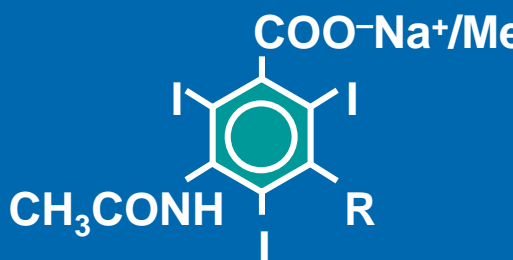

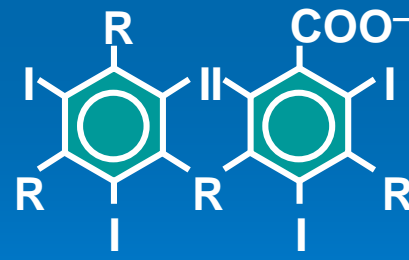
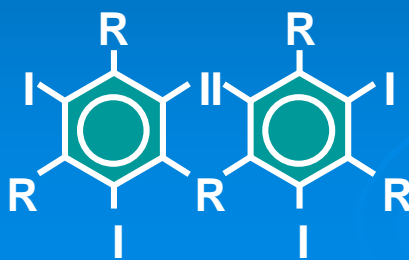


UCSF Radiology Safety: IV Contrast & Pregnancy Screening Update

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UCSF Radiology



Evolution of Modern RCM

Molecular structure	Era	Examples	Comment
	1950s	Ionic monomer Diatrizoate Iothalamate (Conray, Renografin, Hypaque)	Hyperosmolar, 5–8× blood Ratio 1.5
	1980s	Non-ionic monomer Iopamidol Iohexol Ioversol Iopromide (Isovue, Omnipaque, Optiray, Ultravist)	Lower osmolality, ~2× blood, Ratio 3.0
	1980s	Ionic dimer Ioxaglate (Hexabrix)	Osmolality ~2× blood Ratio 3.0
	1990s–	Non-ionic dimer Iodixanol Iotrolan (Visipaque)	Osmolality = blood, increased viscosity Ratio 6.0

Adverse Reactions- LOCM

Mild reactions - 1/100 - 1/500

Moderate reactions - 1/5,000

Severe reactions - 1/10,000

Death - 1/170,000 (or less)

Adverse Reactions

Not an allergy, many are “allergic-like”.
Others are “physiologic”.
Not reliably predictable.
Prepare for them.

Be Prepared: UCSF Guidelines and Fact

- *A supervising physician must be physically present in the facility or office and available* to furnish assistance and direction throughout the performance of the procedure. It does not mean that the physician must be present in the room where the procedure is performed.”
- Virtually all life-threatening reactions occur immediately or *within 20 minutes* after contrast injection.

Risk of Allergic-Type Reaction

History of any allergy (hay fever, drug or food allergies) = Increased risk is insignificant

Asthma = Insignificant

Previous minor reaction to contrast = Insignificant

Previous severe “allergic-type reaction to contrast = up 35%

What should I do if I need to give RCM or Gd to someone who has had a previous adverse reaction?



History of minor reaction only:

- Nausea
- Vomiting
- Itching
- Headache

No pretreatment needed

No pretreatment necessary

- Seafood allergy
- Iodine allergy
- Previous reaction to Gadolinium agent for RCM or RCM for Gd

History of limited urticaria:

No pretreatment

or

Antihistamine only

If antihistamine, preferably give second generation “non-drowsy” antihistamine only (Cetirizine (Zyrtec) 10 mg PO 1 hr. before)

Pretreating Patients Who Had Mild Allergic-Type Reaction in the Past?

- Very low risk, <1%, of more severe reaction
- Efficacy of pretreatment for prevention unproven

Pretreatment for Patients with History of Only Hives after RCM*

- 133 pts w/ hives only, subsequent RCM studies
- No severe reactions with most severe being hives
 - No pretreatment: **7.6%** (5/66) had repeat reactions
 - Benadryl only: **8%** (2/25) had repeat reactions
 - Steroids only: **46%** (12/26) had repeat reactions
 - Steroids + benadryl: **44%** (7/16) had repeat reactions

*Premedication of patients for prior urticarial reaction to iodinated contrast medium. Kolbe AB, et al. Abdom Imaging 2014.

