Imaging, Pediatric Respiratory Tract

Advances and Controversies in Clinical Pediatrics

Go With the Flow: Current Pediatric GU Imaging

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Pediatric GU Imaging

Imaging as a tool
- Radiography (Fluoroscopy)
- Ultrasound
- Computed tomography
- Nuclear Medicine
- Magnetic Resonance Imaging
Pediatric GU Imaging

- Common conditions
  - Congenital, infectious, trauma, neoplasm, misc.
- Controversies
  - UTI - ? VCUG, imaging for renal damage
  - Prenatal hydronephrosis - ? Work-up / follow-up
- Advances
  - Magnetic Resonance Urography (MRU)
  - CT angiography
  - Voiding urosonography

Pediatric GU Imaging

- Congenital anomalies
- Infection
- Trauma
- Neoplasm
- Misc.

Renal Agenesis
Spontaneous PTX
Elongated adrenal

Duplex Kidney
Weigert – Meyer Rule

Multicystic Dysplastic kidney
Pediatric GU Imaging

- Congenital anomalies
  - UPJ
  - UVJ Congenital megaureter
  - Duplex collecting system
  - Multicystic dysplastic kidney
  - Ectopic kidney
  - Horseshoe kidney
  - Posterior urethral valves
  - Uterine anomalies

Pediatric GU Imaging

- Infection
  - UTI
  - Renal abscess
  - Tuberculosis

VCUG - Vesicoureteral reflux

Nuclear Medicine – Radionuclide cystogram
Pyelonephritis
Hx - r/o appy
Sickle cell - renal infarct
Hx - Abdominal pain

5/29/2009

DMSA – Renal scan (cortical imaging)

MRU – VUR and reflux nephropathy

Pediatric GU Imaging
- Trauma
  - Fracture / laceration
  - Vascular injury
Renal Trauma

Wilm’s Tumor

Multilocular Cystic Nephroma

Rhabdomyosarcoma – bladder base
Renal failure – beware iodinated contrast (CT) and gadolinium (MR)

Pediatric GU Imaging
- Neoplasm
  - Wilms tumor
  - Clear cell
  - Renal cell carcinoma
  - Medullary cystic carcinoma (Sickle Cell trait)
  - Multilocular Cystic Nephroma

Pediatric GU Imaging
- Congenital anomalies
- Infection
- Trauma
- Neoplasm
- Misc.
  - Hypertension, Urolithiasis, Cystic renal disease, Intersex, Testicular and Ovarian torsion
Common Controversies

- Work-up of UTI
  - VCU (Fluoroscopy vs. Nuc. Med.)
  - Imaging renal scarring (US -Nuc. Med. - MRU)
- Prenatal hydronephrosis (Ultrasound/VCUG)
- Urinary tract obstruction (Lasix NM vs. MRU)

UTI - summary

- US – t/o obstruction, anomalies
- VCU
  - Initial fluoroscopic
  - Follow-up nuclear medicine (less radiation)
  - Trend – less VCU for non-febrile UTI > 2 y.o.
- Sonographic VCU – Europe
- Renal scarring – US – DMSA - MRU
- Management – VUR -prophylactic antibiotics (decrease risk of febrile UTI)
follow-up VCUG, ? Deflux or surgery

Prenatal Hydronephrosis

- 1-5 %
- Severe – early post-natal US
  - UPJ, other anomalies
  - Boys – posterior urethral valve
- Mild/moderate – wait 1 week for post-natal US
- Follow-up US – VCU if hydro persists
- Significant pathology – Obstructive uropathy, VUR
  - meta-analysis (Pediatrics 118, 2006 Lee, RS et al)
  - Mild 12 %
  - Mod 45%
  - Severe 88%

Obstructive Uropathy

- No clinically useful classification
- Obstruction is usually chronic and partial
  - “compensated hydronephrosis”
  - balance between urine flow and drainage
- Aims of imaging:
  - 1) to identify children who, if left untreated, will develop renal damage
  - 2) estimate how much function is recoverable
Acute-on-Chronic Obstruction

Response to Fluid Challenge

Compensated Hydronephrosis

Decompensated Hydronephrosis

UPJ Obstruction

Lasix renogram (Nuclear Medicine)

Current concepts and Advances

- MR Urography (Courtesy Dr. Damien Grattan-Smith)
  - Anatomic imaging
  - Functional imaging

MR Urography

- Anatomic imaging
  - T2 weighted - (fluid in collecting system)
  - dynamic contrast enhanced imaging

- Functional imaging
  - differential renal function
  - individual kidney GFR - Patlak Plot
  - signal intensity versus time curves
  - assess drainage

MRU

Evaluate anatomy and physiology simultaneously

New insights

- not all UPJ’s are the same
- different prognostic information
- randomized controlled trials
  - who will benefit from surgery
  - estimate how much function is recoverable

MRU – functional information

Immediate, 3 mins, 10 mins
Imaging recommendations in paediatric uroradiology: minutes of the ESPR workgroup session on urinary tract infection, fetal hydronephrosis, urinary tract ultrasonography and voiding cystourethrography

Nephrogenic systemic fibrosis

- Nephrogenic systemic fibrosis (NSF)
- Serious complication of gadolinium (MR contrast)
- Renal failure patients
- May be fatal