

Radiology On Call

A Primer for New Residents

Jon Chung, MD FRCPC

Goals

1. "Put a face to a name"
2. Provide a resident's point of view
3. Offer a basic framework of issues to consider when ordering imaging

Outline

- Introduction to the Radiology Residents - AKA "The Outsiders"
- Getting what you need on call - AKA "Mission: Impossible"
- Radiation – AKA "Risky Business"
- Contrast Reactions - AKA "Cocktail"

Western Radiology Residents

- 22 Residents
- PGY1 – rotating internship



Western Radiology Residents

- PGY?s

Derek Cool
Western



Pavlo Ohorodnyk
Queens

Western Radiology Residents

- PGY5s



Western Radiology Residents

- PGY₄s

Fateme Salehi
Queens



Joel Mercer
MUN

Eugenia Khorachkov
MUN

Stacey Speer
McMaster

Western Radiology Residents

- PGY₃s

Sohaib Munir
Queens



Vinod Ramlal
McMaster

Western Radiology Residents

- PGY2s

David Wang
UofT



Andrea Para
UofT

Caitlyn Ward
Western

Peter Lynch
UofT

Getting What You Need On Call

- Basics
 - Weekdays 5pm – 8am
 - Weekends & Holidays
 - Typically 1 resident on call, 1 on backup
 - When in doubt: page the radiology resident on call for that hospital
- Work Load
 - Average approximately 30 cross-sectional studies/night
 - Turn around time < 1 hour
 - Strokes/traumas subject to even stricter timelines

Getting What You Need On Call

- So, you're ready to order a study.
 - What is the clinical question I am trying to answer?
 - Is the study indicated?
 - Do the potential benefits outweigh costs/risks?
 - Will this study change management overnight/over the weekend?
 - Is this the right test?

Getting What You Need On Call

- The Menu
 - CT, MR, US, interventional radiology, fluoroscopy
 - Radiography
 - IV Contrast
 - Yes or No?
 - Timing
 - Number of phases
 - Oral Contrast
 - Yes or No?