History of Moderate or Severe Allergic-Type Reaction:

- Diffuse erythema/diffuse hives
- Respiratory compromise
- Cardiovascular compromise
- Facial or laryngeal edema

Give full pretreatment, delay RCM or Gd, perform in facility with rapid access to higher level of care

Pretreatment Regimen

Methylprednisolone - 32 mg orally 12 and 2 hours before RCM

And

Antihistamine

Preferably Cetirizine (Zyrtec) 10mg 1 hour before RCM.

Alternative IV or PO diphenhydramine 50 mg

APeX Order/ Smartset

▼ Inpatient IV Contrast Allergy Premedications Manage My Version ▼

Oral premedication regime in patients considered at high risk for adverse contrast reactions

12 hours before

50 mg prednisone OR 32 mg methylprednisolone (Medrol)

AND

2 hours before

50 mg prednisone OR 32 mg methylprednisolone (Medrol)

50 mg Diphenhydramine (Benadryl) (Also used alone as premedication for patients with a history of limited hives only)

Pre-Medications

Collapse

For Mild reaction (e.g. nausea, itching) (not hives), no premedication recommended.

▼ Mild reaction - Hives Only

- diphenhydramine (BENADRYL) capsule
50 mg, Oral, Once, Give 2 hours prior to CT scan. RN to retime dose relative to contrast administration time

▼ Moderate and Severe Reactions - Respiratory or Cardiovascular Symptoms

- PredniSONE AND Diphenhydramine
 Methylprednisolone AND Diphenhydramine

Accelerated Steroid Prophylaxis

- 200 mg hydrocortisone IV @ 5 and 1 hour before CM
- 50 mg Diphenhydramine IV 1 hour before CM
- Breakthrough reaction rate non-inferior to standard 12/13 hour preparation
 - Mervak BM, et al. Radiology 2017

Do Steroids Work?: Repeat Anaphylactoid Reactions

Ionic Agents

No Premedication	17%-44%
Premedication	9.1%

Nonionics

No Premedication	5.5%
Premedication	0.5%

*No life-threatening reactions in any group

Steroid Prophylaxis: Does This Work?

- It is “standard of care” currently
- Unproven to reduce major reaction rates
- Example for inpatients:
 - Increased LOS by 25 hours
 - Increased hospital acquired infections due to LOS
 - Potential \$159,131 to prevent 1 major reaction
 - \$131,211,400 to prevent one fatal reaction

What if High Risk Patient is to get RCM, but not Intravascular?

- E.g. cystogram, urethrogram, HSG, UGI
- There is some risk of intravascular exposure → Full pretreatment, and low-osmolar contrast recommended!
- Enteric barium, Gd are safe



How can I minimize the risk of
Contrast associated ARI?



Factors likely increasing risk of ARI

- Renal severe insufficiency
- Previous contrast associated ARI

Contrast Associated Acute Renal Injury (ARI)

- Patients with $eGFR \geq 30$ are at extremely low risk for development of ARI.

Identify patients at risk



UCSF guidelines

- eGFR < 6 weeks old required if any of these:
 - Inpatient
 - Age \geq 60
 - History of kidney “disease”
 - DM requiring treatment
 - Hypertension requiring medication

UCSF guidelines

- eGFR \geq 30, give RCM
 - No precautions or preparation unless acute renal injury now
- < 30 and not on dialysis, give RCM cautiously, with need documented (consider CT w/o contrast, US, MRI)
 - Outpatients: IV hydration (500 ml IV NS 1 hour before and oral hydration after)
 - 0 % - 10% risk of “Acute Renal Injury”

ARI – Prevention for eGFR < 30

1. Identify the patient at risk.
2. Consider alternative imaging.
3. **Hydration - IV NS or LR hydration have reasonably evidence-based benefit**
4. LOCM is better than HOCM.
5. Is iso-osmolar CM safer than LOCM? **Probably not.**
6. N-acetylcysteine, Bicarb? **Unproven benefit.**

Other concerns

- Safe dosing
- Dialysis patients
- Metformin
- Pregnant patients



How much RCM can I authorize?

