



Original article

Elevated exhaled nitric oxide in anaphylaxis with respiratory symptoms



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FeNO, fractional exhaled nitric oxide;

iNOS, inducible nitric oxide synthase

ABSTRACT

Background: Anaphylaxis is a serious type I allergic reaction that occurs suddenly and can result in death, but it is sometimes difficult to differentiate from other diseases, and physicians must rely on symptoms alone for its diagnosis. Meanwhile, fractional exhaled nitric oxide (FeNO) concentration, used in assessing airway inflammation in bronchial asthma, is known to be affected by atopic disposition. The possible role of FeNO measurements was evaluated in patients with anaphylaxis.

Methods: FeNO was measured in 52 adult patients (17–78 years old, median age 41.5 years) in whom anaphylaxis occurred. These measurements were made within 24 h after onset and after about one month when the patients were symptom-free. In some of these patients, FeNO was measured a third time, two months or more after onset.

Results: The FeNO level in the 52 patients was not significantly different in measurement made within 24 h of onset of anaphylaxis and after one month. However, excluding 9 patients who also had asthma history, the FeNO level in the remaining 43 patients decreased significantly from within 24 h of onset (36.7 ± 27.5 ppb) to one month later (28.8 ± 19.5 ppb). Of these 43 patients, this phenomenon was evident in a group that had respiratory symptoms (31 patients), but it was not seen in a group that did not have respiratory symptoms (12 patients).

Conclusions: Elevation of FeNO was related to respiratory symptoms observed in anaphylactic patients without asthma. Although the mechanism of increased FeNO level is unclear, its usefulness for diagnosis of anaphylaxis must be examined in prospective studies.

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Introduction

Anaphylaxis is a severe allergic reaction that occurs rapidly and can lead to death, and early diagnosis and treatment affect outcomes. However, anaphylaxis is sometimes difficult to differentiate from an asthmatic attack, fainting, anxiety/panic disorder, acute urticaria, and other conditions, and there are no diagnostic criteria about which there is consensus. In clinical practice, clinical diagnostic criteria based on medical interview responses and

characteristic symptoms established by the World Allergy Organization (WAO) are used.¹ However, excluding cases for which there is an obvious time relationship between symptoms and exposure to a causative agent, such as a bee sting or a specific immunotherapy, or when anaphylaxis occurs after exposure to a known allergen for that patient, physicians must currently rely on symptoms alone for diagnosis of anaphylaxis in situations when this information cannot be obtained.

Fractional exhaled nitric oxide (FeNO) concentration, used in assessing airway inflammation in bronchial asthma, is known to be affected by atopic disposition, rhinitis, smoking, and other conditions.^{2–4} Focusing both on the fact that atopic disposition affects FeNO production and that the basic pathology of anaphylaxis is an allergic reaction (immediate allergy) via IgE antibodies, the possible utility of FeNO measurements in anaphylaxis was investigated in this study.

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Table 1
 Characteristics of patients with anaphylaxis whose FeNO were measured both in acute phase and stable phase.

