Title: Management of Allergic Reactions after IV Contrast in Magnetic Resonance Imaging

Introduction: Children undergoing radiologic imaging frequently receive IV contrast agents for the purpose of improving imaging results. Serious allergic reactions to these IV contrast agents, such as anaphylaxis, have been described in the literature, and have historically been more commonly seen with CT contrast agents. Management of these severe allergic contrast reactions requires early recognition of the symptoms associated, followed by prompt management of those symptoms by the radiology/sedation/anesthesia staff present. I want to share findings of our increased incidence of allergic reactions seen with the use of a gadolinium based contrast agent, GADAVIST, during our magnetic resonance imagining (MRI) studies over the past two years. Additionally I want to describe our contrast reaction management algorithm, the medications in the contrast reaction management order set, as well as other educational tools implemented to aide all involved personal (MD, RN, Technicians) in rapidly identifying and efficiently responding to these reactions.

Case presentation of patient that I cared for in MRI, who had such a reaction. Her symptoms/clinical findings, treatment/intervention timeline, and outcome/disposition.

Emphasis will be in sharing:

Awareness of possible increased incidence of allergic reactions, using new IV contrast agent (gadavist) in MRI

Education identifying signs and symptoms of above reactions

Tools implemented to streamline therapeutic interventions and treatment of above at my institution (see attachments of algorithm, order set, and badge cards)

Purpose: Improving knowledge and preparedness of severe allergic reactions during IV contrast use in imaging studies and utilization of tools for timely/standardized delivery of effective patient care.
### Nursing
- **Oxygen**: Routine, CONTINUOUS, Contrast reaction.
- **Vital Signs**: OSW, Contrast reaction.
- **Pulse Oximetry**: Routine, CONTINUOUS, Contrast reaction.

### Medications
- *Adrenaline (VENTOLIN) inhalation solution*
  - 2.5 mg, Inhalation, X1
- *Diphenhydramine (Benadryl) injection solution*
  - 1 mg/ml, IV, X1, For contrast reaction.
- *Epinephrine (Adrenaline) injection solution*
  - 0.1 ml/mL, IV, SC, Give over 2 to 5 minutes.
- *Epinephrine (PE) (Adrenalin) injection solution*
  - 0.5 mg/mL, IV, SC, Give in the antecubital aspect of the middle third of the arm.
- *Methylergonovine (Pepcid-M) injection*
  - 1.2 mg/mL, IV, X1
- *Methylergonovine (PE) (Sal-Medrol) injection*
  - 1.2 mg/mL, IV, X1
- *NS 0.9 % IV solution*
  - CONTINUOUS, at 26 mL/H
- *Ranitidine (Zantac) injection solution*
  - 1 mg/mL, IV, X1
If patient unresponsive or pulseless, call CODE BLUE or 9-911. Initiate CPR.

### Acute Management of Contrast Reaction

**Oxygen:** Via mask 6-10L/min

**Benadryl:**
Give 1mg/kg PO, IM, IV
Give IV over 1-2 min. (Max dose 50 mg)

**Albuterol:** 2 puffs or Nebulized 5 mg

**NS or LR bolus:** 20mg/kg IV

### Hypotension with bradycardia:

**Atropine** 0.02 mg/kg IV (Max dose 1 mg infant and child; 2 mg adolescents)

<table>
<thead>
<tr>
<th><strong>If unresponsive to Acute Management:</strong></th>
<th><strong>Epinephrine:</strong> 1:1000 (1mg/ml) <strong>IM only</strong></th>
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<tbody>
<tr>
<td><strong>Lateral thigh</strong></td>
<td>Give 0.01mg/kg or 0.01ml/kg</td>
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<td>Can repeat every 5-15 min up to 1 mg total</td>
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<thead>
<tr>
<th><strong>Epinephrine:</strong> 1:10,000 (0.1mg/ml) <strong>IV only</strong></th>
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<tr>
<td>(If hypotensive IV preferred route)</td>
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<tr>
<td>Give 0.01 mg/kg or 0.1ml/kg IV push</td>
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<tr>
<td>Can repeat every 5-15 min up to 1 mg total</td>
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**Solumedrol:** 1mg/kg IV. Give over 1-2 min. (Max 40mg)

**Zantac:** 1mg/kg (50 mg max) mixed with 20 ml NS.
Give over 5 min.
Radiology and Sedation Services
Contrast Reaction Response

Non Life Threatening Reactions
- Hives (urticaria) can be mild, moderate or severe
  - Scratchy throat
  - Diffuse erythema
- Sneezing, nasal congestion, rhinorrhea
  - Headache, dizziness, anxiety

Life Threatening Reactions
- Airway: throat tightness, hoarseness
  - Respiratory: Bronchospasm, or Facial/Laryngeal edema, or pulmonary edema, wheezing, dyspnea
- Cardiac: Hypotension (with bradycardia or tachycardia), or severe hypertension, isolated chest pain
  - Neuro: Seizures/convulsions
  - Unconscious/unresponsive/pulseless/collapse
- Protracted nausea and vomiting

Basic Management
1) Discontinue contrast injection/maintain IV access
2) Call physician (radiologist and sedation or Emergency Department physician for assistance)
3) Place patient on cardiorespiratory monitoring
4) Reassure patient if hives are mild (scattered/transient) to moderate (more numerous or bothersome)
5) Give Oxygen via mask (6-10 L/min)
6) Benadryl 1mg/kg PO/IM/IV (max dose 50mg) IV over 1-2 minutes
7) Albuterol 2 puffs (90mcg/puff) or 5mg via Nebulizer

If patient is unresponsive to basic management:
Epinephrine
IM 0.01 mg/kg of 1:1,000 dilution (or 0.01 mL/kg); max 0.15 mg (0.15 mL) if ≤ 30 kg; max 0.30 mg (0.30 mL) if > 30 kg.

Hypotension the preferred route is IV: IV 0.01 mg/kg of 1:10,000 dilution (or 0.1 mL/kg); administer slowly into a running IV infusion of saline; can repeat every 5–15 min, as needed; maximum single dose: 0.15 mg(1.5 mL) ≤ 30 kg; 0.3 mg (3.0 mL)> 30 kg; can repeat up to 1 mg total dose

Hypotension with bradycardia: Atropine- IV 0.02 mg/kg (0.2 mL/kg of 0.1 mg / mL solution); Minimum single dose = 0.1 mg; Maximum single dose = 0.6–1.0 mg; Maximum total dose = 1 mg for infants and children; 2 mg for adolescents; Follow with saline flush
Methylprednisolone (Solu-Medrol) IV 1mg/kg over 1-2 minutes (max 40mg)
Ranitidine (Zantac) 50mg/2ml give 1mg/kg IV mix in 20 ml NS infuse over 5 min
Call Code Blue (initiate CPR):
Unconscious/unresponsive/pulseless or collapse