- No clear dose-toxicity relationship
- No defined threshold or limit
- Decision to give closely spaced IV contrast injections should be clinically driven and individualized.
 - More caution with higher risk patients

Can I authorize RCM for patients on dialysis?

- Concerns:
 - Volume overload
 - Residual renal function

Contrast Media in Dialysis Patients

- RCM volume trivial
- Dialysis schedule not important



Can Use RCM if:

- Dialysis/No Urine
- No expectation of renal recovery, i.e. chronic renal failure

Take care with RCM if:

- Acute renal failure patients
- or
- Chronic dialysis and still produce urine

Metformin Precautions

(These have changed recently)

- Patients on metformin have no increased risk of ARI
- No reports of lactic acidosis from RCM in patients with eGFR ≥ 30

UCSF Metformin/RCM Guidelines

- eGFR \geq 30
 - No need to d/c metformin-just give IV RCM
 - No need to routinely test renal function afterwards
- eGFR < 30 or IA injection of RCM
 - Probably should not be taking metformin
 - Hold metformin for 48 hours
 - Confirm renal function before re-starting

Treatment of Contrast Media Reactions



Mild Reactions

- Observe ~30 minutes
- May herald severe reaction



Effects of Cutaneous Contrast Media Extravasation

- Edema
- Hemorrhage
- Necrosis
- Compartment syndrome
- Maximum tissue damage at 48 hours
 - Not possible to assess maximum injury initially



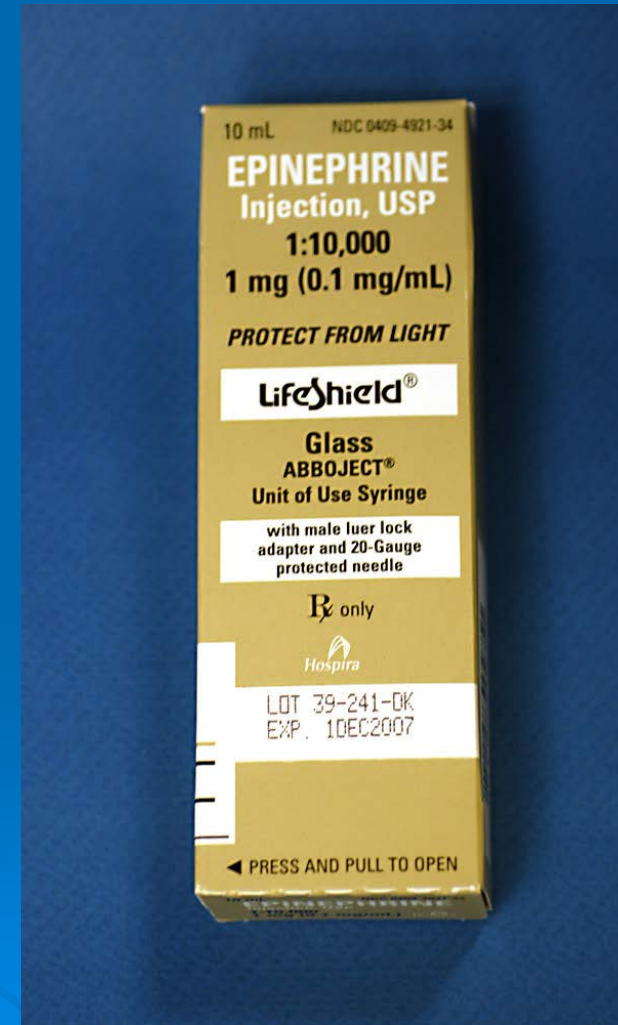
Treatment

- Evaluate patient for 1 -2 hours
- Elevate limb
- Ice packs for 20 min. t.i.d.
- Give D/C instructions and phone number for Radiology nurse

Send To ED If

- Decreased perfusion
- Hypoaesthesia
- Increasing pain
- Decreased neuromuscular function
- Skin blistering, ulceration

Epinephrine: When Needed, Which Concentration?



