

# Desensitization in a Patient with Hypersensitivity to the Iodinated Contrast Medium Iopromide: A Clinical Case Report

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## ABSTRACT

**Introduction:** A contrast agent is a substance that, when introduced into the body, it makes possible to observe organs anatomically, or tumors at a pathological level. These contrast media are administered daily to many people, unfortunately they eventually produce adverse reactions, which in some cases can be lethal. **Objective:** Describe the desensitization process in a patient with hypersensitivity to the iodinated contrast medium iopromide. **Results:** A case of a male patient with hypersensitivity is introduced to contrast medium, who underwent angioplasty to achieve a positive result within minutes after administrating 2998.83 mg/mL of iopromide (300 mg/mL) without any associated post-surgical complications, resulting in a favorable clinical outcome and the patient was medically discharged thereafter. **Conclusion:** The desensitization process is an opportunity that would allow different procedures and/or complementary studies to be carried out quickly and safely in order to clarify diagnoses and therapeutics. Therefore, this process must be carried out by multidisciplinary personnel trained in the management of hypersensitivity states.

**Keywords:** hypersensitivity, contrast agent, iopromide, immunological desensitization

## INTRODUCTION

Contrast media are chemical substances that fulfill the function of inhibiting or absorbing ionizing radiation, causing changes in the radiographic image when introduced into the body, thus achieving differentiation in the different organic structure due to the type of density that they produce [1,2].

There are several types of contrast media: A) ICM (iodinated contrast media), typically used for X-rays and CT scans, B) GBCM (gadolinium-

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based contrast media), English) for MRI and C) dyes such as patent blue, methylene blue and fluorescein, some used for the detection of lymph nodes or melanoma and sometimes for the diagnosis and monitoring of diseases [3]. Although its use has many diagnostic benefits, the probability of adverse reactions occurring is present in the use of any type of contrast agent, and in unpredictable cases it can be lethal (representing 1 in 100,000 cases) [4,5]. The density of soft tissue is approximately equal to the density of water (0.92 to 1.065 g/cm<sup>3</sup>) compared to the density of the whole, which is 4.94 g/cm<sup>3</sup>. The regularity of the presentation of allergic reactions is based on different compounds (these differ in osmolarity, viscosity and ionic strength) [5] and factors that include both the risk profile of each patient, as well as the type of contrast material used [1].

Within adverse reactions, two classes must be differentiated: A) IHR (immediate hypersensitivity reactions) and B) NIHR (non-immediate hypersensitivity reactions).

In IHR, the appearance of adverse symptoms is 2-4% for moderate reactions and severe in less than 1%, in which anaphylaxis is one of the representative symptoms [6]. Generally these occur one hour after the administration of the medication, unlike NIHR where they can occur in up to 10 days after the administration of the contrast agent [3].

Among the prevention methods we find: allergy studies, pre-medication, adequate selection of contrast media and also the treatment with antihistamines and corticosteroids to avoid these adverse events. However, these methods do not guarantee that hypersensitivity to the elements will not occur. For this reason, a desensitization strategy is suggested [4] as an unusual measure in hospitals, which can offer an alternative for the continuity of pharmacological treatment(s). Respectively, extensive knowledge regarding the treatment and diagnosis (before, during and after) of the administration of any contrast agent is essential [6].

## CLINICAL CASE DESCRIPTION

### First desensitization

This is a 71-year-old male patient, from and residing in the municipality of Barranquilla, Department of Atlántico (Colombia), who denies any significant pathological history; however, is an active smoker with a pack-year index (IPA)

of 50 pack-years which represents a high risk for lung cancer. Patient was admitted to the emergency department complaining of pain in the precordial region of sudden and progressive onset, lasting 6 days, which worsened in the last few hours of an oppressive type, not radiating, with an intensity of 7/10 made worse with movements. Additionally, reports that it is accompanied by dyspnea with great exertion, assessed by the internal medicine service with Troponin I and positive Troponin delta, which is why they contextualize it as an acute coronary syndrome type, acute myocardial infarction without ST segment elevation. Coronary stratification is indicated. Subsequently, he was taken by the cardiology service for coronary catheterization, which showed disease in two main vessels (Anterior Descending Artery and Right Coronary Artery) requiring angioplasty with STENT in the anterior descending artery and right coronary artery. However, during the procedure, the patient presented with a skin rash that was generalized, associated with pruritus, in which the procedure was suspended. This probably represented a hypersensitivity reaction to contrast medium, so the clinical pharmacology service proceeded with a desensitization process, directed at the contrast medium, so that a second surgical procedure could be performed later for a second-stage stent implantation of the compromised artery. The risks and benefits of the procedure were explained to the patient, understanding and accepting by signing an informed consent. After this, he is transferred to the intermediate ICU service for monitoring during the procedure.

### Desensitization procedure

The method proposed by Josephson R. et al. was adapted [4]. Those who used the contrast medium, Visipaque, in the development of the protocol. However, the contrast medium Iopromide was used, which is the one approved in the hospital institution for hemodynamic procedures, for which the same solutions were maintained but with variations in the doses to be administered.

