

Emergency Pretreatment for Contrast Allergy Before Direct Percutaneous Coronary Intervention for ST-Elevation Myocardial Infarction

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Patients with previous adverse contrast reactions occasionally present with ST-segment elevation myocardial infarction. Whether they can undergo catheterization safely using current contrast and medications is unknown. We reviewed catheterization laboratory records of all 501 patients (January 2005 to December 2006) presenting with ST-segment elevation myocardial infarction who underwent emergency coronary angiography. Six patients (1.2%) reported a previous contrast reaction including rash, acute bronchospasm, or anaphylaxis. All received a combination of intravenous steroids and H1 and H2 blockers in the emergency department or catheterization laboratory before catheterization. None of these had complications or evidence of allergy in any patient. In conclusion, some patients with previous contrast reaction may undergo emergency catheterization without adverse consequences, although the safety of this approach has not been proved. © 2008 Elsevier Inc. All rights reserved. (Am J Cardiol 2008;102:1469–1472)

In an era when percutaneous coronary intervention (PCI) has emerged as the treatment of choice for ST-segment elevation myocardial infarction (STEMI),¹ it is unclear whether previous reaction to contrast media should be considered an absolute, relative, or no contraindication. Pre-medication with oral steroids decreases the risk of a recurrent adverse reaction, but only if started 6 to 12 hours before exposure to contrast.^{2–8} Contrast-induced reactions can be fatal; however, recurrent contrast reactions are usually mild, particularly in patients whose first reaction was mild.² We hypothesized that with emergency pretreatment contrast-allergic patients could safely undergo emergency PCI for STEMI.

Methods

This study was performed at a 437-bed tertiary-care hospital in rural central Pennsylvania. In January 2005 the hospital initiated a “level I STEMI PCI” program. Its goal was to provide PCI to patients with STEMI presenting to our institution or transferred from community hospitals in <90 minutes from initial presentation. A protocol for emergency pretreatment of patients with a known previous adverse reaction to contrast agents (methylprednisolone 80 mg intravenously, cimetidine 300 mg intravenously, prochlorperazine 10 mg orally, and montelukast 10 mg orally) was borrowed from colleagues at a large referral center. Although it was not catheterization laboratory policy, several interventionists at the hospital used this emergency pretreatment regimen as a basis for pretreatment for direct PCI for patients with STEMI and a history of allergic reaction to

previous contrast administration. Patients with a history of allergy to shellfish or iodine were not considered iodine-allergic and were not pretreated before primary PCI.

Patients who underwent primary PCI for STEMI from January 1, 2005 to December 31, 2006 were identified from the catheterization laboratory database. Medical records of each patient were reviewed for a history of iodinated contrast allergy. Reactions were characterized as minor (limited urticaria, pruritus, erythema), moderate (diffuse urticaria, angioedema, laryngeal edema, bronchospasm), or severe (cardiovascular collapse respiratory/cardiac arrest).³

Records of patients with a history of contrast allergy who underwent primary PCI for STEMI were reviewed for any reaction during or in the days after the procedure using catheterization laboratory records, inpatient notes, and discharge summaries. Medications administered before PCI were identified from emergency department records and catheterization laboratory procedure logs. This study was approved by the hospital institutional review board.

Results

During the study period, 501 patients with STEMI underwent direct PCI within 12 hours of onset of symptoms. Median door-to-balloon times were 108 minutes for transferred patients and 68 minutes for patients presenting to the PCI center. For all patients, median time from arrival in catheterization laboratory to balloon inflation was 21 minutes. Patients with STEMI who did not undergo PCI during the study period were not tracked; we were aware of only 1 patient who did not undergo PCI due to a history of contrast reaction.

