

Food Immediate-contact Hypersensitivity (FICH) and Elimination Diet in Young Children with Atopic Dermatitis

Preliminary results in 107 children

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In atopic dermatitis [AD], not only food consumption, but direct skin-contact too can provoke hypersensitivity reactions. We imitated food immediate-contact hypersensitivity [FICH] to cow's milk, egg, peanut or soy by a skin provocation test. This skin application food test [SAFT] was applied in 91 patients aged up to 5 years and suffering from AD, and in 16 healthy controls (all SAFT-negative). In the SAFT-positive patients ($n=61$), FICH to egg was observed in 72%, to cow's milk in 47%, to peanut in 34% and soy in only 1 patient. SAFT and RAST scores correlated weakly. Nevertheless, many discrepancies between SAFT and RAST results were found. In 20 of the 61 (33%) patients with FICH, a flare-up in AD was noted at SAFT testing. Upon introducing dietary restrictions, AD improved impressively in 9 of 23 patients who could be followed up. FICH is an important symptom in children with AD and food allergy. **Key words:** Atopic dermatitis CADJ, Food, immediate-contact hypersensitivity [FICH]; Skin application food test [SAFT]

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INTRODUCTION

Atopic dermatitis [AD] is a multifactorial, genetically determined disease in children, especially common in infants (1). Food allergens and aeroallergens play an important pathogenetic role (2). In young children, AD is often complicated by acute urticarial flare-ups (3). These immediate reactions can be provoked not only by direct food contact, but also by aeroallergens. The terms in use are immediate-contact reaction (immunologic and non-immunologic) (4), immune-mediated contact urticaria (5), or immediate-contact hypersensitivity (6). Food immediate - contact hypersensitivity [FICH] often presents as urticaria around and in the mouth, and on the hands a few minutes after contact with foods (7). Food proteins easily penetrate the dry atopic skin and mucous membranes (8).

We assume that FICH is IgE mediated (9). After the rapid onset of an urticarial flare-up, one can often observe an eczematous reaction slowly ensue (3). Although the skin, gastrointestinal tract and sometimes the bronchi are involved, the skin is the most common target organ in food allergy [FA] (9).

In FA, non-specific rashes, urticaria and angioedema are well-known symptoms.

Previously, we described a skin provocation test called SAFT ('skin application food test'), based on immunological contact urticaria (7, 10). This test imitates FICH to foods. Here, we present preliminary results of a study in 91 AD patients. The SAFT results were compared with RAST scores.

PATIENTS AND METHODS

Patients

Ninety-one patients with atopic dermatitis [AD] and 16 healthy controls of the identical age-range without skin disease, were investigated. A special project-questionnaire was used. Diagnosis was essentially based on a careful history (taken by APO and by the dietician GL), which is usually typical. Immediate skin contact reactions (urticaria on the face, around the mouth and on hands and angioedema) and food refusal are important clues in the patient's history. Based on this history, medical examination and especially skin provocation (SAFT), two groups, one with FICH ($n=61$) and one without FICH ($n=30$), could be identified. Healthy children tested at a Primary Child Care Institute (R.A.C. Bilo), formed the control group.

Grading (Score) of Atopic Dermatitis

Aggravation or improvement in AD was directly observed or scored using a standard scoring system. We scored the mean AD severity in six different areas of the skin (head/neck, right arm/hand, left arm/hand, trunk, right leg/foot and left leg/foot). This system is convenient in daily practice (see Table I).

Table I. Grading-system of atopic dermatitis

	Head/neck	Right arm/hand	Left arm/hand
Erythema	0 1 2 3	0 1 2 3	0 1 2 3
Scratches	0 1 2 3	0 1 2 3	0 1 2 3
Eczema ^a	0 1 2 3	0 1 2 3	0 1 2 3
Dryness	0 1 2 3	0 1 2 3	0 1 2 3
	Trunk	Right leg/feet	Left leg/feet
Erythema	0 1 2 3	0 1 2 3	0 1 2 3
Scratches	0 1 2 3	0 1 2 3	0 1 2 3
Eczema ^a	0 1 2 3	0 1 2 3	0 1 2 3
Dryness	0 1 2 3	0 1 2 3	0 1 2 3
Eczema	serious 49-72 moderate 25-48 mild 1 -24 not present 0		
Total score: (maximal score = 72)			

^aEczema = more than 2 determinants together.

