



*Research article*

## **Knowledge and experience of radiologists working in Istanbul on radiographic contrast medium anaphylaxis**

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**Abstract:** Radiologists are among the physicians with the highest probability of encountering cases with anaphylaxis. Therefore, they should be familiar with the recent developments in the diagnosis and treatment of anaphylaxis. In this study, we aimed to investigate the level of knowledge of the radiologists about the current diagnostic criteria and management of anaphylaxis in addition to their personal experiences on radiographic contrast medium (RCM) induced systemic reactions. Radiologists working in Istanbul were randomly selected and asked to fill out a 16-item questionnaire related to their experience on radiographic contrast medium anaphylaxis and knowledge about current anaphylaxis diagnosis and management guidelines. The study group consisted of 106 physicians 11 (10.4%) of whom have reported that they had encountered anaphylaxis due to radiographic contrast medium during their own practice. They have also reported two cases of mortality due to RCM. Most of the physicians were familiar with the signs and symptoms of anaphylaxis and about two thirds of them chose epinephrine as the first-line medication for treatment of anaphylaxis. Radiologists may encounter patients with RCM-induced anaphylaxis. Therefore they should be aware of the diagnosis and management of anaphylaxis.

**Keywords:** anaphylaxis; radiographic contrast medium; radiologist

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## 1. Introduction

Anaphylaxis is an emergency situation which may be encountered by every health care worker and should be diagnosed and treated as soon as possible [1]. Although there are many triggers of anaphylaxis, foods and medications are the leading causes of this life-threatening reaction and the medications used in daily radiology practice also constitute an important group of accused medications [1,2]. On the other hand, in recent years, there have been important developments in the diagnostic criteria and treatment of anaphylaxis [3]. Notwithstanding this fact, numerous studies have revealed that physicians from various disciplines who are likely to encounter cases with anaphylaxis are not aware of the recent development in the diagnosis and treatment of this potentially fatal reaction [4,5,6]. Radiographic contrast medium (RCM) anaphylaxis is generally an unpredictable situation and may progress to a life-threatening clinical reaction [7]. Therefore, radiologist, and other physicians must be aware of the risk factors for reactions to contrast media, use strategies to minimize adverse events, and be prepared to promptly recognize and manage any reactions to the contrast media [6,8]. In this study, we aimed to investigate personal experiences of a group of radiologists on radiographic contrast medium induced acute systemic reactions and knowledge on the current diagnostic criteria and management of anaphylaxis.

## 2. Methods

The study was performed among radiologists working in various hospitals of Istanbul. The physicians were randomly selected from hospitals and were asked if they wanted to join the study. Those who accepted to join the study were given a questionnaire to be filled out at sight. They were informed about the study. The questionnaire consisted of 16 items regarding the physicians' demographic characteristics, personal qualifications, personal experiences regarding RCM-induced anaphylaxis, and knowledge about management of anaphylaxis (Table 1). Descriptive statistical analysis was performed using NCSS (Number Cruncher Statistical System) 2007 (Kaysville, Utah, USA). The study protocol was approved by the ethics committee of our university's school of medicine.

## 3. Results

The study group consisted of 106 physicians (44.3% females); 67 (63.3%) of the physicians were radiologists and 39 (36.7%) were residents. The mean professional period were 12.5 years among radiologists and 2.5 years among residents (Table 1). Eleven (10.4%) radiologists have reported that they had seen 27 cases (16 males) with anaphylaxis and two cases of mortality due to RCM in their own practice. The leading responsible agents were ionic monomers or dimers (81.5%) (Table 1). Most of the patients (78.3%) with anaphylaxis were aged between 35–50 years and only one case was younger than 15 years of age. The questions regarding symptoms and signs suggesting anaphylaxis were answered by physicians as follows: shortness of breath (93.4%), hypotension (81.1%), angioedema (68.9%) and urticaria (61.3%) followed by others (Table 2). Most of the physicians (71.7%) reported that they preferred epinephrine as the first-line medication in the

treatment of anaphylaxis, but only one third of them preferred intramuscular route. The rest chose subcutaneous or intravenous routes for the administration of epinephrine (38.2% and 32.4% respectively).

**Table 1.** Some demographic and personal characteristics of radiologists and their experiences related to RCM anaphylaxis.

		N (106)	%
Gender	Female	47	54.2
	Male	59	45.8
Age (years)	25–35	53	47.3
	36–45	23	35.0
	≥46	30	17.7
Period of profession	<5 years	39	36.7
	5–10 years	28	26.4
	>10 years	39	36.7
Have you ever seen any case with anaphylaxis due to RCM? If you have, responsible agent? Yes: 11 physicians (10.4%)	Ionic monomers	12	44.4
	Ionic dimers	10	37.1
	Non-ionic monomers	3	11.1
	Non-ionic dimers	2	7.4
	Total	27	100
I have seen any case died due to RCM anaphylaxis.		2	1,9
How do you behave when you see any case with a previous reaction to RCM?	I give premedication with steroids and antihistaminics.	60	56.6%
	I use another RCM.	37	34.9%
	I use the same RCM under emergency conditions.	4	3.8%
	I refer the patients to the allergy clinic.	5	4.7%

RCM: Radiographic contrast medium.

