

RESEARCH LETTER

Clinical Efficacy of Emergency Premedication Regimen for Contrast Allergy Before Percutaneous Coronary Interventions

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The increased use of low osmolar or nonionic iodinated contrast media (ICM) during percutaneous coronary intervention (PCI) has reduced the risk of contrast reactions. Premedication strategies involving corticosteroids and antihistamines can further reduce the recurrence of contrast reactions.¹ The premedication regimen commonly includes oral prednisone at 13, 7, and 1 hour before PCI.¹ For some patients, waiting 13 hours is not an option if they need immediate PCI. In such situations, emergency intravenous corticosteroid-based regimens can be administered,^{1,2} the efficacy and safety of these approaches is, however, not well-studied. We investigated the frequency of, and factors associated with, breakthrough reactions, and therapeutic implications of premedication regimens among patients with ICM allergy who received emergency premedication before PCI. Being a retrospective study, Institutional Review Board approval and waiver for informed consent were obtained.

We identified all patients with contrast allergy receiving PCI at Geisinger Medical Center between January 1, 2005 and May 30, 2018 using the National Cardiovascular Data CathPCI Registry, catheterization laboratory procedure records, and electronic medical records. We identified them by selecting entries for intravenous/per-oral steroids administered within 24 hours before PCI. We excluded patients who received steroids for other indications, as well as patients whose adverse reactions were physiologic.¹ Only index PCI was included, and repeat PCIs were excluded. Both index and breakthrough reactions to ICM were identified by reviewing electronic medical record notes, discharge summaries,

and discharge instructions and graded using the classification of the American College of Radiology.¹ All analyses were conducted in SAS 9.4 (SAS Institute, NC).

The cohort consisted of 607 patients with ST-segment-elevation myocardial infarction in 25.2%, non-ST-segment-elevation myocardial infarction in 20.4%, unstable angina in 33.8%, stable angina in 11.9%, and miscellaneous in 8.7% of patients. PCI was emergent in 27.2% of patients. The index reaction was mild in 59.6%, moderate in 8.2%, severe in 20.6%, and of unknown severity in 11.5% of patients (Table). The frequency of breakthrough reactions was 1.5% (9 of 607); these were mild in 6 and moderate in 3 patients. Patients with breakthrough reactions tended to present with ST-segment-elevation myocardial infarction, had mild index reactions, and underwent emergency PCI more frequently than patients without breakthrough reactions, but the differences were not statistically significant according to Fisher exact tests. Likewise, the groups were similar regarding demographic features, medical comorbidities, and biochemical characteristics (Table).

A methylprednisone-based premedication regimen was administered to 322 patients (53%), whereas 285 patients (47%) received a hydrocortisone-based regimen (Table). Median time from steroid to contrast administration was available for 445 PCIs and was not statistically significantly different between patients with (5 minutes; interquartile range, 4–946) and patients without breakthrough reactions (38 minutes; interquartile range, 12–110; $P=0.35$). Length of stay and 30-day mortality were similar between the groups (Table).

Key Words: angina ■ anti-allergic agents ■ contrast media ■ corticosteroids ■ hypersensitivity ■ premedication ■ percutaneous coronary intervention

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Table. Baseline Characteristics of Patients With Contrast Allergy Who Had Emergency PCI and Characteristics of the Emergency Contrast Pretreatments and Outcome