A previous documented adverse reaction to iodinated contrast was identified in 6 of the 501 patients with STEMI (1.2%). Previous adverse reactions included skin rash or urticaria (n = 3) and moderate or severe anaphylaxis (n = 3). Patients were given emergency pretreatment in the emergency

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Table 1

Recommendations from published guidelines for contrast administration to patients with previous contrast-allergic reactions

	Japanese Committee on the Safety of Contrast Media (1990) ⁹	Society for Cardiac Angiography and Intervention (1995) ³	American Academy of Allergy, Asthma, and Immunology (2005) ²¹	American College of Radiology (2005) ²	European Society of Urogenital Radiology (2006) ^{24,25}
Type of contrast	Nonionic	Nonionic	Avoid high-osmolar contrast	Nonionic	Nonionic
Steroid pretreatment for previous mild reactions	No recommendation	Equivocal	Recommended	Recommended	No recommendation
Steroid pretreatment for previous severe reactions	No recommendation	Recommended	Recommended	Recommended	No recommendation
Emergency contrast use	No recommendation	"Compare risks and benefits" of doing procedure. If done, use Greenberger protocol*	If emergency procedure done, use Greenberger protocol*	If emergency procedure done, use Greenberger protocol*	No recommendation
H1 blockers	No recommendation	Recommended	Recommended	Recommended	No recommendation
H2 blockers	No recommendation	Recommended	No recommendation	No recommendation	No recommendation
Drugs and protocols in place for emergency treatment of contrast-allergic reactions	No recommendation	Recommended	No recommendation	Recommended	Recommended

* Hydrocortisone 200 mg intravenously immediately and then every 4 hours until the procedure starts and diphenhydramine 50 mg 1 hour before the procedure.

department or on the catheterization table 10 to 50 minutes before contrast injection. All 6 received intravenous steroids (hydrocortisone 100 mg in 1, methylprednisolone sodium succinate [Solu-Medrol, Pharmacia & Upjohn, Peapack, New Jersey] 100 mg in 1, and dexamethasone in 4). Five received H1 blockers (diphenhydramine in 3, prochlorperazine in 1, promethazine in 1). Five received oral H2 blockers (cimetidine in 4, ranitidine in 1). Four received montelukast 10 mg orally. No adverse or allergic reactions were documented in any patient.

Two additional patients on presentation for STEMI reported a possible adverse reaction to contrast, self-described as "heart stopped." These were not considered to have had a true contrast reaction and were not pretreated before primary PCI. Neither of these patients had any evidence of adverse reaction to contrast during or after primary PCI.

Discussion

The most important finding of this study is that contrast-allergic patients with STEMI who receive emergency pretreatment and then undergo direct PCI for STEMI may not have adverse effects. Although this finding may be surprising to cardiologists, a large body of radiology literature suggests that repeat administration of contrast to contrast-allergic patients is rarely dangerous.

About 3% of patients presenting with STEMI may have a previous contrast allergy, and of those, emergency angioplasty may cause a repeat allergic reaction in about 20%. Usually, but not always, the reaction will be mild. These estimates are based on data showing that with low-osmolar contrast, incidences of contrast allergic reactions are 3% for mild reactions, 0.04% for severe reactions, and 2 to 6 per million for fatal reactions.^{9,10} The incidence is sixfold higher for patients with previous contrast allergy.^{11,12} In patients who have a repeat reaction, the reaction is usually of the same degree as the first reaction.²

Most guidelines writers recommend pretreatment for contrast-allergic patients before a repeat, elective, contrast administration. In patients undergoing first exposure to contrast, steroids given 6 to 24 hours before the procedure decrease the incidence of contrast reactions.^{7,13} Siegle et al¹⁴ reported that pretreatment decreased the incidence of contrast reactions in contrast-allergic patients to 3.3% (compared with 6.4% in nonpretreated patients). Pretreatment started ≥ 12 hours in advance of the procedure and use of low-osmolar, iso-osmolar, or nonionic contrast results in 0.6% to 1% rates of recurrent allergic reaction.^{6,15}

Despite this, 2 surveys have indicated many physicians do not pretreat patients with previous mild contrast reaction before repeat elective exposure. Seymour et al¹⁶ surveyed United Kingdom radiologists in 1994 and found that 56% did not use steroid pretreatment in patients with previous mild contrast reactions. An updated 2002 United Kingdom survey reported that 40% of laboratories still did not give corticosteroid pretreatment for patients with a previous mild reaction to contrast. They concluded that "it is arguable whether we should use steroid premedication in the present era of non-ionic contrast media."¹⁷ However, these surveys found that virtually all radiologists pretreat patients with a history of severe reaction to contrast.¹⁶⁻¹⁸

