Disclosure Statement

• The presenter has no financial or nonfinancial interest in any of the products or services mentioned in the presentation.

Neuroimaging

• Computed Tomography (CT)
• Magnetic Resonance Imaging (MRI)
• Angiography
• Ultrasonography

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Electromagnetic Spectrum

X-rays

• Wilhelm Röntgen
• German physicist
• Credited as the discoverer of X-rays in 1895
X-rays

- Hand mit Ringen (Hand with Rings): print of Wilhelm Röntgen’s first “medical” X-ray, of his wife’s hand, taken on 22 December 1895

- Won the first Nobel Prize in Physics in 1901.
- In honor of his accomplishments, IUPAC named element 111, Roentgenium, a very radioactive element with multiple unstable isotopes, after him.

Pedoscope

CT Scanner

CT - Indications

- Orbital and sinus pathology/trauma (except optic nerve)
- Acute cerebral or subarachnoid hemorrhage
- Localization of metallic foreign body

CT Ordering

- Location
  - Orbit
  - Brain
  - Sinuses
- Iodinated Contrast
  - Without contrast
  - With and Without Contrast
- Presumptive Diagnosis
CT Ordering - Contrast

- Iodine Based
- Hard on the kidneys
- Visually translucent, radiographically opaque

CT Ordering - Contrast

- Enhances Sensitivity and Specificity

Without Contrast

With Contrast

CT Ordering - Contrast

- Lab tests prior to scan if ordering contrast
  - Blood Urea Nitrogen (BUN)
  - Creatinine
  - Glomerular Filtration Rate (GFR)

CT Ordering - Contrast

- Contraindications
  - Allergy to iodine
  - Impaired renal function
  - Diabetes – must stop metformin 48 hours prior to scan

CT Ordering - Contrast

- Not indicated (may mask visualization) in:
  - Bony Injury
  - Acute Hemorrhage
  - Localization of Foreign Bodies

Slice Size

- Images can be provided in as thin as 0.5mm slices. Thin slice rendering is advantageous when trying to detect very small objects (i.e. metallic foreign body, bone fragments in the optic nerve, etc.)
CT

MRI

MRI: Excitation and Recovery of Spins

MRI Sequences

- T1
- T2
- Fluid attenuation inverse recovery (FLAIR)
- Diffusion-weighted imaging (DWI)
- Fat-suppression/saturation
### T1 and T2

- Technique of choice for visual pathway
  - Optic nerve and optic nerve sheath
  - Pituitary tumors
  - Cavernous sinus pathology
MRI Ordering

- Location
  - Orbit
  - Brain
  - Sinuses
- Gadolinium Contrast
  - Without contrast
  - With and Without Contrast
- Presumptive Diagnosis

MRI Ordering - Contrast

- Lab tests prior to scan if ordering contrast:
  - Glomerular Filtration Rate (GFR)
- Concern of nephrogenic systemic fibrosis

MRI Ordering - Contrast

- Gadolinium based - acquires magnetic moment when placed in an electromagnetic field
- Administered intravenously and remains intravascular unless there is a breakdown of the blood-brain barrier
- Only visualized on T1 weighted images. Enhancing lesions such as tumors and areas of inflammation will appear bright

Contrast

T1-weighted
T1-weighted with Gad

Table Limits

National Imaging Price Variances

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<thead>
<tr>
<th>Service</th>
<th>Region</th>
<th>High</th>
<th>Low</th>
<th>Variance</th>
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