Contrast Media and Reactions

Vineel Kurli, MD

Diagnostic Radiology

Yale University School of Medicine
Overview

Contrast Media

Iodinated

Non Iodinated

Ionicity

Ionic (ICM)

Non Ionic (NICM)

Osmolality

Low (LOCM)

High (HOCM)
Non-Anaphylactoid

- Physical properties
- Iodine concentration
- Total dose or volume
- Rate or speed of injection

Anaphylactoid

- Resemble allergic reactions (Hypersensitivity)

Combined
Physical Properties

- Ionic:
  - Dissolves into charged particles
    - Anions
    - Cations
  - 3:2 compound (3 iodine, 1 cation, 1 anion)

- Non ionic:
  - Do not dissolve into charged particles
  - 3:1 compound (3 iodine, 1 neutral)
- Osmolality

- Number of molecules and particles in a solution per kilogram of water

- Hyperosmolar = Osmolality > blood

- Most contrast agents are hyperosmolar

- Most non-anionic = LOCM

- All ionic = HOCM

- Hypoosmolar CM are also available now
<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Blood plasma</td>
<td>300</td>
</tr>
<tr>
<td>Non-ionic CM</td>
<td>400-750 (1-2 x)</td>
</tr>
<tr>
<td>Ionic CM</td>
<td>1400-1800 (5-6 x)</td>
</tr>
</tbody>
</table>
Osmosis

Blood

Extra-vascular
Rapid fluid movement

▷

Hypervolemia

▷

Vessel dilation

▷

Hemodynamic Changes
Iodine Concentration

- Increased concentration = Increased radioopacity

- Increased concentration = Increased risk of adverse reactions
Total Volume & Rate of Injection

Increased volume/rate of injection may increase the risk of adverse reactions.
Non-anaphylactoid Reactions

- Skin
  - Pain, Heat, Erythema

- GI Tract
  - Nausea, Vomiting, Diarrhea
Non Anaphylactoid Reactions

- Cardiopulmonary
  - Congestive heart failure
  - Arrhythmias, PEA
  - More with underlying CV disease

- CNS
  - Headache, Confusion
  - Seizures
Anaphylactoid Reactions

- Resemble allergic reactions
- Exact cause is unknown
- Vasoactive substance release - histamine, serotonin
- Anxiety, apprehension and fear
Anaphylactoid Reactions

- Urticaria
- Bronchospasm
- Laryngeal edema
- Hypotension, tachycardia

Mild, moderate or severe
Combined reactions

- Anaphylactoid + Non-anaphylactoid
- Can present a confusing picture
Contrast Reactions - Incidence

- 5-12% (HOCM) and 1-3% (LOCM)
- Usually occur early (<20 min)
- Most are mild-moderate
- Delayed reactions - 2% (24-48 hours)
Serious reactions are rare

- 1-2/1000 HOCM
- 1-2/10,000 LOCM

Death

- HOCM 1/40,000-170,000
  (0.9/100,000 HOCM & LOCM)
## Contrast Reactions - Incidence

<table>
<thead>
<tr>
<th>Incidence</th>
<th>HOCM</th>
<th>LOCM</th>
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<tbody>
<tr>
<td>All</td>
<td>3.5-12 %</td>
<td>1-3 %</td>
</tr>
<tr>
<td>Minor</td>
<td>3.5%</td>
<td>Almost 0 %</td>
</tr>
<tr>
<td>Severe</td>
<td>0.22 % (1:1000)</td>
<td>0.04% (1:10,000)</td>
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When do I use LOCM?

- Previous H/O adverse reactions
- Asthma
- H/o other serious allergic reactions
- Cardiac dysfunction
- Renal insufficiency
- High risk for extravasation
- Generalized severe debilitation
- Cardiac intervention
Patient Selection and Preparation

- Mild reactions are common, but self limited
- Severe reactions are rare, but unpredictable

Purpose
- Prevent contrast reactions
- Manage them effectively when they do
Patient Selection and Preparation

- General Considerations
  - Previous reactions
  - Allergy/asthma
  - Cardiac status
  - Renal dysfunction
  - Emotional state
  - Diabetes (Metformin)
Patient Preparation

- Pre contrast checklist (the 4 H’s):
  - History
  - Hydration
  - Have expertise and equipment ready
  - Heads up!
Pre medication

- At risk patients who require contrast
- Decreases, but does not eliminate anaphylactoid reactions
- Pre testing with test dose not useful: can be dangerous
- Use LOCM

- NO GUARANTEES, SO STAY PREPARED!!
Premedication Regimens

- Steroid/antihistamine
  - Prednisone 50 mg PO 13, 7 and 1 hour before and Diphenhydramine 50 mg PO/IV/IM 1 hour before

- Steroid alone
  - Methylprednisolone 32 mg PO 12 and 2 hours before

- Emergency
  - 200 mg IV Hydrocortisone 4-6 hours and 1 hour before exam
  - Diphenhydramine
Nephrotoxicity

- 3rd most common cause of in-hospital renal failure

- Etiology
  - Renal hemodynamic changes
  - Direct tubular toxicity
Nephrotoxicity

- **Risk factors**
  - Pre existing renal insufficiency (Serum Cr > 1.5)
  - Dehydration
  - Diabetes
  - Medications: NSAIDs
  - Diabetes + Renal insufficiency - Highest risk

