

Radiologic Contrast Media Desensitization for Delayed Cardiac Catheterization

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Abstract

This protocol for rapid desensitization to intravenous radiographic contrast material (RCM) improves the strategy first reported by Uppal et al. Desensitization is a validated preventative measure for medical emergencies, such as cardiac catheterization, when patients present with histories of anaphylactoid reactions to the allergen of concern. The patient required another catheterization that was modified to repeat the final dosage of 320 mg/mL of Visipaque[®], accommodating cardiac catheterization postponement, contrary to readministration of doses 4 (0.625 mg/mL) and 8 (10 mg/mL) as reported in Uppal et al. Our risk score calculations suggested that the patient was at low risk of contrast-induced nephropathy (CIN) that did not necessitate reduced dosage. No complications were reported following catheterization. We propose repetition of the final RCM dosage as a more effective and efficient desensitization strategy, as long as the scoring system does not indicate high risk for CIN.

Keywords

radiographic contrast material, anaphylactoid, desensitization, cardiac catheterization, Visipaque[®]

Introduction

Anaphylactoid reactions to iodinated intravenous (IV) radiographic contrast material (RCM) are rare and may be life-threatening in approximately one-tenth percent (0.1%) of reactions.¹ Desensitization is a validated preventative measure for anaphylaxis or anaphylactoid reactions. Several studies offer data on the efficacy of RCM desensitization for medical emergencies, such as cardiac catheterization.^{2–4} Frequently, the cardiac catheterization schedule does not accommodate the RCM desensitization protocol. We propose an RCM desensitization protocol to meet the catheterization schedule without losing the protective nature of the desensitization.

Case Report

The patient previously described by Uppal et al. required a repeat catheterization due to unstable angina with RCM desensitization 2 years after the initial procedure.² The patient was pretreated with prednisone, diphenhydramine (Bendaryl[®]), and ranitidine. Following the protocol reported by Uppal et al.,² the patient tolerated doses 1 and 2 and subsequently

developed pruritus minutes after the third dose (Table 1). Fifty milligram of IV diphenhydramine was administered, resulting in the improvement of pruritus. Doses 2 and 3 were then repeated. The patient developed diffuse pruritus with the administration of dose 4, which resolved after 50 mg IV diphenhydramine and 50 mg IV methylprednisolone. The patient tolerated a repeated fourth dose and doses 5 and 6 in the continued desensitization. The pruritus returned after administration of dose 7, which was managed with 25 mg IV diphenhydramine. A subsequent, repeated dose 7, in addition to doses 8, 9, and 10, was administered without adverse effects. Full-body pruritus returned during dose 11 and was managed the same as the latter anaphylactoid

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Table 1. Visipaque[®] Contrast Desensitization.

Dose ^a	Dilution	Concentration (mg/mL)	Dose (mg)	Volume (mL)
1	1:10 000	0.032	0.160	5
2	1:5000	0.064	0.320	5
3	1:1000	0.320	1.600	5
4	1:500	0.625	3.125	5
5	1:250	1.250	6.250	5
6	1:125	2.500	12.50	5
7	1:62.5	5.000	25.00	5
8	1:32	10.00	50.00	5
9	1:16	20.00	100.0	5
10	1:8	40.00	200.0	5
11	1:4	80.00	400.0	5
12	1:2	160.0	800.0	5
13	1:1	320.0	1600	5
14 ^b	1:1	320.0	1600	5
15 ^c	—	—	—	—

^a10-minute intervals between dosages.

^bAddition to protocol described in Uppal et al.; repetition of dose 13.

^cFuture dosage(s), if indicated.

reaction. The repeated dose 11, in addition to doses 12 and 13, was also well-tolerated. Dose 13 was repeated (ie, dose 14) to accommodate a brief delay in cardiac catheterization, contrary to the repetition of doses 4 and 8 as reported in Uppal et al.² Although readministration of the final dose was considered in the protocol described by Uppal et al. to avoid contrast-induced nephropathy (CIN),² our risk score calculations suggested that the patient was at low risk of nephropathy that did not necessitate reduced dosage.⁵ This RCM desensitization was conducted in an intensive care unit. No complications were reported following catheterization.

Discussion

Anaphylactoid events mimic anaphylaxis, which is a life-threatening, systemic Type I hypersensitivity reaction occurring after exposure to an allergen, leading to multi-organ system involvement.^{6–8} By definition, anaphylaxis affects 2 or more organ systems, including dermatological, respiratory, cardiovascular, gastrointestinal, and/or neurological with or without autonomic dysfunction.^{6–8} Anaphylactoid reactions involve nonspecific activation of the complement system, in contrast to the immunoglobulin E (Ig E)-mediated mechanisms attributed to anaphylaxis.^{7,8} Agents associated with non-IgE-mediated adverse reactions include plasma expanders (eg, Dextran, hydroxyethyl starch), opioids, nonbarbiturate hypnotics, and RCM.¹

Anaphylactoid and IgE-mediated reactions to RCM are uncommon, estimating 5% to 8% of the