Without Contrast

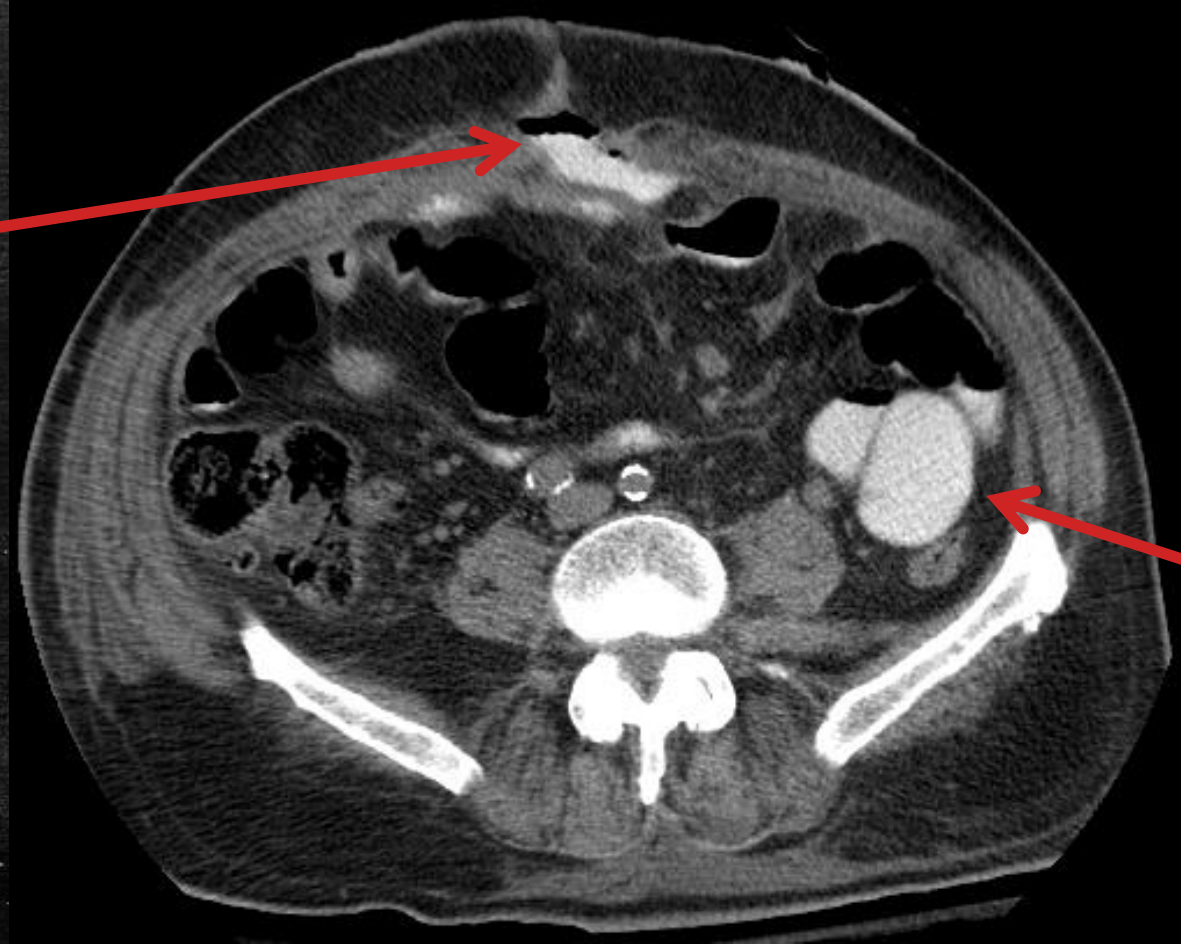


With Contrast

Getting What You Need On Call

- Oral Contrast

Extravasated
Oral Contrast



Oral Contrast
in Bowel

Getting What You Need On Call

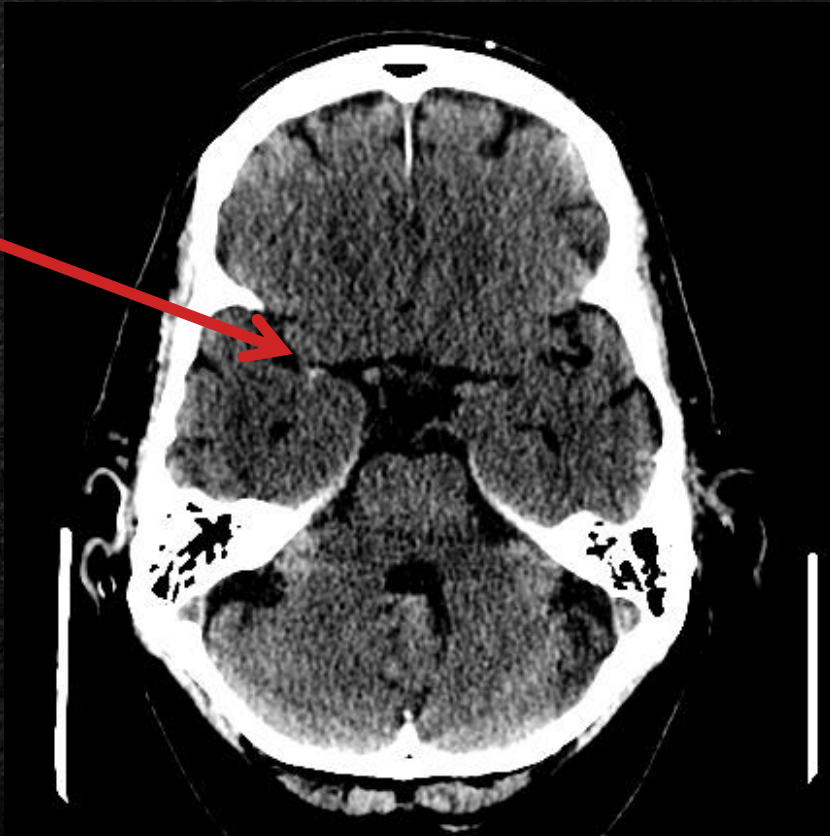
- Ordering

The screenshot displays a medical software interface with a sidebar on the left containing navigation options such as 'Summaries ViewPoint', 'Results Review', 'Orders', 'Quick Orders (New)', 'Quick Orders (Old)', 'Allergies', 'Problems and Diagnoses', 'Histories', 'Clinical Documents/Rep...', 'Documents', 'Clinical Notes Viewer', 'Form Browser', 'Medication List', 'MAR Summary', 'MAR', 'Transplant Lab (HLA)', 'Infection Control', 'Blood Product Information', 'Oncology', 'Chemotherapy Summary', 'Radiation Therapy Summary', 'Patient Information', 'Appointments', 'Violent Behaviour Indicator', 'Overview', and 'Chart Review'. The top menu bar includes 'Home', 'Patient List', 'Scheduling', 'Message Center', 'Multi-Patient Task List', 'Medication Information', 'PowerChart Info and Training', 'Microbiology Antibigram', 'OLIS', 'Messa.: 0', 'Crib.: 0', 'Order.: 9', 'New Sticky Note', 'View Sticky Notes', 'Tear Off', 'Attach', 'Change', 'Suspend', 'Exit', 'Calculator', 'Documents', 'Patient