- **Prevention**
  - HYDRATION
  - Mucomyst® (Acetylcysteine)

- **Dialysis patients**
Contrast Reactions in Children

- Less common than adults
- Allergic type reactions > cardiac problems
- Minor reaction rate of 3% (HOCM), 0.9% (LOCM)
- LOCM for restrained, anesthetized, asthmatic, cardiac, renal diseases, < 1 y
- Make sure there is a pediatric “crash cart” available
Injection of Contrast Media

- Power injectors
  - Potential complications:
    - Extravasation
      - Ulceration and necrosis
      - Elevation, cold or warm compresses, surgical consult
      - Check departmental policy
      - LOCM better tolerated
    - Air Embolism (rare)
      - Dyspnea, cough, chest pain
      - 100% O2, left side down, hyperbaric O2
Detection of Contrast Reactions

- Early identification of contrast reactions is key to their management

- Categories
  - Mild
  - Moderate
  - Severe
Mild Reactions

- Symptoms (limited):
  - Nausea, vomiting, altered taste
  - Headache, dizziness, warmth
  - Shaking, chills, flushing, pallor, itching
  - Sweats, hives, rash
- Not progressing, self limited
- Observe patient confirm resolution
- Patient reassurance helpful
- No medications necessary
Moderate Reactions

- Symptoms (persistent):
  - Increased or decreased HR and BP
  - Dyspnea, wheezing, bronchospasm, laryngeal edema
  - Pronounced skin reaction

- Immediate treatment
- Watch carefully, as they may progress
Severe Reactions

- Symptoms:
  - Laryngeal edema
  - Convulsions
  - Hypotension
  - Arrhythmia, arrest
  - Unresponsive

- Call a code (learn the number at your institution)

- Prompt identification and management
Management – ABCD Approach

- **A**
  - Airway, Assistance, Assessment, Access

- **B**
  - Breathing (CPR), Bag valve mask, Beware of responses due to pre existing medications

- **C**
  - Categorize reaction, circulatory assistance (fluids), call a CODE if needed

- **D**
  - Drugs, DON’T delay, DO monitor, assess and treat
Management of Acute Reactions

- Urticaria
- Facial or laryngeal edema
- Bronchospasm
- Hypotension
  - With increased HR
  - With decreased HR
- Severe hypertension
- Seizures or convulsions
- Pulmonary edema
Urticaria

1. Stop infusion
2. Usually no Rx
3. H1 blocker
   Diphenhydramine 25-50 mg PO/IV/IM
5. If severe
   Epinephrine SC(1:1,000) 0.1-0.3 ml
   (If no cardiac contraindications)
Facial or Laryngeal Edema

- **Epinephrine**
  - 1:1000: 0.1-0.3ml SC
    (0.1 - 0.3 mg)
  - 1:10,000: 1 ml IV
    (0.1 mg)
  - Repeat to max 1 mg

- 6-10 l/min O2 (Via mask)
- CPR if not improved
Bronchospasm

- 6-10 l/min O2 (Mask)
- Check O2, BP, EKG
- β agonist inhalers: Alburerol, Terbutaline
- Epinephrine (If not responding to inhalers)
- Aminophylline 6mg/kg IV in D5W over 10-20 min, then 0.4-1mg/kg/h
- Call CODE, intubate
Hypotension and Tachycardia

- Elevate legs
- Monitor (EKG, BP)
- O2 6 l/min
- Fluids - RL or NS
- Poorly responsive
  - Epinephrine IV (not SC)
  - ICU
Hypotension and Bradycardia

- Vagal reaction
- Trendelenburg position
- O2
- IV access, fluids
- Atropine 0.6-1 mg IV slowly
- Repeat to 0.04 mg/kg (2-3 mg for adults)
Severe Hypertension

- O2
- Monitor (EKG, BP)
- Nitroglycerine
  - 0.4 mg SL
  - 2% topical ointment
- Na nitroprusside in D5W
- Transfer to ICU
- Pheo: phentolamine
  - 5 mg (1 mg kids) IV
Seizures

- Secure airway
- O2
- Monitor
- Medications
  - Diazepam 5 mg IV (Valium®)
  - Midazolam 0.5-1.0 mg IV (Versed®)
  - Phenytoin Infusion 15-18 mg/kg (long acting)
- Call CODE
Pulmonary Edema

- Elevate torso
- O2
- Diuretics
  - Furosemide
    - 20-40 mg IV slowly
- ICU
Gadolinium Based Contrast Media

- Adverse reactions - Much lower frequency
- Vast majority are mild
- Severe anaphylactoid reactions - very rare
- Treatment similar to iodinated contrast
Checklist

- Clear posting of emergency numbers
- Oxygen cylinders, valves, prongs, tubing, masks
- Oral airways and protective barriers
- Ambu bag
- Stethoscope, pulse oximeter, sphygmomanometer, torniquets, tongue depressor
- IV solutions and tubing
- Needles and syringes
- Tracheostomy set
- Medications
- Emergency cart
  - Defibrillator
  - EKG
  - Pulse oximeter
  - BP/Pulse monitor
Summary

H = History

E = Equipment

A = Airway

D = Drugs

S = Staff

U = Unexpected

P = Preparation
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