A basic guide to performing Pediatric Fluoroscopy

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Fluoroscopy is not just capturing images but observing and understanding the dynamic nature of the human body.

In children, all fluoroscopy should be performed adhering to the ALARA principles

Upper Gl

 Scout film either CXR or KUB depending on esophageal or abdominal symptoms

Upper Gl views Quick Overview



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Lateral view of the distended esophagus from the nasopharynx to GE junction. A second AP image optional and shows aortic arch location





RLD position allows the contrast to exit the stomach into the normally retroperitoneal duodenum. Once contrast moves anteriorly to the 3rd/4th portion of the duodeum, place patient in supine position.



With the patient perfectly supine and straight demonstrate the duodenum. The ligament of Trietz is normally to the left of the spine at the duodenal bulb.



Pediatric Upper GI

Indications

- Common: vomiting, bilious emesis/concern for intestinal malrotation, abdominal pain and weight loss/failure to thrive.
- Less common: epigastric pain, nausea, upper GI bleeding, abdominal masses, chronic or recurrent respiratory disease, including cough, ALTE.
- Contraindications: recent barium/contrast study, pregnancy

Contrast Choice

 <u>Barium</u> unless there is concern for perforation then use a <u>water</u> soluble contrast such as Omnipaque 180 or Optiray 240/320

Pediatric Upper GI

Preparation

Oral feeding should be withheld for a time period appropriate for the patient's age: 2 to 3 hours for neonates and young infants, 4 hours for older infants and children. 6 to 8 hours for adolescents.
Emergency examinations may be performed with shorter to no fasting times.

Tips for successful studies

- Preparing the families through education
- Engaging a Child Life Specialist and/or using child appropriate distraction techniques
- Contrast should be given in a manner that is familiar to the patient (i.e. bottle, sippy cup from home etc...) to avoid placement of an NG tube or use of a syringe.

Upper GI views

Esophagus

- Lateral view from the nasopharynx to the gastric fundus (patient LLD prevents gastric contents from prematurely filling the duodenum)
- Assess motility with one swallow
- AP view (optional) provides 3 D information and side of the aortic arch



Double contrast studies are rarely done in children with the esophageal mucosa better assessed by endoscopy

Upper GI views

Duodenum

- RLD postion allows contrast to empty from the stomach into the duodenum
- The normal duodenum is retroperitoneal, just anterior to the spine. The second and fourth portions nearly overlap on the lateral view.



Upper GI views

Ligament of Trietz

- The normal location is left of the spine at the level of the duodenal bulb proven in a well positioned AP image of this area.
- Patient should be lying flat and straight on the table to assess Ligament of Trietz



Upper GI pearls

- If the indication is for bilious emesis in a newborn consider placement of NG tube by the primary team prior to study to decompress the stomach, directly control contrast administration and optimize visualization of the ligament of Trietz.
- For patients who aspirate and are on a modified diet, standard contrast used for UGI has the equivalent thickness to nectar thick liquids.



- 1. ACR-SPR practice guidelines for the performance of contrast esophagrams and upper gastrointestinal examinations in infants and children. 2010.
- 2. Applegate KE, Anderson JM, Klatte EC. Intestinal malrotation in children: a problem solving approach to the upper gastrointestinal series. Radiographics. 2006. 26(5): 1485-1500.

VCUG Views

Quick Overview

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Scout including pubic symphysis and catheter as well as the renal fossae (L1-L2 level)

May take >1 image if patient is larger



Bladder in early filling phase

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Optional fluoro store of bladder at capacity (i.e. patient says they have to pee!)

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Oblique images of UVJ's to look for reflux •Include catheter, bladder base, iliac crest and exact insertion of the refluxing ureter Voiding Images

- Boys: Image of <u>entire</u> urethra including bladder base to tip of penis
- Girls: Image in AP plane



Post void AP radiographs of bladder area & renal fossae to check for any obstruction or reflux you may have missed

Pediatric VCUG

- Indications
 - Common:
 - Pyelonephritis or urinary tract infection
 - Hydronephrosis or hydroureter, prenatal or postnatal
 - Scarring seen on renal US
 - Suspected bladder outlet obstruction
 - Congenital anomalies of the GU tract
 - Post op evaluation

– Uncommon/Debated:

- Sibling with documented reflux
- Pre-renal transplant
- Females with incontinence (not constant dribbling however)

Contrast: Cystoconray 17%*

*Contast choice may vary by institution

Variations

<u>Cyclic vs. Non-cyclic VCUG</u>

- Cyclic: < 1 year of age</p>
 - Patient should void a total of at least 3 times during the study
 - Rationale: infants tend to void spontaneously before the bladder fills completely. Each cycle of voiding increases the likelihood of seeing reflux
- Non-Cyclic: > 1 year of age

Voiding Images

Boys:

Full exposure at 2/sec or 3/sec in the lateral position to see the entire male urethra



Girls: Fluoro store in AP plane to include the entire female urethra



What to do if you see reflux?

-Look at the kidneys and take a full exposure at the highest grade of reflux

-Take voiding shots

-Ensure that contrast has drained from kidneys at the end of the study.

- If not, recatheterize the patient and drain
- If contrast <u>remains</u> in the collecting system(s), you have just diagnosed a superimposed component of OBSTRUCTION on top of the patient's reflux.









What to do if you see reflux?

 Look at the kidneys and take a full exposure at the highest grade of reflux





- Ensure that contrast has drained from kidneys at the end of the study.
 - Consider recatheterizing the patient and draining through the catheter is the bladder if contrast <u>remains</u> in the collecting system(s), you have just diagnosed a superimposed component of OBSTRUCTION superimposed on reflux.



Grading Reflux



Pearls

- The Older Patient
 - Boys:
 - Instill ~10mL topical anesthetic gel into the male urethra sterilely with a fistula tip and hold in the urethra by pinching the glans for 3 minutes
 - Girls:
 - Place gauze coated in anesthetic gel on the perineum for ~3 minutes prior to catheterization
- Correlate the appearance on VCUG with that of ultrasound (often performed prior to VCUG)
 - Ultrasound tends to underestimate degree of reflux
- Sedation is not generally necessary, especially if a Child Life specialist is able to participate in the study or if ageappropriate distraction techniques are used



 ACR-SPR Practice Parameter for the performance of VCUG in Children (<u>http://www.acr.org/~/media/62930639ac564e00a2c3a48f</u> <u>e9e3cf0f.pdf</u>)