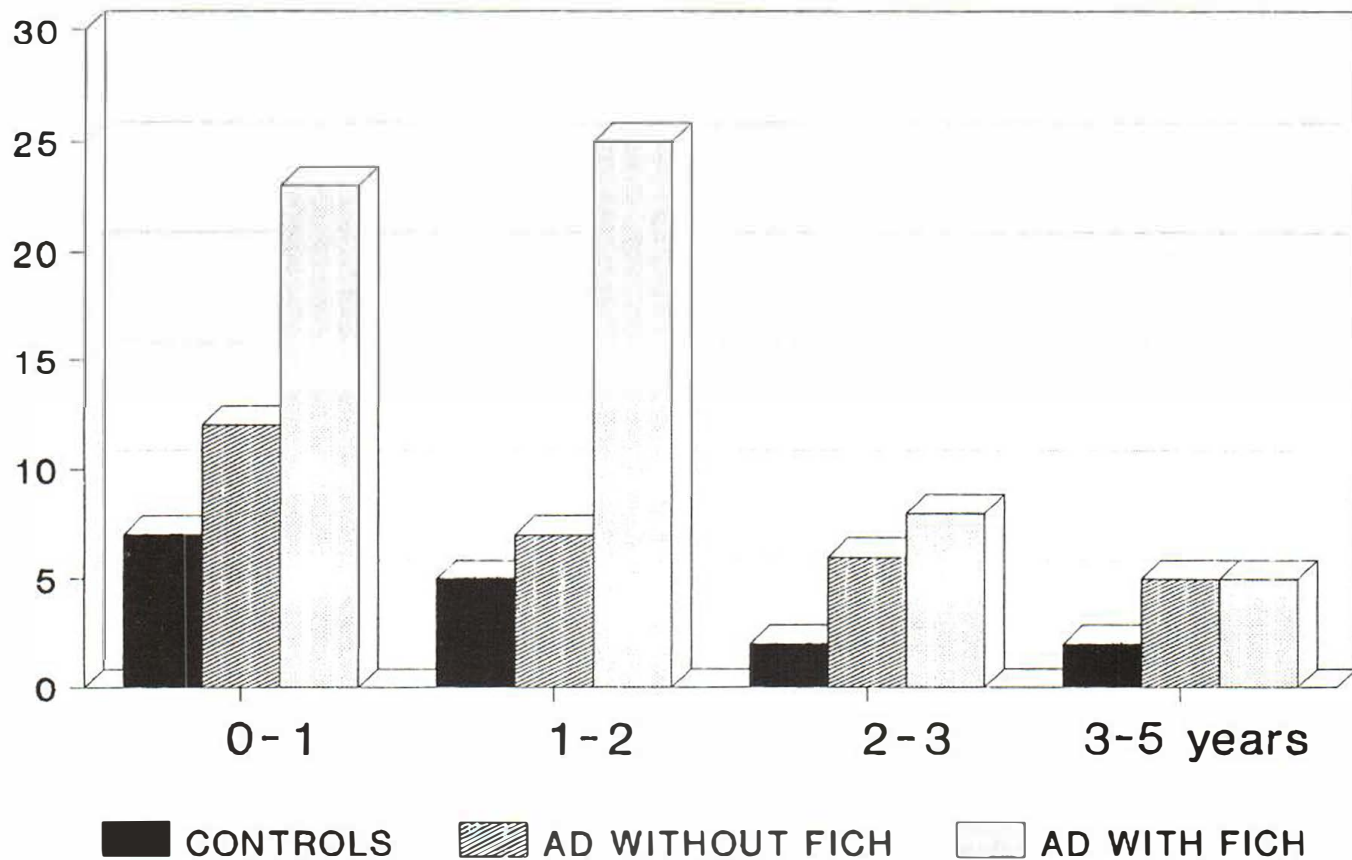


Fig. 1. Age-distribution in the FICH-positive ($n=61$), FICH-negative ($n=30$) and healthy controls ($n=16$).