A rapid intravenous protocol was designed (Table 1) that consisted of a series of 13 dilutions of increasing concentrations of Iopromide (300 mg/mL) and their respective administration times (every 10 and 15 minutes), which were prepared in the mixing center by the Pharmaceutical Chemist.

**Table 1:** Contrast media desensitization protocol with Iopromide.

Iopromide Desensitization						
Time interval for	No of		Concentration		Volume	Administration
admin. (min)	Doses	Dissolution	(mg/mL)	dose(mg)	(mL)	time
	1	1:10000	0.03	0.12	5	6:45 AM
10	2	1:5000	0.6	0.3	5	6:55 AM
	3	1:1000	0.29	1.46	5	7:05 AM
	4	1:500	0.58	2.93	5	7:15 AM
	5	1:250	1.17	5.85	5	7:25 AM
	6	1:125	2.34	11.71	5	7:35 AM
	7	1:62.5	4.68	23.43	5	7:45 AM
	8	1:32	9.37	46.87	5	7:55 AM
	9	1:16	18.75	93.75	5	8:10 AM
	10	1:8	37.5	187.5	5	8:25 AM
15	11	1:4	75	375	5	8:40 AM
	12	1:2	150	750	5	8:55 AM
-	13	1:1	300	1500	5	9:10 AM

**Conventions:** adm: administration, min: minute, mg: milligram, mL: milliliter, N<sup>o</sup>: number

**Source:** self-made

During desensitization, monitoring of the patient was maintained according to the protocol until an acceptable general condition was observed: afebrile, conscious, oriented, hydrated, hemodynamically stable, with no evidence of respiratory difficulty, blood pressure levels and heart rate at goals.

The desensitization protocol was successful. The patient did not present additional relevant signs or symptoms that would condition any hypersensitivity response. Once the protocol time had concluded, the patient was transferred to surgery to proceed to a second surgical procedure for STENT implantation in the second compromised artery.

### Second desensitization

Two months later, the patient went to the emergency room with a clinical picture lasting approximately 3 hours characterized by oppressive chest pain in the left hemithorax with radiation to the jaw and shoulders.

He stated that he was not adherent to the pharmacological treatment with clopidogrel 75 mg Oral C. /24 hours. The electrocardiogram showed a sinus rhythm with inversion of the T wave in the septoapical wall, without ST elevation and with positive troponin levels, it was categorized as an acute coronary syndrome type acute myocardial infarction without

ST segment elevation (NSTEMI ACS).

After the diagnosis, the patient was to be admitted for invasive coronary stratification, but due to his history of hypersensitivity to the contrast medium, he underwent desensitization again, which, that procedure only required only medication prior to the procedure (catheterization), without required subsequent exposure to it.

Completing the desensitization protocol, it was successfully achieved and, as a result of the invasive procedure by arteriography, healthy epicardial arteries without lesions were visualized.

It was decided to establish a personalized medication plan, where the patient was explained and taught how to use their medications and the importance of therapeutic adherence.

### DISCUSSION OF RESULTS

According to studies, the new low-osmolarity non-ionic contrast agents have demonstrated a 4-5 times lower impact of adverse reactions compared to high-osmolarity contrast agents. The administration of high- osmolarity ionic contrast agents has an impact of 5% to 12%, compared to low-osmolarity contrast agents, which have an incidence of 1%-3%.

It is believed that about 80% of adverse events can be avoided by administering low-osmolarity contrast agents [5]. Iopromide belongs to the group of medications that are low osmolarity and water soluble [7]. For this reason, it was the drug of choice; and in this case, the patient did not present with any adverse reaction during the procedure.

Drug desensitization is the temporary induction of tolerance to a sensitized drug by administering slow increments of the drug, from a very small amount to a full therapeutic dose. It can be used as a therapeutic strategy for patients with drug hypersensitivity when comparable alternatives are not available [8].

The contrast media desensitization procedure gives patients with hypersensitivity the possibility of using them without the risk of releasing an adverse reaction. Further, specialists have the option of using them for diagnostic means without fear of triggering hypersensitivity.

Desensitization to contrast media was successful, the medication was administered intravenously, and they waited 30 minutes after the procedure, since the majority of adverse reactions occur during this period [7].

## CONCLUSION

It is important to recognize that every day the need for medical studies that require the use of contrast media increases, which, if not used routinely, could trigger hypersensitivity reactions. A desensitization process is an important opportunity that allows different procedures and/or complementary studies to be carried out quickly and safely to clarify diagnosis, as well as therapeutical options. Therefore, this process must be carried out by multidisciplinary personnel trained in the management of hypersensitivity situations. From this arises the importance of continuing to produce this type of publications in order to establish institutional protocols that allow a better approach to these cases and ensure compliance with good clinical practices in reducing the risk of early or late complications in patients.

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