral hydrate may work for older babies and toddlers, but the 2-4 year old age group frequently require a general anaesthetic
- Children over 4 will often lie still for a scan, but won’t breath hold
- Modern fast scanners produce little or no respiratory artifact in a child who is breathing quietly

Contrast

- Lack of mediastinal fat and the presence of thymic tissue make mediastinal assessment very difficult without intravenous contrast in children, and so contrast is preferable for most scans
- Angiographic imaging is required for many studies, including many congenital malformations
- Children have a proportionally higher circulating blood volume than adults, and so require significantly higher doses of intravenous contrast; 2ml/kg is usually adequate, but doses up to 4ml/kg are acceptable for some indications
- Contrast should ideally be given into a blue venflon in the anteceubital fossa, via a pump
- For angiographic studies the scan should usually start around the end of the injection
Pathology

- Children have radically different chest pathologies to adults
- Congenital anomalies are seen almost exclusively in children
- Neoplasia and interstitial lung disease are much rarer in children than in adults, and when present take very different forms.
- Congenital thoracic anomalies include bronchopulmonary foregut malformations, the hypogenetic lung spectrum and congenital cardiovascular disease
- Bronchopulmonary foregut malformations are related disorders characterized by bronchial obstruction/malformation sequences and persistent primitive vascular connections and include sequestration, bronchial atresia, congenital pulmonary airway malformations, foregut duplication cysts and congenital lobar overinflation
- The hypogenetic lung spectrum comprises pulmonary agenesis, aplasia and hypoplasia. These may be associated with anomalies of arterial supply, or venous drainage or both
- Vascular rings include aortic arch vascular rings, pulmonary slings and innominate artery compression syndrome.

Recommended reading

- Journal articles
  - Brenner et al; Estimated risks of radiation induced fatal cancer from pediatric CT, AJR, February 2001
- Texts
  - Pediatric Body CT, Marilyn J Siegel, Lippincott Williams and Wilkins, 2008