

Short communication

Emotion with tears decreases allergic responses to latex in atopic eczema patients with latex allergy

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Abstract

Objective: Allergic responses are enhanced by stress, whereas they are reduced by laughter in atopic eczema patients. Emotion with tears decreases plasma IL-6 levels in patients with rheumatoid arthritis. Thus, the effect of emotion with tears on allergic responses in patients with atopic eczema was studied. **Methods:** Sixty patients with atopic eczema having latex allergy viewed both the weather information video and the heart-warming movie, *Kramer vs. Kramer*. Just before and immediately after viewing each video, allergic responses to latex were

measured. **Results:** Viewing the weather information video did not cause emotion with tears in any patients, and it failed to modulate allergic responses. In contrast, viewing *Kramer vs. Kramer* caused emotion with tears in 44 of 60 patients, and it reduced allergic skin wheal responses to latex and latex-specific IgE production in them. **Conclusion:** Emotion with tears reduced allergic responses, and it may be useful in the treatment of allergic diseases.

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Keywords: Emotion with tears; Latex allergy; Atopic eczema; Skin prick test; Latex-specific IgE production; Th1 and Th2 cytokine

Introduction

Allergic responses are enhanced by stress, whereas they are reduced by laughter in atopic eczema patients [1,2]. On the other hand, patients with breast cancer who habitually suppress anger have higher serum IgA levels [3]. Pleasant feeling induced by watching a comical video enhances free radical-scavenging capacity in the saliva of normal subjects [4]. Deep emotion with tears decreases plasma IL-6 levels and CD4/CD8 ratios of peripheral blood in patients with rheumatoid arthritis [5]. These findings prompted me to study the effect of emotion with tears on allergic responses in patients with atopic eczema (AE).

Methods

Subjects

After obtaining informed written consent, 60 mild AE patients [mean SCORAD index 9 (95% CI 7–11)] (30 women and 30 men; mean, 27 years; range, 21–30 years) with latex allergy were studied [6]. Atopic eczema patients were treated with application of a mixture of pinetar (Yoshida Pharmaceutical, Tokyo, Japan) and zinc oxide ointment, but without oral medication [7]. Atopic eczema patients with latex allergy were recruited by advertisement at our hospital, and all of AE patients were allergic to latex as confirmed by positive skin prick test to latex and serum latex-specific IgE (mean $\pm$ S.E.M., 36.8 ± 2.1 IU/ml).

Study design

The study was conducted by cross-over style. Thirty randomly assigned patients first viewed the 105-min weather information video, and after 2 weeks they viewed

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the movie *Kramer vs. Kramer*, the 105-min heart-warming movie directed by Robert Benton. Just before and immediately after viewing each video, skin prick test was conducted to determine allergic responses to latex or histamine, and, simultaneously, mononuclear cells from blood were separated [1]. Mononuclear cells were cultured ($4 \times 10^4/0.2$ ml per well) with 0.1 ng/ml latex allergen (C-serum, kindly provided by Dr. Akira Akasawa, Department of Allergy and Immunology, National Research Institute for Child Health and Development, Tokyo, Japan) [1]. After 14 days of culture, latex-specific IgE production was determined by ELISA, whereas after 5 days of culture, production of IL-4, IL-10, IL-12, IL-13, and IFN- γ was determined by ELISA (R&D Systems, Minneapolis, MN) [1]. Statistical analysis was performed with Wilcoxon signed-rank test. This study was approved by the Ethical Committee of Satou Hospital.

Results and discussion

As shown in Table 1, after viewing the weather information video, none of the AE patients was moved to tears. Thus, all of 60 AE patients were classified as “no tears” after viewing the weather information video. Viewing the weather information video had no effect on skin wheal responses induced by latex or histamine, or on latex-induced Ig and cytokine production. In contrast, after viewing *Kramer vs. Kramer*, 44 AE patients were moved to tears,

whereas 16 AE patients were not. To confirm emotion, patients were asked by questionnaire about their feeling after viewing *Kramer vs. Kramer* whether the movie was dull or touching. Upon questioning, 16 AE patients without tears felt that the movie was dull, whereas 44 AE patients with tears felt that the movie was touching.

In 16 AE patients without tears, viewing *Kramer vs. Kramer* had no effect on latex- or histamine-induced skin wheal responses or on latex-induced Ig and cytokine production. In contrast, in 44 AE patients with tears, viewing *Kramer vs. Kramer* significantly reduced latex-induced skin wheal responses and latex-specific IgE production. This was allergen and IgE-specific, since neither histamine-induced wheal responses nor latex-specific IgG4 or IgA1 production was changed.

The profiles of 16 AE patients without tears and those of 44 AE patients with tears were compared. The skin symptoms assessed by SCORAD index (mean, 95% CI), serum total IgE levels (mean $\pm$ S.E.M.), and serum latex-specific IgE levels (mean $\pm$ S.E.M.) were 9 (7–11), 1426 ± 205 IU/ml, and 36.3 ± 1.9 IU/ml in 16 AE patients without tears, respectively, and 9 (7–11), 1512 ± 94 IU/ml and 37.6 ± 1.6 IU/ml in 44 AE patients with tears, respectively. Thus, there was no difference between these two groups.