Only 15.2% of the physicians said that they kept epinephrine at hand to use in any emergency situation. Nearly sixty percent of the radiologists knew the correct dose of epinephrine for children (defined as a 0.2 mg for a 20 kg child) and one third for adult dose (defined as a 0.5 mg) of scenario cases. When we asked the behavior of the radiologists if they had to give RCM to a patient with a previous suspected hypersensitivity, 56.6% of the physicians chose a premedication with corticosteroids and antihistaminics, 34.9% of the physicians would choose an alternative RCM, a small portion of the physicians (3.8%) reported that they might have given the RCM following required measures, and only 4.7% chose a consultation with allergy department (Table 2).

**Table 2.** Questions related to diagnosis and treatment of anaphylaxis.

<b>Which of the following symptoms and signs make you consider anaphylaxis in a patient given RCM?</b>		
N (106) %		
Shortness of breath	99	93.4
Hypotension	86	81.1
Angioedema	73	68.9
Urticaria	65	61.3
Wheezing	64	60.4
Nausea and vomiting	36	34.0
<b>Which medication do you prefer firstly in a case with anaphylaxis</b>		
Epinephrine	76	71.7
Corticosteroids	20	18.9
Antihistamines	5	4.7
IV fluids	3	2.8
Salbutamol	2	1.9
Glucagon	0	0.0

RCM: Radiographic contrast medium.

#### 4. Discussion and Conclusion

Adverse reactions to radiographic contrast media may range from a mild urticaria to a life-threatening anaphylaxis [9]. The true incidence of anaphylactic reactions during a radiological procedure has not been defined clearly [10]. In a large Japanese case series (337, 647 cases), the overall risk of any adverse reaction was 12.66% with ionic RCM and 3.13% with nonionic RCM; the risk of a severe adverse drug reaction was 0.2% for ionic RCM and 0.04% for nonionic RCM; and the risk of a very severe adverse drug reaction was 0.04% for ionic RCM and 0.004% for nonionic RCM [11]. In another study accessing 456,930 contrast doses, a total of 522 cases of adverse events were reported 458 (87.7%) of which were attributed to low-osmolar iodinated contrast media and only 64 to gadolinium injections [12]. In our study group, radiologists reported 27 systemic reactions 81.5% of which were attributed to ionic RCM. Although the number of the cases in our study is low, it is compatible with the literature [13].

Despite all educational efforts, there are large gaps in the recognition and treatment of anaphylaxis in daily health care practice, and anaphylaxis remains underrecognized and underreported [4,5,6]. Since the diagnosis of anaphylaxis is mainly based on symptoms that occur within minutes to a few hours after exposure to a potential trigger, such as RCM, it should be recognized by the physicians as soon as possible. The most common symptoms and signs that may be indicative of anaphylaxis were reported as shortness of breath (93.4%), hypotension (81.1%) and angioedema (68.9%) by our study group. Urticaria and angioedema which are the most common symptoms of anaphylaxis occur in 80 to 90 percent of reactions [1]. These two symptoms have been known as the symptoms of anaphylaxis by 61.3% and 68.9% respectively of our study group (Table 2). Epinephrine is a life-saving medication in the treatment of anaphylaxis and should be used without any delay [3]. When required, 71.7% of radiologists in our study group chose

epinephrine as the first-line medication in anaphylaxis during a radiological procedure. Unfortunately, nearly 24% of the physicians reported corticosteroids or antihistamines as the first-line medications which should never be used in place of epinephrine [1,3]. In addition, current guidelines recommend that initial management of the patients with suspected anaphylaxis should be intramuscular epinephrine [1,3]. However, 28.1% of the respondents reported that they preferred subcutaneous route, which is not recommended because of delayed absorption of epinephrine [14]. An important percentage of the radiologists did not know the ideal dose of epinephrine (0.01 mg/kg for children and 0.5 mg for adults [1]) for the management of the severe contrast material-induced allergic reaction scenarios. Similar results have been reported from Australia [8] and United Kingdom [15].

The subjects expressed various approaches when they meet a patient with a suspected previous hypersensitivity reaction to RCM. Most of the physicians (56.6%) chose a premedication with corticosteroids and antihistaminics. Although premedication with corticosteroids and antihistamines may reduce the incidence and severity of acute pseudoallergic reactions to RCM, these regimens have not been systematically studied for the prevention of IgE-mediated reactions [16]. Since premedication may mask early symptoms and signs of anaphylaxis and lead to delay the administration of epinephrine, physicians should be ready to treat any severe systemic reactions. Furthermore, because of the increased risk, it has been suggested that a patient should never receive again the same specific agent that caused the systemic reaction [17]. The study has some limitations. All of the respondents to the questionnaire were from Istanbul. Different results would have been obtained if the survey was performed globally. 36.7% of the respondents were radiology residents some of whom are brand new with very little experience on contrast medium and allergy.

In conclusion, since radiographic contrast media are increasingly used in modern radiological investigations, the radiologists should be prepared to promptly recognize and manage any RCM-induced systemic reactions in their practice. In addition, radiologists should be familiar with the recent developments in the diagnosis and treatment of anaphylaxis.

### **Main Points**

- (1) Radiographic contrast medium (RCM) anaphylaxis is an unpredictable situation and may become a life-threatening condition.
- (2) Urticaria and angioedema are the two most common symptoms of anaphylaxis.
- (3) Epinephrine is a life-saving medication in the treatment of anaphylaxis and should be used without any delay.
- (4) The correct dose of epinephrine is 0.01 mg/kg for children and 0.5 mg for adults.

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Nuri Tasali revised the paper with permission. Authors contributions: FC designed the study, GA collected the data, AB, RC evaluated the data, FC, GA wrote results, FC wrote discussion.

### **Conflict of Interest**

The authors declare that they have no conflict of interest.

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