Locator', 'Label Reprint', 'Inquiry', 'Add', 'AdHoc', and 'Scheduling Appointment Book'. The main content area features a 'Reconciliation Status' section with 'Meds History', 'Admission', and 'Discharge' options. The 'Orders' tab is active, showing a list of orders and a detailed view for a 'CT Head/Neck' order. The 'Orders' section includes a 'View' button and a list of orders with columns for 'Order Name', 'Status', 'Start', and 'Details'. The 'CT Head/Neck' order is highlighted, showing details such as 'Priority: Emergency', 'Requested Date/Time: 2015/06/24 09:47', 'Contact Name and #: x35199', and 'Requested Hospital: UH Main'. The 'Details for CT Head/Neck' section includes fields for 'Date of Creatinine Level', 'Send Appt notification to (if no...)', 'Clinical Indication for Scan', 'Attending Physician', 'Creatinine level (within 3 mo...)', '*Requested Date/Time', 'Copy to Physician', '*Reason for Exam/Clinic...', 'Follow Up Requested for', 'Impaired Renal Function(I.e. ...)', 'Powerform Critical Patient By...', and 'Precautions'. A 'Sign' button is located at the bottom right of the interface.

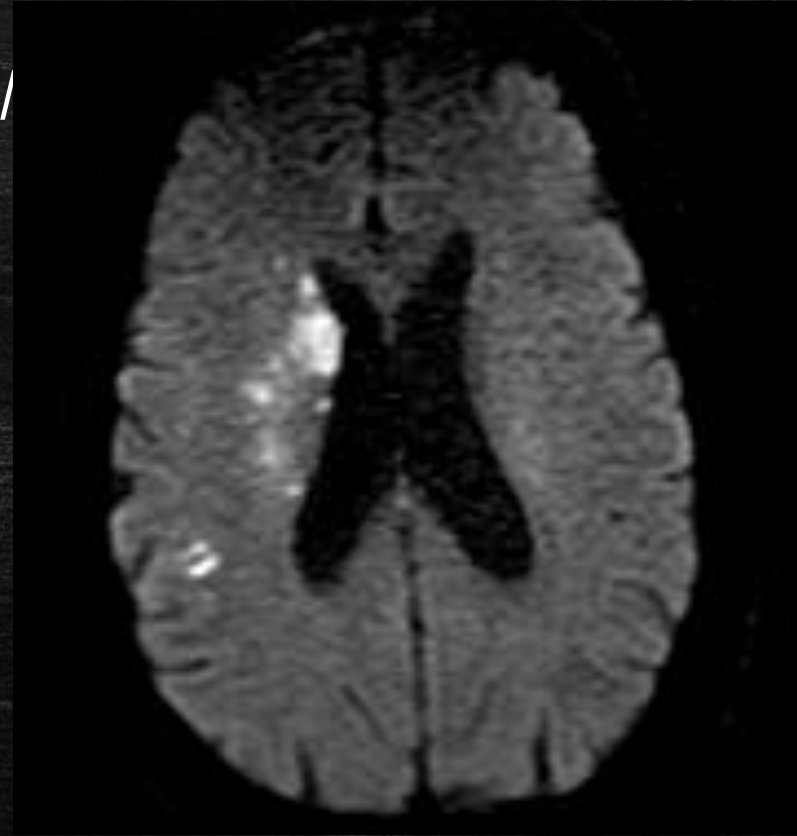
Getting What You Need On Call

- The Importance of a Good History

Hyperdense
Dot



"R/"



