Basic Abdominal and Pelvic Imaging Concepts

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Basic Imaging Concepts

Contrast Resolution vs Spatial Resolution
...refers to the ability of the imaging modality to differentiate two closely-approximated objects.

Low spacial resolution techniques will be unable to differentiate between two objects that are relatively close together.
Spacial Resolution

(The ability to see really small things)

X-ray > CT > US > MRI

<table>
<thead>
<tr>
<th>Modality</th>
<th>Spacial resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-ray</td>
<td>&lt; 1 mm</td>
</tr>
<tr>
<td>CT</td>
<td>1-2 mm</td>
</tr>
<tr>
<td>US</td>
<td>2-3 mm</td>
</tr>
<tr>
<td>MRI</td>
<td>3-4 mm</td>
</tr>
</tbody>
</table>
Contrast Resolution

The ability to distinguish differences in image intensity of adjacent structures of the basis of their grayscale “color.”

CT                             MRI
Contrast Resolution

MRI > CT > US > X-ray
Abdominal Imaging Modalities

- **Radiography** (aka KUB, plainfilm, x-ray)
- **Fluoroscopy** (Fluoro)
- **Computed tomography** (CT)
- **Magnetic resonance imaging** (MRI)
- **Ultrasound** (Sonography)

Different methods of looking at the same anatomy and the same pathology
Abdominal Imaging Modalities

- Radiography (aka KUB, plainfilm, x-ray)
- Fluoroscopy (Fluoro)
- Computed tomography (CT)
- Magnetic resonance imaging (MRI)
- Ultrasound (Sonography)

**REMEMBER:** MRI ➤ CT ➤ x-ray!!!!!
With or without contrast???

**Contrast** is a substance administered into a patient's blood stream, GI tract, or other space which increases that space's conspicuity on imaging.
With or without contrast???

Contrast material improves contrast resolution and, therefore, sensitivity and specificity for disease.
With or without contrast???

Contrast administration provides information on physiology and vascularity of the organ or lesion in question.
Radiography (plain old x-ray)

Things you can see:

- Bones and other calcified or metallic objects
- Gas in or outside of bowel
- Faint outline of some solid viscera

- Great spacial resolution
- Baaaaaad contrast resolution
Radiography (plain old x-ray)

Good at:
- Screening for pneumoperitoneum
- Screening for bowel obstruction or ileus
- Evaluating tube / radio-opaque foreign body location

Crappy at:
- Everything else (eg. appendicitis, cholelithiasis, gastroenteritis, cancer, etc.)
Radiograph variations

- Positional
  - Decubitus
  - Supine
  - Upright

- After contrast administration
  - Intravenous pyelogram (IVP)
  - For tube placement verification
Radiography
Radiography
Radiography

Gastroesophageal junction

Pylorus

Duodenum

Tube outlet in proximal jejunum
Fluoroscopy

Like x-rays, but **LIVE ON TV !!!!!**
Contrast is administered to demonstrate the lumen (inside) of the space we're interested in.
Provides anatomic and functional information.

To wit:
Routine fluoroscopic studies

Esophagram

Upper GI

mass, ulcer, reflux

dysphagia, stricture

Barium enema

mass, polyp
Fluoroscopy
Computed Tomography (CT)

- Very good spatial resolution
- Pretty good contrast resolution without contrast
- Very good contrast resolution with contrast

Pros:
- Excellent anatomic detail
- Sensitive and specific for almost any abdominal disease which causes anatomic changes (inflammation, masses, obstruction, stones, etc.)
- Quick to acquire

Cons:
- Uses ionizing radiation
- Poor specificity for GYN pathology
Computed Tomography (CT)
Computed Tomography (CT)
Computed Tomography (CT)
Computed Tomography (CT)

Ascites
Magnetic Resonance Imaging (MRI)

- Freaking amazing contrast resolution
- Pretty good spacial resolution
- Problem-solving technology

**Pros**
- Excellent tissue characterization
- Very sensitive and specific for soft tissue lesions, especially in solid organs
- Excellent characterization of GYN pathology

**Cons**
- Expensive
- Long acquisition time
- Quality depends on patient cooperation
Magnetic Resonance Imaging (MRI)

CT without

T1WI in-phase

T1WI out-of-phase
Magnetic Resonance Imaging (MRI)
Magnetic Resonance Imagine (MRI)
Magnetic Resonance Imagine (MRI)
Basic Abdominal and Pelvic Imaging Concepts

Remember the basics:
Resolution
Modalities (x-ray, Fluoro, CT, MRI, US)
With or without contrast?

If you don’t know what to do,
ask a radiologist !!!