Intravascular Contrast Agents for Patients with Previous Hypersensitivity Reactions

Purpose

The purpose of this document is to assist Medical Imaging (MI) departments with managing patients with prior hypersensitivity reactions (HSRs).

Site Applicability

This procedure is applicable to all MI departments within Fraser Health (FH), Providence Health Care (PHC), Provincial Health Services Authority (PHSA) and Vancouver Coastal Health (VCH).

Practice Level

Profession:	Responsibilities:
Medical Radiation Technologist	• Review patient allergy status • Interview patient for culprit agent, reaction features and treatment • Review electronic medical record or prior imaging report • Consult radiologist • Administer recommended contrast agent as per department protocol • Document contrast agent administered per health authority procedure
Radiologist, Nuclear Medicine Physician and Radiation Oncologist	• Assess prior HSRs and determine severity • Substitute with alternative diagnostic testing, if available • Order alternative contrast agent as per department protocol • Determine prophylactic premedication strategy • Request premedication strategy

Requirements

- Request for alternative contrast agent and/or prophylactic premedication must be assessed, ordered or recommended by a Radiologist, Nuclear Medicine Physician or Radiation Oncologist
- Imaging departments must have access to an alternative contrast agent in the department
- Document contrast agent administered per health authority procedure

Need to Know

- Patients with prior allergic-like or unknown-type contrast reaction to a known contrast agent, changing the contrast agent to one with a different active pharmaceutical ingredient (API) (e.g. in CT switch from Isovue to Visipaque; in MRI switch from Gadovist to ProHance) may help reduce the likelihood of subsequent contrast reaction. [1]
- Premedication strategy is not a substitute for pre-administration preparedness. Contrast reactions can occur despite premedication and the radiology team must be prepared to treat breakthrough reactions when they occur. [1]
- Some studies have shown that the effect of substituting a contrast agent may be greater than that of premedication alone, and combining premedication with a change in agent may have the greatest effect. [1]

- Patients who have followed a contrast allergy pre-medication strategy and been administered a substitute contrast agent (iodinated/ gadolinium based) and experienced a breakthrough reaction should not receive intravascular contrast media of the same class without clinical consultation with a radiologist.
- The allergic recurrence rate (lowest to highest): [2]
    1) Switching to a different modality,
    2) Changing to a contrast agent with a different API within the same modality and pre-medicate the patient,
    3) Changing to a contrast agent with a different API within the same modality, and
    4) Reusing the culprit contrast agent with premedication strategy
- Changing intravascular contrast from the culprit agent may have clinical considerations, including enhancement patterns that may affect serial follow-up patients, volume change due to concentration differences, which may impact power injector parameters.

Equipment and Supplies

- Standard contrast administration supplies
- Second contrast agent with a different API as per physician recommendation
- Emergency drug kit is up-to-date and available

Procedure

Assessment

1. All patients receiving intravascular-contrast agents are screened for prior contrast allergies.
2. Investigate the specific culprit agent that caused the prior allergic reaction.
3. Investigate the specific type of reaction and severity the patient had with culprit agent.
4. Review allergy records or previous imaging, if available.
5. Provide information to Radiologist, Nuclear Medicine Physician or Radiation Oncologist to determine whether to proceed with the exam or another modality to obtain imaging data is suitable.
6. If the preferred modality does not change, Radiologist, Nuclear Medicine Physician or Radiation Oncologist is to follow **Table 1** to determine severity based on Adverse Reaction Features.
7. After the Radiologist, Nuclear Medicine Physician or Radiation Oncologist has determined Type of Severity, refer to **Intervention**

Table 1: **Adverse Reaction Features and Type of Severity** *[1][5]*

Adverse Reaction Features	Severity
Rash, itch, cough, hives, sneezing, nasal stuffiness, mild eye swelling, mild facial swelling, vomiting, nausea, perspiration, warmth, anxiety, flushing, altered taste	Mild
Dyspnea, bronchospasm, symptomatic tachycardia, symptomatic bradycardia, mild laryngeal edema, hypotension	Moderate
Severe respiratory distress, altered responsiveness, arrhythmia, convulsion, cardiopulmonary arrest, progressive angioedema, marked hypotension	Severe

Intervention

After determining the severity, follow the corresponding intervention table.