Epi 1:1000 IM Only,
and good BP needed for absorption. Not safe
for IV injection



1:1000 Epinephrine @ UCSF

- Switched to only single use Epi-pens
 - To avoid IV injection of concentrated epinephrine
 - IM injection only, 0.3 mg dose
 - Requires training to avoid self injection



Epi 1:10,000 IV Injection Only



Resident Quality Improvement Project

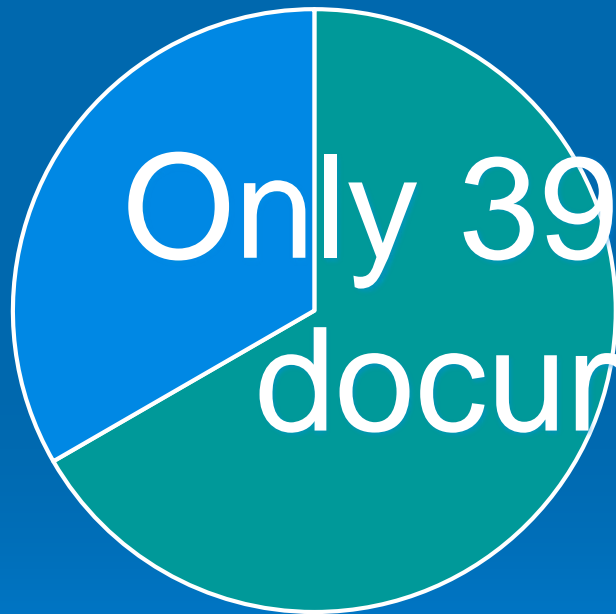
GME Incentive Project 2017-18

Molly Chapman



1.1.16-3.22.17: 60% of ACEs documented

Allergic reactions



Documented Not documented

Extravasations



Documented Not documented

Only 39% of cases were documented by MD!

Step 1: Dictate “Macro ACE”



Step 2: Read, then delete instructions

***Instructions: DELETE AFTER READING:

- Include this macro in your Technique section, with a summary line as an impression point.
- Please consider copy/pasting the following into a Significant Event progress note in Apex.
- Remember to add allergy to contrast if applicable in Apex***

The patient experienced an adverse event related to the administration of intravenous contrast:

[This is the adverse contrast event common template. Please pick type of event from the left-hand column.]

Iodinated Contrast Material Recommendation Update

- Forget iodine, Gd and seafood allergies: No extra risk
- Limited hives only-no pretreatment needed
- Moderate/Severe Allergic-type reactions: Steroid preparation required, may use accelerated prep
- eGFR ≥ 30 , and no acute ARI: No prep, or delay required
- RCM safe if on dialysis and no renal function
- Metformin: eGFR ≥ 30 , no need to hold metformin
- Epi-pens for high concentration epinephrine

New UCSF Guidelines for Gd

eGFR \geq 30

eGFR $<$ 30

Group II
GBCA
(Gadavist®)

Single dose appropriate

Confirm necessity of
GBCA

Group III
GBCA
(Eovist®)

Single dose appropriate

Informed consent
needed

Major Change for Gadolinium Use

- For macrocyclic agents: Gd can be given regardless of renal function
- If on dialysis, urgent dialysis is recommended after Gd

Pregnancy Issues

- MRI safe for fetus
 - Avoid Gd unless absolutely essential
-
- Iodinated contrast safe during pregnancy
 - Breast feeding safe after either Gd or RCM without special precautions

Pregnancy Screening and Ionizing Radiation

- UCSF Guidelines being revised
- Technologist screens patients verbally and with written form
- When in doubt, get pregnancy test for higher dose exams, POS test adequate
- If pregnant, avoid exams with pelvic higher doses, when possible, e.g. A/P CT, KUB, GI fluoroscopy, IR

THANKS!