SAFT (Skin Application Food Test)

The test was performed as described earlier (7, 10). Pieces of gauzes (2 cm²) containing food (allergen) or control liquid were applied to an eczema-free skin area, cleansed of fat (with alcohol). In a few instances, a negative test (to be expected positive) was repeated on eczematous skin and then positive. The gauzes were fixed to the skin with Finn Chamber Scanlon[®], plasters. We used 0.8 ml of buffered-saline as control. As routine test substances, 0.8 ml of cold pasteurized cow's milk (Melkunie[®]), 1 slice (2 g) of boiled egg (egg white), 0.8 ml of soy milk (Nutricia[®]) and a film of highly purified peanut butter (80% peanut, without any other allergens; Gouda's Glorie[®]) were applied to the skin. In most children, the test was also performed with ground peanut in saline, with identical results. In 1 of 67 instances a discrepancy was observed: in one patient, a positive SAFT, using ground peanut, and a negative SAFT using peanut butter, was scored. Other foods were also tested if highly suspected. The patch sites were examined and scored as previously described (10). Scores of 0 and 1+ (only redness) were regarded as negative. The reactions 2+ (redness & oedema) and 3+ (redness & oedema covering 2 cm²) were regarded as positive.

Oral food challenge tests

Patients in whom there were inconsistencies in SAFT, serological tests and symptoms, were challenged orally with food. The oral provocations were conducted in a titrated manner at the daycare ward or in bulk at the Outpatient Department (10).

IgE test procedure

Total IgE was measured using a non-competitive immunoassay (Enzymun-Test IgE, Boehringer Mannheim, Almere, The Netherlands). The RASTs were performed according to the manufacturer's instructions (Pharmacia, Uppsala, Sweden). RAST results were expressed as RAST classes.

Statistical analyses

The Spearman Rank Correlation test was used to compare the scores of the SAFT and the corresponding RAST^{II}. The Mann-Whitney test was used to examine the equality of the means of the total IgE scores in the FICH-positive and FICH-negative groups^{II}.

RESULTS

Clinical characteristics

The patient population aged up to 5 years could be divided into a group with Food Immediate-Contact Hypersensitivity [FICH] ($n=61$), and without FICH ($n=30$). Forty-eight of the 61 (78%) FICH-positive children and 19 of the 30 (63%) FICH-negative children were younger than 2 years (Fig. 1). Food-related symptoms were primarily cutaneous. In these 61 FICH-positive patients, positive SAFTs to one or more foods were observed.

FICH to eggs was observed in 44 (72%), to cow's milk in 29 (47%) and to peanut in 21 (34%) of the 61 FICH-positive patients. FICH to soy was observed in 1 patient and to milk hydrolysate (only if suspected, tested) in 2 patients.

In the 30 FICH-negative children, diet restrictions were not indicated therefore not applied. Or the already used not-indicated diet could be normalized after bulk provocation at the Outpatient Department or by titrated oral provocation at the daycare ward. Only a few of the parents refused to normalize the child's diet. The skin application food tests [SAFT] using cow's milk, egg, peanut and soy proved negative in all 16 healthy controls.

Table II. Comparison of SAFT and RAST scores in 91 children with atopic dermatitis

SAFT (class)	RAST cow's milk, egg and peanut ^a			
	0	1	2	≥3
0-1	92	31	26	14
2	4	8	15	19
3	4	3	18	27

Spearman Rank Correlation Coefficient, $r_s = 0.56, p < 0.001$.
^a Results with soy milk were not included, as there was only 1 positive SAFT.

SAFT, RAST & total IgE

The SAFTs and corresponding RASTs to cow's milk, egg and peanut were compared. The results with soy were not included because there was only one positive SAFT. We observed a significant correlation between SAFT and specific RAST scores, using the Spearman Rank Correlation coefficient ($r_s = 0.56, p < 0.001$). This is illustrated in Table II and Fig. 2. However, there were also many discrepancies between the SAFT and RAST results (Table II). Results were better for concordant scores, if the RAST cut-off point was set at RAST class ≥ 2 instead of ≥ 1 .