Getting What You Need On Call

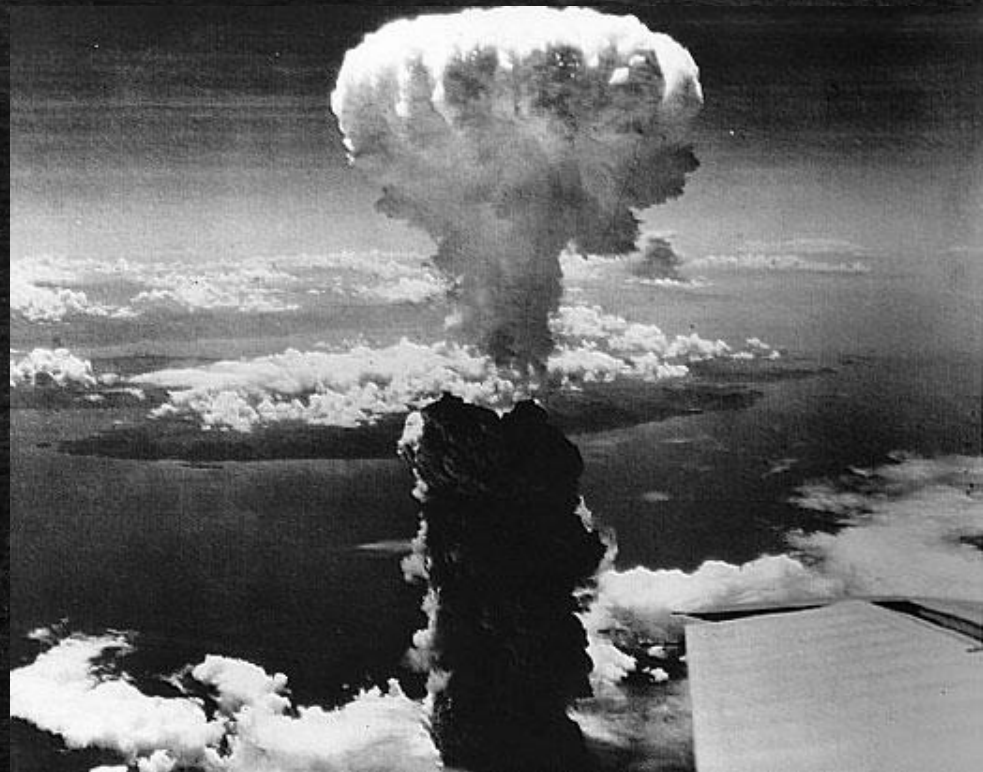


Getting What You Need On Call

- Tips (take them for what they're worth)
 - Approach every study as a consult, not an order
 - Provide an accurate and succinct history (HMHY)
 - Page, don't call
 - We love guests

Radiation

- Ionizing Radiation → Nuclear DNA damage
 - Unrepaired or misrepaired DNA can cause mutations and carcinogenesis
- How bad is it?
 - We're not quite sure
 - Much less than 1% but not zero



Radiation – Risky Business

The Opinion Pages | OP-ED CONTRIBUTORS

We Are Giving Ourselves Cancer

By RITA F. REDBERG and REBECCA SMITH-BINDMAN JAN. 30, 2014



Ben Jones

DESPITE great strides in prevention and treatment, [cancer](#) rates remain stubbornly high and may soon surpass heart disease as the leading cause of death in the United States. Increasingly, we and many other experts believe that an important culprit may be our own medical practices: We are silently irradiating ourselves to death.

The use of medical imaging with high-dose radiation — CT scans in particular — has soared in the last 20 years. Our resulting exposure to medical radiation has increased more than sixfold between the 1980s and 2006, according to the National Council on Radiation Protection & Measurements. The radiation doses of CT scans (a series of [X-ray](#) images from multiple angles) are 100 to 1,000 times higher than conventional X-rays.

Of course, early diagnosis thanks to medical imaging can be lifesaving. But there is distressingly little evidence of

The New York Times


“...the National Cancer Institute estimates that CT scans conducted in 2007 will cause a projected 29,000 excess cancer cases and 14,500 excess deaths over the lifetime of those exposed.”

Radiation – Risky Business

- Additional Considerations
 - Pediatric Patients
 - Risks are magnified
 - Mortality risk for abdominal CT
 - 15 year-old 1/1400
 - 5 year-old 1/1100
 - Toddler 1/700
 - Pregnancy
 - High-risk for further imaging

REVIEWS AND COMMENTARY ■ PERSPECTIVES

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Debriefing the Brief: It is Time for the Provision of Informed Consent before Pediatric CT¹

Diane M. Armao, MD
J. Keith Smith, MD, PhD
Richard C. Semelka, MD

In the welter of controversy surrounding the statistical risk projection models of radiation-induced cancer from medical imaging, two recent seminal studies that used direct epidemiologic data from large cohorts of children have emerged and confirmed that the use of computed tomography

small prescription. It is an example of right conduct as habit.