10 million radiologic examinations performed annually in the United States.^{1,10–12} Approximately 1% of patients receiving RCM experience moderate reactions, including acute vomiting, urticaria, and/or angioedema.² Life-threatening conditions, such as anaphylactoid reactions, manifest in less than 0.1% of patients traditionally with high-osmolality contrast.²

CIN, or contrast-induced acute kidney injury (AKI), is a potential complication following cardiac angiography and is responsible for a third of hospital-acquired AKIs.⁵ Preexistent clinical and periprocedural risk factors are considered in predicting CIN occurrence and guiding targeted preventative therapies.⁵ The most significant preprocedural risk factor for CIN is stage III chronic kidney disease, defined as an estimated glomerular filtration rate (eGFR) <60 mL/min/1.73 m² for over 3 months.⁵ Maioli et al.'s and Mehran et al.'s preprocedural and periprocedural CIN risk scores, assessing age, diabetes mellitus, eGFR, and other factors, were computed for the present patient and indicated low risk for CIN and dialysis.^{5–7}

Desensitization to biologic agents or other allergens is a standard preventative measure of anaphylactic and anaphylactoid events and is considered when patients present with history of anaphylaxis to the allergen of interest and no therapeutic alternative exists.² Limited literature offers data on successful RCM administration without adverse events for medical emergencies such as cardiac catheterization.^{1,3,4} The present case demonstrates a common delay that occurs with cardiac catheterization and timing of desensitization to RCM

Although there has been a protocol published for rapid, successful desensitization to RCM,² accommodation for delayed cardiac catheterization has not been reported in the literature. The proposed desensitization schedule, although identical to Uppal et al.,² provides extra doses to the end of the protocol to accommodate the variable timing of the catheterization while maintaining the contrast quantitative amount to minimize CIN risk. Our protocol repeated the final dose, dose 13 (Table 1), preventing postponement in the catheterization schedule. Ultimately, the need for cardiac catheterization supersedes the potential risk of nephrotoxicity, which may be offset by prehydration and pharmacological prophylaxis, if necessary. We describe a protocol that provides an additional dose to the desensitization process in order to accommodate cardiac catheterization delays.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval

This study was approved by our institutional review board.

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Statement of Human and Animal Rights

This article does not contain any studies with human or animal subjects.

Statement of Informed Consent

There are no human subjects in this article and informed consent is not applicable.

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References

1. Lieberman P, Nicklas RA, Randolph C, et al. Anaphylaxis—a practice parameter update 2015. *Ann Allergy Asthma Immunol*. 2015;115(5):341–344.
2. Uppal S, Decicco AE, Intini A, Josephson RA. Rapid desensitization to overcome contrast allergy prior to urgent coronary angiography. *Int Heart J*. 2018;59(3):622–625.
3. Gandhi S, Litt D, Chandy M, et al. Successful rapid intravenous desensitization for radioiodine contrast allergy in a patient requiring urgent coronary angiography. *J Allergy Clin Immunol Pract*. 2014;2:101–102.
4. Hong SJ, Bloch KJ, Wong JT. Rapid IV challenge/desensitization using iso-osmolar radiocontrast medium (RCM) in two patients at high risk for anaphylactoid reactions. *J Allergy Clin Immunol*. 2002;109:S150.
5. Rear R, Bell RM, Hausenloy DJ. Contrast-induced nephropathy following angiography and cardiac interventions. *Heart*. 2016;102:638–648.
6. Maioli M, Toso A, Gallopin M, et al. Preprocedural score for risk of contrast-induced nephropathy in elective coronary angiography and intervention. *J Cardiovasc Med Hagerstown*. 2010;11:444–449.
7. Mehran R, Aymong ED, Nikolsky E, et al. A simple risk score for prediction of contrast-induced nephropathy after percutaneous coronary intervention: development and initial validation. *J Am Coll Cardiol*. 2004;44:1393–1399.
8. Simons FE, Arduso LR, Bilo MB. World Allergy Organization guidelines for the assessment and management of anaphylaxis. *J Allergy Clin Immunol*. 2011;127:593e1–193e22.
9. Pasternak JJ, Williamson EE. Clinical pharmacology, uses, and adverse reactions of iodinated contrast agents: a primer for the non-radiologist. *Mayo Clin Proc*. 2012;87:390–402.
10. Katayama H, Yamaguchi K, Kozuka T, Takashima T, Seez P, Matsuura K. Adverse reactions to ionic and nonionic contrast media: a report from the Japanese Committee on the safety of procedural risk score of contrast-induced nephropathy in elderly patients undergoing elective coronary angiography. *Int Heart J*. 2017;58:197–204.
11. Goss JE, Chambers CE, Heupler FA Jr. Systemic anaphylactoid reactions to iodinated contrast media during cardiac catheterization procedures: guidelines for prevention, diagnosis, and treatment. Laboratory Performance Standards Committee of the Society for Cardiac Angiography and Interventions. *Cathet Cardiovasc Diagn*. 1995;34(2):99–104; discussion 105.
12. Barrett BJ, Parfrey PS, Vavasour HM, O’Dea F, Kent G, Stone E. A comparison of nonionic, low-osmolality radiocontrast agents with ionic, high-osmolality agents during cardiac catheterization. *N Engl J Med*. 1992;326:431–436.