



Research article

Knowledge and experience regarding perioperative anaphylaxis among anesthesiologists in Istanbul

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Abstract: Anesthesiologists are among the physicians with the highest probability of encountering cases with anaphylaxis. Therefore, they should be familiar with recent developments in anaphylaxis diagnosis and treatment. This study assessed the personal experiences and knowledge of the current diagnostic criteria and management of anaphylaxis among anesthesiologists. Anesthesiologists working in Istanbul were randomly selected and requested to complete a 16-item questionnaire related to their experiences with perioperative anaphylaxis and knowledge about current anaphylaxis guidelines. The study group consisted of 203 physicians; 10.8% of them reported having experienced any case with perioperative anaphylaxis during their own practice. The leading responsible agents were penicillins and other antibiotics (36.3%), followed by neuromuscular blocking agents (32%). Most of the physicians reported hypotension as the most important sign of anaphylaxis under general anesthesia and preferred epinephrine as the first-line medication during anaphylaxis. Antibiotics and neuromuscular blocking agents were the most common causative agents identified in the cases of perioperative anaphylaxis experienced by our study group. Like other health care providers, anesthesiologists should be aware of recent advances in anaphylaxis diagnosis and treatment.

Keywords: anaphylaxis; anesthesiologists; anesthetics; neuromuscular blocking agents

Abbreviations:

NMBAs Neuromuscular Blocking Agents
IgE Immunoglobulin E

1. Introduction

Anaphylaxis is an emergency situation which may be encountered by every health care provider and which should be diagnosed and treated as soon as possible [1]. Although there are many triggers of anaphylaxis, foods and medications are the leading common causes of this disease; the medications used during general anesthesia constitute an important group of causative medications [1,2]. In recent years, there have been important developments in the diagnostic criteria and treatment of anaphylaxis [3]. However, numerous studies have revealed that physicians from various branches who are likely to encounter cases with anaphylaxis are not aware of these recent developments [4,5]. Perioperative anaphylaxis is generally an unpredictable situation and may progress to a life-threatening clinical picture [6]. Therefore, anesthesiologists—as a requirement of their job—are among the physicians with the highest probability of encountering cases of anaphylaxis. This study aimed to assess the personal experiences and knowledge of the current diagnostic criteria and management of anaphylaxis among anesthesiologists working in various hospitals in Istanbul.

2. Materials and Methods

The study included anesthesiologists working in 10 government hospitals in Istanbul (approximately 10% of all state hospitals), where middle and lower-class social groups are treated and many surgeries are performed every day. The physicians were randomly selected from hospitals and asked to join the study. Those who agreed to participate received a questionnaire to be completed anonymously. The questionnaire consisted of 16 items regarding the physicians' demographic characteristics, personal qualifications, personal experiences regarding anaphylaxis, and knowledge about the management of anaphylaxis (Annex-1). The diagnostic criteria were based on the updated practice parameters for the diagnosis and management of anaphylaxis developed by the Joint Task Force on Practice Parameters [1].

The study was approved by the Institutional Ethics Committee of Sisli Hamidiye Etfal Teaching and Research Hospital (November 24, 2015, registration number: 1130).

Descriptive statistical analyses were performed using IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY).

3. Results

The study group consisted of 203 physicians (54.2% female). Eighty-three anesthesiologists reported that they had themselves had an allergic disease, most commonly allergic rhinitis (23.6%). Table 1 shows the personal characteristics of the subjects. Forty-two (20.7%) of the anesthesiologists reported having seen any case with anaphylaxis in their professional careers; 22 of these (10.8%) had witnessed this event during their own practices. The leading responsible agents were penicillins and other antibiotics (36.3), followed by neuromuscular blocking agents (NMBAs; 32%) (Table 2). The

answers to questions regarding the symptoms and signs suggestive of anaphylaxis were as follows: shortness of breath (53.2%), hypotension (31%), and angioedema (22.7%), followed by others (Table 3). A significant proportion of physicians (88.2%) reported hypotension as the most important sign of anaphylaxis under general anesthesia (Table 3). Most physicians (89.2%) reported that they preferred epinephrine as the first-line medication for the treatment of anaphylaxis (Table 4). None of the anesthesiologists reported any mortality due to perioperative anaphylaxis.