Two reviewers have suggested that steroid pretreatment of contrast-allergic patients is not necessary if nonionic contrast is used. Webb¹⁹ opined that "in high risk patients . . . for urgent investigations, the risk:benefit ratio may be such that the potential benefit of steroid prophylaxis should be waived in the interests of early diagnosis." Dawson and Sidhu²⁰ suggested that "the value of corticosteroid prophylaxis is not proven and may reasonably be abandoned" in patients with previous contrast reaction. These investigators cited a 1990 study by Wolf et al¹² comparing patients receiving ionic contrast, ionic contrast with steroid pretreatment, and nonionic contrast. Contrast reactions were 3.3%,

4.0%, and 0.6% ($p < 0.001$). Of 553 patients with previous contrast allergic reactions who received nonionic contrast without steroid pretreatment, 7.1% had mild reactions (limited urticaria), 2.2% had moderate reactions (extensive urticaria, facial edema, bronchospasm), and 0.2% had severe reactions (shock). Wolfe et al¹² concluded that nonionic contrast without steroid pretreatment was safer than ionic contrast with steroid pretreatment. Based on this study, virtually all reviewers and guidelines recommend using nonionic contrast in patients with a previous contrast allergy.

Several sources recommend stopping β blockers, although this may be contraindicated in a patient with acute coronary syndromes.^{8,21} Most guidelines and reviewers recommend use of an H1 blocking antihistamine.^{6,8,11,21–23}

Emergency administration of contrast to contrast-allergic patients has been reported in only 1 paper. Greenberger et al⁵ in 1986 reported on 10 patients with a history of contrast allergy (8 with urticaria, 1 with throat constriction, and 1 with severe hypotension). Intravenous hydrocortisone and diphenhydramine were given ≥ 2 hours before the “emergency” procedure in 8 of these 10 patients. None had an allergic reaction. Subsequent guidelines^{3,21,22} and reviewers^{8,11,17} have advocated the regimen of Greenberger et al for pretreatment of contrast-allergic patients requiring emergency contrast administration, but its efficacy has never been subsequently tested.

There is no proof that the emergency administration of corticosteroids at time of contrast administration has any effect at all. Two studies of intravenous steroids given at the time of a first contrast exposure failed to show any protection from a first contrast reaction.^{7,13} In contrast, steroids given 6 hours before a procedure significantly decreased the incidence of first allergic reactions.

Five professional societies have issued guidelines or reviews regarding contrast reactions, but none offer firm guidance for emergency pretreatment of contrast-allergic patients^{3,9,21,22,24,25} (Table 1). Most recommend the protocol used by Greenberger et al,⁵ with or without attribution. Based on this review, we recommend the following for contrast-allergic patients requiring emergency repeat contrast administration.

First, the potential benefits of the procedure requiring contrast must be balanced against the risks of repeat contrast reaction, recognizing that reactions range from minimal to severe or even life-threatening. For patients in whom contrast has caused cardiovascular or respiratory collapse, contrast-requiring emergency procedures should be undertaken only if the potential benefits are considerable.

Second, if an emergency contrast-requiring procedure is undertaken, it is reasonable to give intravenous steroids, knowing that they will not prevent immediate reactions but might prevent or mitigate sustained or delayed reactions.

Third, nonionic contrast should be used.

Fourth, it is reasonable to give intravenous H1 and H2 blockers, recognizing that their value is unproved. If an H2 histamine receptor blocker is administered, an H1 histamine receptor blocker must also be administered because unopposed H1 histamine receptor stimulation may result in coronary vasoconstriction of the coronary arteries.³

Fifth, the value of montelukast is uncertain. There is no

study of montelukast in contrast allergy. Anaphylaxis is thought to be at least partly regulated by leukotrienes and might be inhibited by a leukotriene inhibitor.²⁶

Sixth, operators should know (or have posted in the catheterization laboratory), and be prepared to administer, the protocol for immediate treatment for acute reactions, including cardiovascular or respiratory collapse.³ Resuscitation equipment should be available.

This is a small single-center study that included only a small number of patients, using a treatment protocol with some variation in medications administered. Information regarding previous reactions was obtained retrospectively at the time of the second catheterization. Safety cannot be inferred from the absence of reactions in this small number of patients. Patients with STEMI and previous contrast reaction not treated with primary PCI during the period of this study were not reported.

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