What We Know: "Cancer Risks from Diagnostic Radiology: The Impact of New Epidemiologic Data"

With the use of electronic record linkage

Radiology

Radiation – Risky Business

Imaging overutilisation: Is enough being done globally?

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Received 30 December 2009; received in revised form 19 May 2010; accepted 26 May 2010

The discovery of X rays by Roentgen in 1895 was one of the greatest discoveries with historical impact on each and every one of us. The ability to view anatomy and infer function of inner organs and tissues of human body has provided immense potential that have led imaging to therapeutic arena through interventions and follow-up. How much imaging is appropriate is a legitimate question to ask. This stems from recent emphasis on overutilisation of medical imaging [1–2]. Overutilisation of imaging has been defined as any application where imaging is unlikely to improve patient outcome. Being a probabilistic situation the uncertainties

What has not been commented on is the difference between developed and developing countries. While overutilisation is becoming a problem for developed countries, lack of access remains an issue in a large part of the third world, despite the fact that there has been an increase in the rate of growth and unnecessary radiation dose to patients, in a number of developing countries, undergoing computed tomography (CT) and interventional procedures [9–10]. Even though access is limited in developing countries, inappropriate utilisation of imaging modalities still exists. While defensive medicine and self-referral are relatively minor or



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“...a significant fraction (perhaps 20 to 50 percent in some areas) of radiological examinations may be inappropriate.”

Radiation – Risky Business



Contrast Reactions



Canadian Association of Radiologists

Consensus Guidelines for the Prevention of Contrast Induced Nephropathy

AKA Contrast-Associated Acute Kidney
Injury

GENERAL GUIDELINE FOR ALL PATIENTS WITH EGFR <60 mL/min:

- ◆ Avoid Dehydration
- ◆ Consider alternate Imaging studies not requiring iodinated contrast medium
- ◆ Minimize contrast medium volume
- ◆ Avoid repeat iodinated contrast studies within especially within 48 hours
- ◆ Use low- or iso-osmolar non-ionic contrast medium

- ◆ eGFR < 45 mL/min AND
- ◆ Intravenous Contrast Administration

MILD-MODERATE RISK OF CIN

- ◆ IV hydration
- ◆ Avoid dehydration (Oral fluids if IV hydration impractical)
- ◆ f/u SCr and eGFR in 48 – 72 hrs.

- ◆ eGFR < 60 mL/min AND
- ◆ Intra-arterial Contrast Administration
- ◆ OR any eGFR w/ acute illness, unstable renal function or inpatients

MODERATE-HIGH RISK OF CIN

- ◆ Hold nephrotoxic drugs (esp. NSAIDs and diuretics),
- ◆ Hydrate with IV NaCl or NaHCO₃
- ◆ Consider NAC
- ◆ f/u SCr and eGFR in 48 – 72 hrs.

PERI-PROCEDURAL FLUID ADMINISTRATION PROTOCOLS

IV FLUID

1. 0.9% NaCl @ 1 mL/Kg/hr for 12 h pre and for 12 hr post contrast administration

for same day examinations:

2. isotonic NaCl or NaHCO₃ @ 3 mL/kg/hr for 1-3 hr pre and for 6 hr post contrast administration

or

3. NaHCO₃ 150 meq in 850 mL D5W @ 3 mL/kg/hr for 1 hr pre and @ 1 mL/kg/hr for 6 h post contrast administration

❖ Depending on the patient's weight, at least 300 to 500 mL of IV fluids should be received before contrast is administered³⁹.

Contrast Reactions

- Acute Contrast Reactions
 - For low osmolar contrast media
 - Overall prevalence - 3.13%
 - Severe reactions - 0.04%
 - Pre-medication regimens available for those with a history of previous reactions

- How to treat?