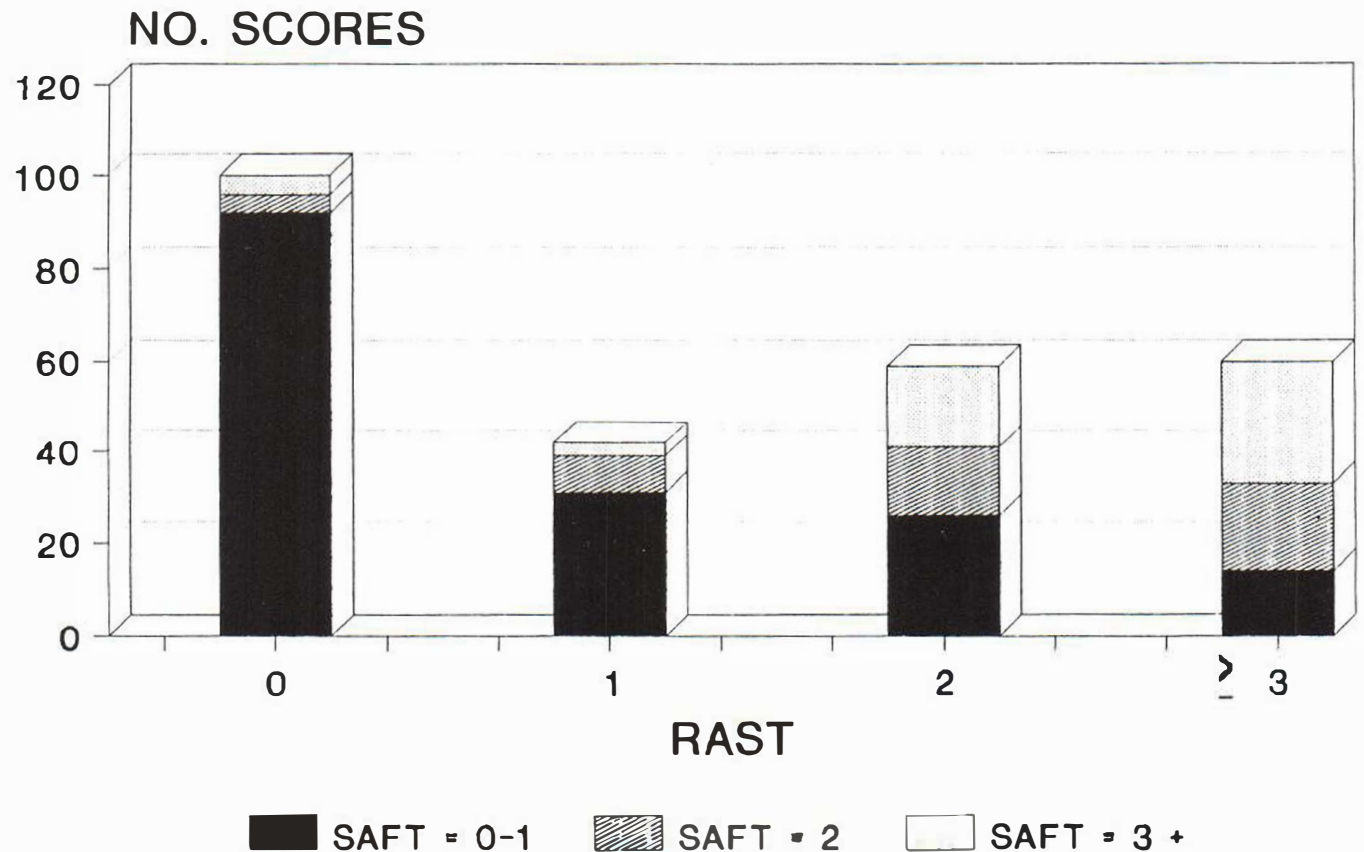


Fig. 2. The scores of the SAFT and corresponding RAST (expressed as RAST classes), plotted against each other in 91 children suffering from atopic dermatitis. SAFT scores are expressed in grades: 0 = no reaction, 1+ = redness (0 and 1+ are negative) / 2+ = redness and oedema, 3+ = redness, oedema, extending outside the patch area. The RAST and SAFT correlated significantly (Spearman rank correlation coefficient $r_s = 0.56, p < 0.001$).

