Imaging in VHL: What you need to know

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Manifestations of VHL

Magnetic Resonance Imaging

Uses a strong magnetic field to magnetize the body
Radiofrequency pulses apply energy
Radiofrequency receivers pick up signal from tissue
MRI Safety-Equipment

• No radiation!
• Some implanted devices are still not compatible with MRI
  – Safety books list equipment as MR-safe or conditional or not MR safe
    • Cochlear implants
    • Aneurysm clips
    • Pacemakers

Nephrogenic Systemic Fibrosis

• Hospital in Denmark in 2008 noted some patients in renal failure developing fibrosis of the skin
• Tracked to use of frequent Gadolinium in renal failure patients
• World wide concern over NSF and panic
• Establishment of guidelines: NO new cases of NSF since 2011

MR Safety-Gadolinium Contrast Agents

- Linear
- Caged or Cyclic

Very low rate of allergic reactions

What is Gadolinium?

Heavy Metal
Also, Heavy Metal

Guidelines to Avoid NSF

• Avoid Gadolinium compounds when glomerular filtration rate <30cc/min
• Avoid linear gadolinium compounds such as Omniscan, OptiMark and Magnevist and use ProHance or MultiHance
• Avoid repeated exposures to Gadolinium within a few days if renal function is compromised

Abdominal Imaging

Normal Kidneys

Cystic and Solid Lesions
Pheochromocytomas
Neuroendocrine tumors

The Importance of Follow-up

Cystic 3.8 cm
Solid 2.6 cm

Jan 2001
Jan 2003
Computed Tomography (CT)

CT Safety-Renal Function

- Iodine contained in contrast agents can be damaging to kidneys in large amounts
- Recent studies show that the rate of renal dysfunction after CT contrast administered intravenously is VERY low and may not be different from matched patients NOT receiving contrast
- Risk factors: poor renal function, diabetes, congestive heart failure, age

Contrast Induced Nephropathy

- Known Risk Factors
  - Dehydration
    - Always stay hydrated for CT scans!
    - Oral contrast or oral water helps!
  - Among 272,000 patients rate of CIN was 2.2 %
    - Significant association with Renal dysfunction, diabetes and CHF.
    - However, when compared to matched patients without contrast, no statistical difference!
    - Reduced rate of CIN with hydration

Lee J. et al. Kor J. Radiol. 2014
McDonald JS et al. Radiol 2014

Radiation Exposure

EJ Hall Int J Radiat Biol May 2004
CT Safety-Radiation

- Seek alternative (e.g. MRI)
- Especially avoid in children <18y
- New scanners offer dose reduction
  - Precontrast scans can be derived from post-contrast scans using dual energy CT
  - Low dose CT (including lower contrast)

Low Dose CT

Dose=0 (Synthetic)  Dose reduced: <50% of typical

Net radiation: 40% of standard 3 Phase CT scan of the Abdomen

Dose Reduction

MRI substitutes for CT
Ultrasound

- Non invasive
- No radiation
- Ideal for kids
  - Epididymus
  - Intraoperative US
  - Image Guided therapy
- Limited views
- Resolution limits

Summary

- CNS Imaging (MRI of head and spine)
  - No radiation exposure
  - Implanted devices can be problematic
  - The “NSF” scare is over: It has disappeared
- Abdominal Imaging (MRI or CT)
  - Increased use of MRI
  - Dose reduction for CT
  - Decreased concern over renal dysfunction with iodinated agents.