Allergen-specific IgE production was dependent on the balance of Th1 cytokine (IFN- γ and IL-12) and Th2 cytokine (IL-4, IL-10, IL-13) [1,8]. In 44 AE patients with tears, viewing *Kramer vs. Kramer* increased the production

Table 1
Effect of emotion with tears on allergic and immunological responses

	Wheal response, and Ig and cytokine production					
	Weather information video		<i>Kramer vs. Kramer</i> video			
	No tears ($n=60$)		No tears ($n=16$)		Emotion with tears ($n=44$)	
	Before	After	Before	After	Before	After
(A) Skin wheal response (mm)						
Latex	8.5 (7.5–9.5)	8.8 (7.8–9.8)	8.2 (7.3–9.6)	8.0 (7.2–8.8)	8.6 (7.6–9.6)	5.0 (4.2–5.8)*
Histamine	7.4 (6.6–8.2)	7.6 (6.8–8.4)	7.0 (6.0–8.0)	7.2 (6.1–8.3)	7.3 (6.4–8.2)	7.9 (6.9–8.9)
(B) Latex-specific immunoglobulin (ng/ml)						
IgE	3.5 (2.9–4.1)	3.7 (3.1–4.3)	3.9 (3.3–4.5)	3.6 (3.0–4.2)	3.9 (3.3–4.5)	1.8 (1.6–2.0)*
IgG4	2.6 (2.1–3.1)	2.2 (1.7–2.7)	2.5 (2.1–2.9)	2.2 (1.8–2.6)	2.5 (2.1–2.9)	2.8 (2.3–3.1)
IgA1	1.6 (1.4–1.8)	1.4 (1.2–1.6)	1.2 (1.0–1.4)	1.3 (1.1–1.5)	1.2 (1.0–1.4)	1.5 (1.3–1.7)
(C) Cytokine (pg/ml) $\times 10^{-2}$						
IFN- γ	1.3 (1.2–1.4)	1.4 (1.3–1.4)	1.1 (1.0–1.2)	1.3 (1.2–1.4)	1.2 (1.1–1.3)	2.2 (2.0–2.4)**
IL-12	1.2 (1.1–1.3)	1.3 (1.2–1.4)	1.0 (0.9–1.1)	1.0 (0.9–1.1)	1.1 (1.0–1.2)	2.1 (1.9–2.3)**
IL-4	2.8 (2.6–3.1)	3.0 (2.7–3.3)	2.9 (2.7–3.1)	3.2 (2.9–3.5)	3.1 (2.7–3.5)	2.0 (1.9–2.2)*
IL-10	2.7 (2.5–2.9)	2.8 (2.6–3.0)	2.5 (2.3–2.7)	2.6 (2.4–2.8)	2.9 (2.6–3.2)	1.6 (1.5–1.7)*
IL-13	3.2 (2.9–3.4)	3.3 (3.0–3.6)	3.5 (3.2–3.9)	3.3 (3.0–3.6)	3.6 (3.3–3.9)	1.7 (1.6–1.8)*

Patients with atopic dermatitis viewed both the weather information video and the movie *Kramer vs. Kramer*. After viewing the weather information video, none of the 60 patients was moved to tears ($n=60$). In contrast, after viewing *Kramer vs. Kramer*, 16 patients were not moved to tears ($n=16$), whereas 44 patients were moved to tears ($n=44$). After viewing each video, skin prick test to determine allergic responses to latex or histamine was conducted (A), and in vitro production of latex-specific IgE, IgG4, and IgA (B) and cytokine (C) was measured.

Values are median (95% CI).

* Significant decrease ($P < .001$) compared to before.

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of Th1 cytokine (IFN- γ and IL-12), whereas it decreased the production of Th2 cytokine (IL-4, IL-10, and IL-13) (Table 1). Psychological stress skewed cytokine pattern toward Th2 type by decreasing the production of Th1 cytokine (IFN- γ and IL-12) and increasing the production of Th2 cytokine (IL-4, IL-10, and IL-13), and, consequently, it enhanced allergic responses [1,9]. Therefore, it would be tempting to speculate that emotion with tears may induce relaxation, which, in turn, may reduce allergic responses by skewing cytokine pattern toward Th1 type. However, since the half-life of IgE seems to be 2–4 days, sensitized IgE bound to mast cells in the skin in sensitized individuals would be unchanged in the short time of viewing *Kramer vs. Kramer*. Thus, other factors may be involved in the reduction of allergic skin wheal responses. We have previously reported that kissing reduces allergic skin wheal responses together with a concomitant decrease in plasma levels of neurotrophins, such as nerve growth factor [10]. In contrast, stress triggers mast cell degranulation via nerve growth factor and enhances allergic skin wheal responses [11,12]. It is possible that emotion with tears may reduce plasma nerve growth factor, and, consequently, it may reduce allergic skin wheal responses. This possibility is currently under investigation. On the other hand, anxiety and depression increased in the activity of autonomic nervous system and provoked motility alterations through mast cell mediator release due to allergen cross-linking with IgE at the mast cell surface, which, in turn, aggravated symptoms in irritable bowel syndrome [13]. Thus, negative mood may enhance allergic responses, whereas positive mood may reduce allergic responses, and emotion with tears may be regarded as positive mood.

We have also studied the effect of another movie, *Ben-Hur*, directed by William Wyler, on 60 patients with allergic rhinitis having Japanese cedar pollen (JCP) allergy. Viewing *Ben-Hur* induced emotion with tears in 55 of 60 AE patients and reduced skin wheal responses to JCP and reduced JCP-specific IgE production by mononuclear cells in 55 patients with tears, but not in another five patients without tears (manuscript in preparation).

These results indicate that emotion with tears may be helpful in the treatment of allergic diseases.

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