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A Case Of Radiocontrast Desensitization In A High-Risk Cardiac Patient

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Educational Objective

This case illustrates a successful desensitization approach for a non-IgE mediated radiocontrast media hypersensitivity reaction.

Introduction

- Adverse reactions to radiocontrast media can be classified as chemotoxic or non–IgE-mediated anaphylaxis
  - Chemotoxic reactions include nephrotoxicity and neurotoxicity
    - Concentration-dependent
  - Non–IgE-mediated anaphylactic reactions are immediate hypersensitivity reactions
    - Mediated by release of histamine from mast cells and basophils as well as complement activation
    - Does not involve the cross-linking of IgE antibodies

Introduction

- Pretreatment regimens with corticosteroids and antihistamines have been shown to be effective for patients with non-IgE mediated anaphylactic reactions
  - Breakthrough reactions do still occur
  - There is no consensus on how to proceed when encountering patients who have had breakthrough reactions to contrast media

Introduction

- **Desensitization** allows for temporary drug tolerance by the slow introduction of medication
  - Causes decreased reactivity of effector cells

- Desensitization has proven effective in IgE-mediated drug reactions
- There is limited information about desensitization to RCM or in non-IgE mediated reactions

Case Presentation

- A 22-year-old patient with history of a heart transplant secondary to hypoplastic left heart syndrome (HLHS) , chronic kidney disease (CKD), epilepsy, and postural orthostatic tachycardia syndrome (POTS) who previously tolerated contrast 20+ times given his complex cardiac history presents with 2 hypersensitivity reaction episodes to radiocontrast media.

Case Presentation

1st RCM Hypersensitivity Reaction

- At age 21, patient underwent a CT chest with contrast to evaluate for aortic root dilation.
- Iohexol contrast was given then five minutes later patient developed diffuse erythema, facial swelling, difficulty breathing, confusion, and nausea.
  - No hypotension or desaturations
- CODE called; patient given a normal saline bolus and IV diphenhydramine
- Patient was tachycardic to 110s but did not have any hypotension or desaturations charted.
- Patient was admitted overnight for IV fluids and observation

Case Presentation

- Prior to future imaging, a 13-hour corticosteroid and antihistamine pretreatment regimen was recommended by Allergy consult.

Case Presentation

2nd RCM Hypersensitivity Reaction

- 5 months later patient underwent cardiac catheterization
  - Only received a single dose of hydrocortisone and diphenhydramine one hour prior to the procedure
- Patient received iodixanol and immediately thereafter developed a severe reaction of subjective hyperpyrexia, hypotension to the 30s, and a rash
  - Received epinephrine x6 doses, methylprednisolone x1, then started on an epinephrine gtt
  - Admitted to CICU
- Tryptase elevated to 12.2 mcg/L
  - Drawn ~3 hours after initial epinephrine given

Case Presentation

Allergy was consulted for desensitization prior to the patient's necessary repeat cardiac catheterization at age 22.

Case Presentation

- Pre-medications
  - 13 Hours prior to cath: Prednisone 50 mg, montelukast 10 mg, cetirizine 10 mg
  - 7 hours prior to cath: Prednisone 50 mg
  - 3-4 hours prior to cath: (30-60 minutes before starting the desensitization) give cetirizine 10 mg PO x1 and famotidine 20 mg IV x1, montelukast 10 mg PO x1
  - 1 hour prior to cath: Prednisone 50 mg (during desensitization steps)

Case Presentation

- Desensitization Protocol
  - Started desensitization 2.5 hours prior to catheterization
  - Each step is an IV infusion to be given over 9 minutes with a 1 minute flush afterwards (10 minutes total)

Protocol for desensitization:

DOSE #	DILUTION	CONCENTRATION	DOSE	VOLUME TO ADMINISTER	TIME OF ADMINISTRATION
1	1:1000	0.32 mg/mL	1.6mg	5mL	0
2	1:1000	0.32 mg/mL	3.2mg	10mL	10
3	1:1000	0.32mg/mL	6.4mL	20mL	20
4	1:100	3.2mg/mL	12.8mg	4mL	30
5	1:100	3.2mg/mL	25.6mg	8mL	40
6	1:100	3.2mg/mL	51.2mg	16mL	50
7	1:10	32mg/mL	102.4mg	3.2mL	60
8	1:10	32mg/mL	204.8mg	6.4mL	70
9	1:10	32mg/mL	409.6mg	12.8mL	80
10	1:1	320mg/mL	819.2mg	2.6mL	90
11	1:1	320mg/mL	1638.5mg	5mL	100

Time for each dose is 9 minute infusion with 1 minute flush then move onto the next step/dose.

After completion of dose 11, the patient should be given dose 11 AGAIN every 10-15 minutes until iodinated radiocontrast medium is administered during his catheterization.

Case Presentation

- The patient successfully completed a 12-step RCM desensitization and tolerated routine post-transplant cardiac catheterization without incident.

Discussion

- The introduction of modern radioiodine contrast agents has decreased the risk of adverse reactions substantially
  - However severe reactions, including death, are still reported
- Unfortunately, despite adequate premedication, breakthrough reactions do occur, and there is no consensus on how to proceed when encountering patients who have had breakthrough reactions to contrast media

Discussion

- Rapid desensitization is a procedure that can be used to provide a temporary tolerance to a first-line drug when no alternative is available
- The mechanism of action in non–IgE-mediated anaphylaxis may be due to slow subclinical mediator depletion or other unknown mechanisms still not fully understood
- Despite incomplete understanding of the mechanisms involved in RCM anaphylactic reactions, desensitization can be considered where no alternative is available to the use of RCM.

Discussion

- Cases have been reported of successful desensitization following premedication failure:
  - 81yo who presented with anaphylaxis to RCM despite pretreatment who tolerated desensitization to iodixanol via an 11-step doubling dose protocol
  - 66yo who despite premedication presented with anaphylactic reactions to RCM who tolerated 16-step, 4 bag desensitization to iodixanol
  - 79yo who presented with anaphylactic reaction to RCM who tolerated a 16-step, 4 bag desensitization to iodixanol
- 12-step desensitization such as ours is typically standard for antibiotics and chemotherapy

Review

- Severe RCM hypersensitivity reactions (either anaphylactoid or IgE-mediated) are rare
- To our knowledge, the literature describes no cases with RCM desensitization using a 3 bag 12 step approach, ones that occur in such a short time span, or in a patient this young
- This case illustrates a successful 3-bag, 12-step desensitization for RCM hypersensitivity

References

- *Al-Ahmad M, Bouza TR. Successful desensitization to radiocontrast media in two high-risk cardiac patients. Ann Saudi Med. 2017;37(4):333-335. doi:10.5144/0256-4947.2017.333*

- *Gandhi S, Litt D, Chandy M, Nguyen BM, Jindal NL, Tarlo SM, Overgaard CB. Successful rapid intravenous desensitization for radioiodine contrast allergy in a patient requiring urgent coronary angiography. J Allergy Clin Immunol Pract. 2014 Jan-Feb;2(1):101-2. doi: 10.1016/j.jaip.2013.06.016. Epub 2013 Sep 8. PMID: 24565778.*