Table 1. Demographic and personal characteristics of 203 anesthesiologists.

		Number	%
Gender	Female	110	54.2
	Male	93	45.8
Age (years)	25–35	96	47.3
	36–45	71	35.0
	≥46	36	17.7
Professional experience (years)	≤5	103	50.7
	6–15	69	34.0
	≥16	31	15.3
Allergic disease (yes)	Allergic rhinitis	48	23.6
	Food or drug allergy	33	16.3
	Atopic dermatitis	14	6.9
	Urticaria	12	5.9
	Asthma	9	4.4

Table 2. Responsible agents identified by 22 anesthesiologists.

Agent	Number	%
Penicillins	4	18.2
Other unspecified antibiotics	3	13.6
Vancomycin	1	4.5
Atracurium	2	9.1
Induction agents, unspecified	2	9.1
Induction agents unremembered	2	9.1
Neuromuscular blocking agents, unspecified	2	9.1
Rocuronium	2	9.1
Pancuronium	1	4.5
Thiopental	1	4.5
Thiopental + atracurium	1	4.5
Thiopental + rocuronium	1	4.5
Dextran	2	9.1

Table 3. Which of the following symptoms and signs lead you to consider anaphylaxis in a patient under general anesthesia?

Symptom or sign	Number	%
Shortness of breath	108	53.2
Hypotension	63	31.0
Angioedema	46	22.7
Urticaria	28	13.8
Wheezing	9	4.4
Nausea and vomiting	57	28.1
To you, which of these symptoms and signs is most specific for the diagnosis of anaphylaxis		
Hypotension	179	88.2
Urticaria	175	86.2
Shortness of breath	169	83.3
Angioedema	162	79.8
Wheezing	92	45.3
Nausea and vomiting	4	2.0

Table 4. First-line medications preferred by anesthesiologists (n = 203) for the treatment of anaphylaxis under general anesthesia.

Medication	Number	%
Epinephrine	181	89.2
Corticosteroids	13	6.4
Antihistamines	11	5.4
Salbutamol	2	1.0
Glucagon	2	1.0

4. Discussion

The true incidence of anaphylactic reactions during general anesthesia has not been clearly defined [7]. The reported incidence rates vary from country to country and among regions within countries, but is generally about 1:3500–1:25,000 [8,9,10]. Sensitization to NMBAs responsible for 50% to 75% of allergic reactions [11]. However, very different findings have been reported by various studies. For example, Porri et al. [12] reported that nearly 10% of the general population was sensitive to NMBAs, a rate higher than that of reactions due to these drugs during anesthesia. Hypersensitivity reactions to NMBAs were an estimated 1 in 6,500 anesthetic procedures involving a muscle relaxant in 1996 [13], representing around 60% of all IgE-mediated reactions. In Norway, NMBAs were the most frequently reported allergen, representing 93.2% of IgE-mediated reactions [14]. Our study group reported seven cases (31.8%) of anaphylaxis due to NMBAs and two cases with thiopental sodium plus NMBAs (Table 2). Atracurium and rocuronium were the most common NMBAs reported by our study group. In a French study, succinylcholine was the most frequent trigger (33.4%), followed by rocuronium (29.3%) and atracurium (19.3%) [15]. Antibiotics represent 12 to 15% of the perioperative reactions observed in France [9,15]. However, in an American study, antibiotics accounted for 50% of IgE-mediated reactions [16]. Among antibiotics, penicillins and cephalosporins elicit approximately 70% of perioperative anaphylactic reactions to

antibiotics [17]. Allergic reactions with vancomycin remain rare. Unfortunately, antibiotics are used in an uncontrolled fashion in our community and latent and manifest sensitization rates are very high [18]. The common and uncontrolled use of antibiotics in our community might have led to prior sensitization and 36.4% of 22 reported reactions in our study were due to antibiotics.

