MRAD 223:
Introduction to Contrast Media

MRT Program

Contrast

- Contraindications
- Administration methods
- Types of contrast
- Safety considerations
- Complications

Contraindications

For **barium** studies:

- Any condition that may lead to bowel perforation

Iodinated contrast studies = Risk assessment:

- Compromised *kidney function*
  - Lab tests assist with detection
- Compromised cardiac function
- Compromised respiratory function
- History of *allergic reaction to iodinated contrast*
- *Diabetic patients must be closely monitored and medication regiments may be altered

Administration Methods

Enteral Route:

- Administration directly into the GI tract
  - *Oral*
  - *Rectal*
  - NG tube (nasogastric tube)

Parenteral Route:

- Administered via injection to bypass the GI tract
  - Intra-articular
  - Subcutaneous (SC)
  - Intra-muscular (IM)
  - Intravascular or intra-arterial
  - Intrathecal

Intravenous (IV)

The parenteral route offers the most immediate effect

- Contrast enters the bloodstream quickly

Intravenous & Intra-arterial administration:

- Iodinated contrast media only

Intra-articular administration:

- Air and/or iodinated contrast media

Administration Considerations

Parenteral administration requires patient consent

- Intravenous & Intra-arterial administration require a specific type of informed/written consent
  - "*contrast consent form*"
- Follows general consent form guidelines, and also focuses on *iodinated contrast* risks, and contraindications
  - Patient history questions
    - Medications, lab work etc.
  - Allergies or previous history of reactions
  - Detailed description of contrast agent
    - Type, amount used etc.

Types of Contrast

- Barium Sulfate
- Air/Gases
- Iodine compounds

Barium Sulfate

Aka. Barium

- Inert inorganic salt
- Administered orally or rectally
- Used for GI (gastrointestinal tract) imaging
- Packaged in many forms/concentrations
  - Must not be administered in powder form
- Hygroscopic nature (aka. absorbs water)

Air & Gases

Air & CO2

- Negative contrast agents
- Primarily administered orally or rectally
  - May also be *injected
    - *NEVER inject air into blood vessels = air embolus*
- Used mainly for GI tract imaging
  - Can also be used for arthrograms (aka. Intra-articular injections)
- Alternative for patients who are allergic to iodinated contrast media
- Non-toxic and readily absorbed by the body

Iodine Compounds

Water-soluble carbon-based organic chemicals

- Composed of molecules containing iodine and various other atoms
  - Molecules may vary in size
  - Some molecules contain more iodine atoms than others
- Chemical composition affects image quality, usage, and possibility of adverse effects
  - Concentration
  - Osmolality
  - Viscosity
  - Toxicity

Iodine Compounds

Concentration: number of molecules added to a solution

- ↑ concentration = ↑ attenuation

Viscosity: the resistance of fluid to flow

- ↑ concentration = ↑ viscosity

Osmolality: the number of particles in solution per kilogram of water (mOsm/kg)

- ↑ concentration = ↑ osmolality

Toxicity: the potential for an agent to cause harm

- ↑ concentration = ↑ toxicity

Iodine Compounds

Water-soluble

- Ionic
  - Dissociates into charged particles
  - Usually expressed as a ratio (3:2)
    - Causes ↑ osmolality
- Non-Ionic
  - Remains whole
    - Maintains a lower osmolality
  - Ratio is 3:1

Safety Considerations

Barium Studies

Patients must be instructed to drink lots of fluids post exam

- Barium absorbs water
- Helps remove/flush out barium

Air/Gas

Air and gases will be absorbed naturally

- Air may cause cramping and abdominal discomfort
- Administration rate must be controlled/monitored
- May cause emboli, depending on administration method

"Iodine" Safety Considerations

Iodine causes physiological changes to the body. The main systems affected by these changes include:

- Respiratory
- Cardiovascular
- *Renal*
- Neurologic

Conditions/situations which predispose patients to ↑ risk of adverse effects include:

- Diabetes
- Asthma
- Allergies
- Medications (such as beta blockers, or metformin)
- Total volume & rate of contrast administration

Safety Considerations

IV injection Safety Considerations

- Site selection
- Equipment used (ex. butterfly vs. angiocath)
- Bolus vs. infusion
- Air must be removed
- Contrast media characteristics
- Lab results & patient history/condition
- Saline flush

General Safety Rules:

- Type of contrast agent used helps determine administration method
- Confirm/check with a radiologist and site protocols

Complications

- Barium peritonitis
- Constipation
- Bowel obstruction
- Extravasation/Infiltration
- Renal failure
- Allergic-like reactions
  - Includes anaphylactic reactions