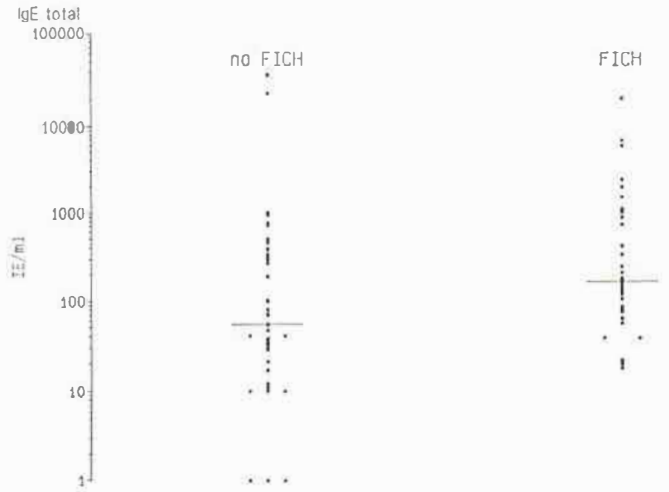


Fig. 3. Total IgE values in FICH-positive ($n=61$) and FICH-negative ($n=30$) groups. The median values are marked (-). Total IgE was significantly higher in the FICH-positive group (Mann-Whitney test, $p=0.002$).

Mean total IgE was significantly higher in the FICH-positive group (Fig. 3). This was calculated using the Mann-Whitney test ($p=0.002$).

SAFT & Flare-ups in Atopic Dermatitis

In 20 of the 61 (33%) FICH-positive patients, a flare-up in AD during or shortly after SAFT testing was noted. In these 61 patients, positive SAFTs to one or more foods were observed. The flare-ups were mostly urticarial. Eczematous or a combination of urticarial and eczematous flare-ups were also sometimes observed.

Dietary influence

After introduction of an elimination diet, AD improved in 14 out of 23 patients that would be followed within 4 months after dietary elimination. The improvement was evaluated according to the scoring system. Dietary elimination led to complete clearance of AD – or made it unnecessary for local specific therapy – in 9 patients.

DISCUSSION

Food immediate-contact hypersensitivity [FICH] is common in young children with atopic dermatitis [AD]. We imitate this symptom in the skin application food test [SAFT]. This test is a variation of the rub test (4, 12), and the open application test (13). In adults, there is an oral allergy syndrome, particularly in individuals allergic to birch which has IgE-binding structures in common with some fruits and vegetables (14). The SAFT-positive children not only suffer from an oral allergy syndrome, but, more likely, from food hypersensitivity too, with the skin as the primary target organ (7, 10). In addition, the results of the SAFT also depend on the permeability of the skin to food allergens. In AD, the permeability is increased. The intensity of food allergic symptoms is determined not only by the IgE system, but also by the release capacity of the mast cells in the target organ and its sensitivity towards mediators, released during the allergic response (9).

Although we assume that the SAFT is a skin provocation test inducing the naturally occurring events of FICH, it is still uncertain that the SAFT is more than a variation of the prick test. The positive, though weak correlation observed between the SAFT and RAST results has also been observed in our previous studies (7, 15). However, we also observed many discrepancies between the RAST and SAFT results. The RAST measures only an atopic immune response, not always indicating clinical atopic symptoms. In the last 5 years we performed about 100 open or coincidental oral challenges, but found only two discrepancies between the SAFT and challenge (7).

In some patients whom we could follow, AD improved upon dietary elimination based on our test results. However, other factors such as local treatment and climate changes could not be excluded. In 9 patients, the response to elimination of foods was impressive. In these children, AD was either completely cleared or no local therapy was required after institution of the diet.

Practical consequences of FICH include adverse skin reactions caused via contamination on hands of one of the parents, by bathing in water containing allergenic bath-oil products (for example wheat oil or incompletely purified peanut oil) or by application of ointments containing cow's milk or egg. Severe reactions, even anaphylaxis, have been reported upon direct skin contact (16). In conclusion, FICH is an important phenomenon in young children with AD. The diagnosis of FICH can easily be established using the skin application food test [SAFT].

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