Table 2: **Intervention Based on Severity**

Severity	Intervention Based on Severity
Mild and Moderate	The risk of a breakthrough reaction is increased and careful consideration to another imaging modality to obtain the necessary imaging data should be considered. If the preferred modality does not change, a substitute contrast agent from the culprit contrast agent and pre-medication strategy is recommended for patients with a previous mild or moderate severity reaction. Patients who have followed a contrast allergy pre-medication strategy and been administered a substitute contrast agent (iodinated/ gadolinium based) and experienced a breakthrough reaction should not receive intravascular contrast media of the same class without clinical consultation with a radiologist. See **Appendix B and C** for Substitution of Culprit Gadolinium and Iodinated Contrast Agent, respectively. Follow health authority protocol for ordering contrast pre-medication.
Severe	Clinical consultation between the referring clinician/service and radiologist should review risks and benefits of using the same class of contrast agent. Using the same class of contrast agent is strongly contraindicated for patients with previous severe adverse reactions. The risk of a breakthrough reaction is life threatening and careful consideration to another imaging modality to obtain the necessary imaging data must be considered. Patients who have followed a contrast allergy pre-medication strategy and been administered a substitute contrast agent (iodinated/ gadolinium based) and experienced a breakthrough reaction should not receive intravascular contrast media of the same class without clinical consultation with a radiologist.

Documentation

- Alternative contrast agent prescribed by the Radiologist, Nuclear Medicine Physician or Radiation Oncologist must be viewable electronically, either on the picture archiving and communication system (PACS) or ordered through the electronic health record.
- Contrast agent and dose administered must be electronically documented in the patient's electronic health record per Health Authority protocol.

Related Documents

Related Guidelines

- Allergy Assessment and Documentation:
  - FH: Allergy Assessment and Documentation: Medical Radiation Technologists & Sonographers (A-21-16-90142)
  - VPP: Allergy Document Policy (BCD-11-11–4000)

- Adverse Reaction Reporting and Documentation:
  - Regional: Adverse Reactions: Reporting and Documentation in Medical Imaging Departments (ABCD-21-12-90017)
- Gadolinium and Renal Impairment:
  - Contrast Administration: Use of Gadolinium-Based Contrast Agents in Patients with Renal Impairment (ABCD-21-15-90135)
- Management of Adult Adverse Events in Medical Imaging
- Contrast Concentration Conversion Process (Iodine Based)

References

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Definitions

Hypersensitivity Reactions (HSR): An immediate allergic-like adverse reaction that is associated with direct release of histamine and other mediators from circulating basophils and eosinophils [1]

Active Pharmaceutical Ingredient (API): is the active component(s) in substances or drugs that are responsible for the beneficial health effects experienced by consumers. The active ingredient in a pharmaceutical drug is called an active pharmaceutical ingredient (API) [15]

Breakthrough Reaction: an allergic-like reaction that occurs despite pre-medication with corticosteroids and antihistamines

Mild: Signs and symptoms are self-limited without evidence of progression [1]

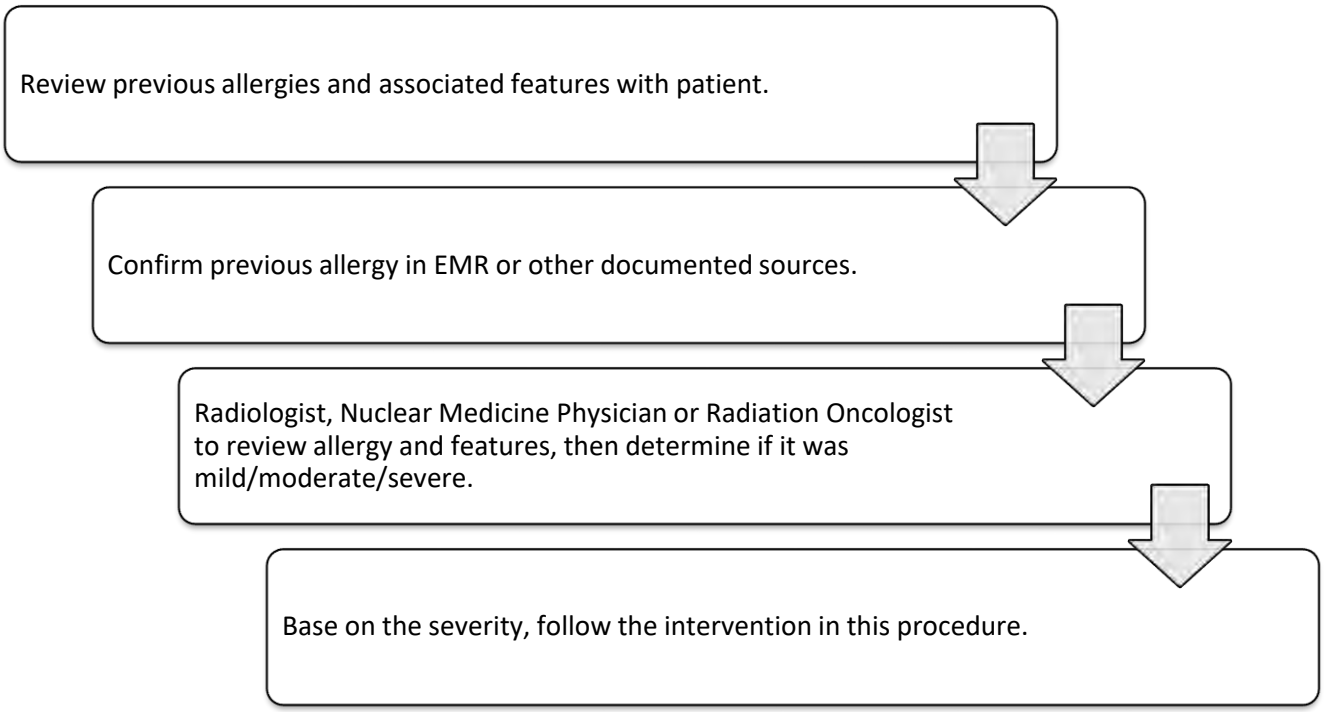
Moderate: Signs and symptoms are more pronounced and commonly require medical management [1]