Case	Gender	Age	Allergen	Asthma history	Current treatment for asthma	Current smoking	Serious symptom			Treatment for anaphylaxis		FeNO (ppb)	
							Lower airway symptom	Hypotension	Grade [†]	Adrenaline	Steroid	Acute phase	Stable phase
1	F	50	WDEIA [‡]	–	–	–	+	–	Moderate	–	–	17	19
2	M	62	WDEIA [‡]	–	–	–	–	–	Severe	–	+	24	31
3	F	29	Oral mite [§]	–	–	+	+	–	Moderate	–	–	36	32
4	M	65	Venom	–	–	–	+	+	Severe	+	+	34	54
5	F	31	Soybean or nuts	–	–	–	+	–	Moderate	–	–	16	12
6	F	19	Unknown drug	–	–	–	+	+	Severe	–	+	10	11
7	M	47	Wheat	–	–	–	+	–	Moderate	–	–	63	35
8	M	25	Anisakis	–	–	+	+	–	Moderate	–	+	20	16
9	M	45	NSAID [¶]	–	–	+	+	–	Moderate	+	+	108	43
10	F	34	Nuts	–	–	–	–	–	Mild	–	–	23	18
11	F	63	Shrimp	–	–	–	–	+	Severe	+	+	28	36
12	F	49	Wheat	–	–	–	+	–	Severe	+	+	29	46
13	M	39	Butterbur sprout	–	–	+	+	–	Moderate	+	+	45	22
14	M	58	Bamboo shoot	–	–	–	–	–	Moderate	–	+	35	35
15	M	31	Unknown	–	–	+	+	–	Moderate	–	–	25	29
16	M	45	Anisakis	–	–	–	+	–	Moderate	+	+	20	15
17	F	68	Anisakis	–	–	–	–	+	Severe	–	+	11	11
18	M	40	Egg	–	–	–	+	–	Moderate	+	+	82	49
19	F	36	NSAID	–	–	+	+	–	Moderate	+	+	14	9
20	F	33	Anisakis	–	–	+	–	+	Severe	+	+	14	8
21	F	20	Wheat	–	–	–	+	+	Severe	–	+	21	14
22	F	47	Anisakis	–	–	–	+	–	Moderate	+	+	45	21
23	M	49	NSAID	–	–	–	+	–	Moderate	+	+	56	59
24	F	57	Unknown	–	–	–	–	–	Mild	–	+	17	13
25	F	73	Mushroom	–	–	–	+	–	Moderate	+	+	21	14
26	M	17	Shrimp	–	–	–	+	–	Moderate	+	–	71	69
27	F	54	NSAID	–	–	+	+	–	Moderate	–	+	37	28
28	M	53	Shrimp	–	–	–	–	–	Moderate	–	+	42	32
29	F	41	Buchwheat	–	–	–	–	–	Moderate	+	+	13	17
30	M	33	Apple	–	–	+	+	–	Moderate	+	+	28	22
31	M	37	Soybean	–	–	–	+	–	Moderate	+	+	82	66
32	F	47	Mackerel	–	–	–	+	–	Moderate	–	+	44	23
33	F	25	Unknown	–	–	–	–	–	Moderate	–	–	21	13
34	F	42	Antibiotics	–	–	–	+	–	Moderate	+	+	137	35
35	F	25	Sea urchin	–	–	–	–	–	Severe	+	–	13	16
36	F	55	Shrimp	–	–	–	+	–	Moderate	+	+	37	50
37	M	54	Spirinchus lanceolatus	–	–	–	+	+	Severe	+	+	5	5
38	F	24	Wheat	–	–	–	+	–	Moderate	–	–	63	22.4
39	F	38	Unknown	–	–	–	+	–	Moderate	+	+	16	15
40	M	61	Antibiotics	–	–	–	+	–	Moderate	+	–	26	25
41	F	30	Shrimp	–	–	–	–	–	Mild	+	+	53	101
42	M	21	Nuts	–	–	–	–	–	Mild	+	+	19	17
43	M	42	WDEIA [‡]	–	–	–	+	+	Severe	+	+	58	28
44	F	52	Anisakis	+	FP (200) 4puff	–	+	–	Moderate	–	–	49	52
45	M	43	NSAID	+	FP(250)/SM [#] (25) 2puff	–	+	–	Moderate	–	+	25	34
46	M	41	WDEIA [‡]	+	No	+	+	+	Severe	–	+	15	26
47	F	47	Shrimp	+	BUD(160)/FM ^{††} (4.5) 2puff	–	–	+	Severe	+	+	23	22
48	F	21	Spawn	+	No	+	–	+	Severe	+	+	42	117
49	F	36	Tuna	+	No	+	+	–	Moderate	+	+	30	14
50	F	34	Supplement drug	+	No	+	–	+	Severe	+	+	31	34
51	F	78	NSAID	+	BDP ^{†††} (100) 2puff	–	+	+	Severe	–	+	37	26
52	M	17	WDEIA [‡] or tomato	+	no	–	+	+	Severe	+	+	115	183

[†] Based on reference 6.

[‡] Wheat dependent exercise induced anaphylaxis.

[§] Mite-contaminated foods.

[¶] Non-steroidal anti-inflammatory drug.

^{||} Fluticasone propionate.

[#] Salmeterol.

^{††} Formoterol.

^{†††} Beclomethasone.

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