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www.carjonline.org

Computed Tomography / Tomodensitométrie

Safety Essentials: Acute Reactions to Iodinated Contrast Media

Ramesh S. Iyer, MD*, Jennifer G. Schopp, MD, Jonathan O. Swanson, MD,
Mahesh M. Thapa, MD, Grace S. Phillips, MD

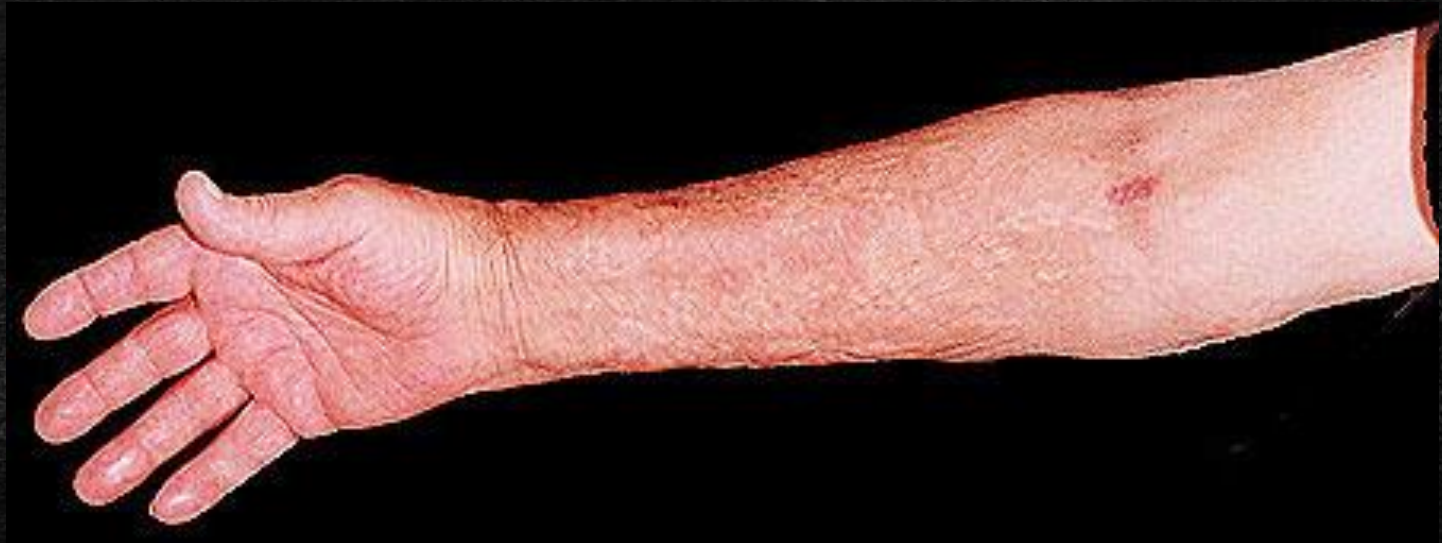
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Abstract

The objectives of this article are to review the diagnosis and management of acute nonrenal reactions to iodinated contrast media. We will begin by discussing the types of contrast media and their correlative rates of reaction. The mechanism of contrast reactions, predisposing risk factors, and preventative measures will then be discussed. The remainder of the article will review the assessment of potential reactions, initial management, and treatment algorithms for specific reactions.

Contrast Reactions

- Nephrogenic Systemic Fibrosis (NSF)
 - Rare manifestation of gadolinium administration
 - Irreversible fibrosis of the skin and organs
 - Generally, not concerned unless $\text{eGFR} < 30 \text{ mL/min/1.73m}^2$



NSF involving the skin of the forearm

Contrast Reactions

Intracranial Gadolinium Deposition after Contrast-enhanced MR Imaging¹

Radiology

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David F. Kallmes, MD
Mark E. Jentoft, MD
David L. Murray, MD, PhD
Kent R. Thielen, MD
Eric E. Williamson, MD
Laurence J. Eckel, MD

Purpose: To determine if repeated intravenous exposures to gadolinium-based contrast agents (GBCAs) are associated with neuronal tissue deposition.

Materials and Methods: In this institutional review board–approved single-center study, signal intensities from T1-weighted magnetic resonance (MR) images and postmortem neuronal tissue samples from 13 patients who underwent at least four GB-

“...intravenous administration of GBCA is associated with dose-dependent deposition in neuronal tissues that is unrelated to renal function, age, or interval between exposure and death.”

Take Home Points

- Imaging utilization is a complex issue deserving of continuous consideration of the potential benefits, harms and costs.
- We are all here to help patients. Radiology exists to help you. Let's be good to each other.



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Questions?