Severe: Signs and symptoms are often life-threatening and can result in permanent morbidity or death if not managed appropriately [1]

Appendices

- Appendix A: Alternative Contrast Workflow
- Appendix B: Substitution of Culprit Contrast Agent – Gadolinium Based Contrast
- Appendix C: Substitution of Culprit Agent - Iodinated Contrast

Appendix A: Alternative Contrast Workflow



Appendix B: Substitution of Culprit Contrast Agent: Gadolinium

Culprit Contrast Agent:	Substitute with:	Dose / Protocol Change Considerations
Gadobutrol (**Gadovist**) – Macrocyclic Non-Ionic	Prohance, Dotarem or Multihance^	Follow standard dosing †
Gadoteridol (**Prohance**) – Macrocyclic Non-Ionic	Gadovist, Dotarem or Multihance^	Follow standard dosing †
Gadoterate Meglumine (**Dotarem**) – Macrocyclic Ionic	Gadovist or Prohance	Follow standard dosing †
Gadobenate Dimeglumine (**Multihance**) – Linear Ionic	Gadovist, Prohance or Dotarem Primovist (liver imaging)	Follow standard dosing † or double dose if goal of achieving high T1 relaxivity
Gadoxetate Disodium (**Primovist**) – Linear Ionic	Multihance	Protocol and injection rate changes are necessary. Follow standard dosing †
If culprit agent is unknown:	Review with radiologist: 1) If gadolinium is necessary for diagnosis 2) If another imaging modality can be considered 3) If gadolinium is required, consider: a. Dotarem - if adverse reaction occurred in Canada prior to 2017-September-22* b. Pre-Medication Strategy - if adverse reaction occurred outside Canada or after 2017-September 22	

^ Using a different molecular structure of gadolinium-based contrast agent provide lower rate of recurrence. However, there is preference in using macrocyclic agents. [2]

† Molar concentration may differ, please refer to standard dosing in product monograph.

** Dotarem was approved by Health Canada for use on 2017-September-22 and distributed soon after. [7]*

Appendix C: Substitution of Culprit Agent: Iodinated Contrast

Culprit Contrast Agent:	Substitute with:	Dose Change Considerations
Isovue 300 or 370 (Iopamidol) Low osmolar contrast	Omnipaque 300 / 350 (Iohexol) Low osmolar contrast ***OR*** Visipaque 320 (Iodixanol) Iso-osmolar contrast	Follow standard dosing † Refer to Contrast Concentration Conversion Process
Visipaque 320 (Iodixanol) iso-osmolar contrast	Isovue 300 or 370 (Iopamidol) Low osmolar contrast ***OR*** Omnipaque 300 / 350 (Iohexol) Low osmolar contrast	Follow standard dosing † Refer to Contrast Concentration Conversion Process
Omnipaque 300 / 350 (Iohexol) Low osmolar contrast	Isovue 300 or 370 (Iopamidol) Low osmolar contrast ***OR*** Visipaque 320 (Iodixanol) iso-osmolar contrast	Follow standard dosing † Refer to Contrast Concentration Conversion Process
If culprit agent is unknown:	Review with radiologist, nuclear medicine physician, or radiation oncologist: 1) If iodinated contrast is necessary for diagnosis 2) If another imaging modality can be considered 3) If iodinated contrast is required, must consider an agent with a different active pharmaceutical ingredient.	

^ Using a different molecular structure of iodinated contrast provide lower rate of recurrence.

† Iodine concentration may differ in substitute contrast agent, please refer to standard dosing in product monograph and the Lower Mainland Medical Imaging – Contrast Concentration Conversion Process.

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Revision History:	**Version**	**Date**	**Description/ Key Changes**	**Revised By** (Name and Position)
	1.0	24-JAN-2024	Initial release	Sam Yim, MR Reg Practice Lead Sean West, CT Reg Practice Lead