The hypnotics commonly used in anesthesia include thiopental, propofol, midazolam, etomidate, ketamine, and inhaled anesthetics. Allergic reactions to these drugs appear to be relatively rare. The incidence of hypersensitivity reactions with thiopental is estimated 1:30,000 [19]. In our study, only one reaction due to thiopental and two others due to thiopental plus NMBA were reported. Although, protamine, antiseptics (e.g., chlorhexidine), plasma expanders, iodinated contrast agents, and latex have also been reported to possibly induce perioperative anaphylaxis [20], they were not reported by our study group.

Despite educational efforts, there remain large gaps in the diagnosis and treatment of anaphylaxis in daily health care practice and anaphylaxis remains under-recognized and underreported [4,5]. The symptoms of perioperative anaphylaxis can differ slightly in clinical manifestations and severity during an operation according to the usual forms of anaphylactic reactions [2,6,20]. Cardiovascular collapse and bronchospasm are the worst manifestations and have been reported in 88% and 37% of patients with perioperative anaphylaxis, respectively [21]. The most common symptoms and signs suggestive of anaphylaxis reported by our study group included shortness of breath (53.2%), hypotension (31%), and angioedema (22.7%). Symptoms related to the skin; i.e., erythema, angioedema, and urticaria have been reported less commonly during perioperative reactions [2,6,20]. Urticaria, which occurs in nearly 90% of anaphylactic reactions outside of anesthesia [1] was reported by 13% of our subjects. Cutaneous signs are usually overlooked in the operating room, likely because of surgical drapings [2]. When queried regarding the treatment of witnessed anaphylaxis during general anesthesia 89.2% of the anesthesiologists in our study group preferred epinephrine as the first-line treatment. Unfortunately, nearly 11% of the physicians reported corticosteroids or antihistamines as the first-line medications, which should never be used in place of epinephrine [1]. Anaphylaxis can be fatal within the first 5–30 min of its presentation, with an incidence of cardiac arrest of 10% [22,23]. Therefore, current guidelines recommend intramuscular epinephrine [1,3] or intravenous epinephrine for those under general anesthesia [20] for the initial management of patients with suspected anaphylaxis. Nevertheless, 28.1% of the respondents reported that they preferred the subcutaneous route, which is not recommended because of the delayed absorption of epinephrine [24].

When we asked the subjects regarding the administration of anesthesia to a patient with a previously suspected hypersensitivity, most (71.4%) reported conducting anesthesia following required measures, while 22.2% preferred consultation with the allergy department. If possible, all patients—except for emergent surgeries—who have experienced an anaphylactic reaction during anesthesia should undergo a complete allerge-anaesthetic follow-up prior to subsequent anesthesia [20].

Unfortunately, we did not apply any allergological work-up to verify the sensitivity of the patients to the suspected medications because this was a questionnaire survey. This is an important limitation of the study. However, the main purpose of the study was to determine whether the anesthesiologists had seen any cases of anaphylaxis and to learn whether they were aware of the latest developments in anaphylaxis diagnosis and treatment. It will be necessary for anesthesiologists

to collaborate with allergists to determine the etiologies of anaphylactic reactions after increasing their awareness of the diagnosis and treatment of anaphylaxis.

5. Conclusion

Antibiotics and NMBAs were the most common causative agents in the cases of perioperative anaphylaxis experienced by our study group. Since many agents may lead to perioperative anaphylaxis, anesthesiologists should be aware of the recent advances in anaphylaxis diagnosis and treatment.

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Conflict of Interest

The authors of this study declare that there is no conflict of interest.

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