	Overall Encounters (n=607)	Breakthrough Reaction (n=9)	No Breakthrough Reaction (n=598)	P Value
Age, mean (SD)	66.0 (10.9)	66.9 (10.6)	66.0 (10.9)	0.8100
BMI, mean (SD)*	30.9 (7.3)	27.7 (7.5)	30.9 (7.3)	0.1934
Sex				1.000
Female	302 (49.8%)	4 (44.4%)	298 (49.8%)	
Male	305 (50.2%)	5 (55.6%)	300 (50.2%)	
Race				1.0000
White	601 (99.0%)	9 (100.0%)	592 (99.0%)	
Other	6 (1.0%)	0 (0.0%)	6 (1.0%)	
Diagnosis cath status				0.0665
Emergency	165 (27.2%)	5 (55.6%)	160 (26.8%)	
Non-emergency	442 (72.8%)	4 (44.4%)	438 (73.2%)	
Clinical presentation				0.3617
Stable angina	72 (11.9%)	0 (0.0%)	72 (12.0%)	
Unstable angina	205 (33.8%)	2 (22.2%)	203 (33.9%)	
NSTEMI	124 (20.4%)	2 (22.2%)	122 (20.4%)	
STEMI or equivalent	153 (25.2%)	5 (55.6%)	148 (24.7%)	
Miscellaneous	53 (8.7%)	0 (0.0%)	53 (8.9%)	
Hypertension†	500 (83.1%)	7 (77.8%)	493 (83.1%)	0.6534
Dyslipidemia‡	422 (77.6%)	5 (83.3%)	417 (77.5%)	1.0000
Prior myocardial infarction§	141 (26.0%)	2 (28.6%)	139 (25.9%)	1.0000
History of diabetes mellitus	223 (37.1%)	3 (33.3%)	220 (37.2%)	1.0000
History of asthma	84 (13.8%)	0 (0%)	84 (14%)	0.6195
History of asthma or atopy	127 (20.9%)	1 (11.1%)	126 (21.1%)	0.6929
Hemoglobin g/dL, mean (SD)¶	13.2 (2.0)	14.2 (1.3)	13.2 (2.0)	0.1379
WBC K/uL, mean (SD)#	8.8 (3.3)	10.8 (2.4)	8.8 (3.3)	0.0902
Eosinophil %, median (IQR)**	0.14 (0.07–0.23)	0.15 (0.06–0.23)	0.14 (0.07–0.23)	0.8852
Characteristics of the emergency contrast pretreatments and outcome				
Severity of index dye allergy				0.4249
Mild	362 (59.6%)	5 (55.6%)	357 (59.7%)	
Moderate	50 (8.2%)	2 (22.2%)	48 (8.0%)	
Severe	125 (20.6%)	1 (11.1%)	124 (20.7%)	
Unknown	70 (11.5%)	1 (11.1%)	69 (11.5%)	
Steroids				1.000
Methylprednisone	322 (53.0%)	5 (55.6%)	317 (53.0%)	
Hydrocortisone	285 (47.0%)	4 (44.4%)	281 (47.0%)	
IV administration minutes, median (IQR)††	38 (11–110)	5 (4–946)	38 (12–110)	0.3465
Length of stay, days, median (IQR)	2 (1–4)	3 (2–4)	2 (1–4)	0.5538
Mortality within 30 days	27 (4.4%)	0 (0.0%)	27 (4.5%)	1.0000

BMI indicates body mass index; IQR, interquartile range; IV, intravenous; NSTEMI, non–ST-segment–elevation myocardial infarction; PCI, percutaneous coronary intervention; STEMI, ST-segment–elevation myocardial infarction; and WBC, white blood count.

*BMI missing data: n=4

†Hypertension missing data: n=5

‡Dyslipidemia missing data: n=63

§Prior myocardial infarction missing data: n=64

||Diabetes mellitus-II missing data: n=6

¶Hemoglobin missing data: n=58

#WBC missing data: n=59

**Eosinophil missing data: n=107

††IV administration time missing data: n=162

The most important finding of this study is that patients receiving an emergency contrast preparation have an incidence of breakthrough reactions of only 1.5%, lower than previously reported for oral premedication regimens³ or accelerated 5 hour intravenous premedication regimens.⁴ In addition, the reactions were mild or moderate; none were severe. Our results are similar to other studies that reported breakthrough reactions are similar in severity to the index reaction.³ In our study, age, sex, asthma, atopy, hypertension, dyslipidemia, prior myocardial infarction, and diabetes mellitus were not associated with an increased risk of breakthrough reactions.

The minimum premedication duration required for intravenous corticosteroid to be effective in reducing the incidence of breakthrough reactions to ICM is unknown, but for oral corticosteroid regimens it is longer than 2 hours.⁵ Based on data of 445 PCIs, we found that the median time from steroid to contrast administration was 38 minutes for patients without breakthrough reactions, while it was 5 minutes for patients with breakthrough reactions. This difference was not statistically significant, as the study was underpowered to detect statistically significant differences. Larger studies are warranted to evaluate the shortest premedication duration with which breakthrough reactions can be reduced. No study has evaluated clinical outcomes of patients receiving nontraditional premedication protocols. Our study also revealed that patients with breakthrough reactions had a longer length of hospital stay (3 versus 2 days) although this was not statistically significant ($P=0.53$).

Data obtained from electronic medical record review may underestimate the severity of reactions or even the incidence of severe reactions since in unstable patients, these might be misdiagnosed as hemodynamic complications. Similarly, our study may underestimate the incidence of mild and moderate breakthrough reactions because these may not have been documented or treated. While we observed a low incidence of contrast reactions, the size of the study is not large enough to conclude that the emergency medication protocol reported here is safe, and we cannot exclude

a clinically significant incidence of moderate or even severe breakthrough contrast reactions. In conclusion, in nonemergency situations, the standard pretreatment regimen remains the preferred strategy. Conversely, in emergency situations, the nontraditional premedication regimen reported here may be acceptable. However, physicians must be particularly vigilant to identify and treat recurrent ICM reactions.

Because of the sensitive nature of the data collected for this study, we will not make our data, and study materials available to other researchers.

ARTICLE INFORMATION

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Disclosures

None.

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