ORIGINAL ARTICLE

THE ROLE OF ATOPY PATCH TEST IN DIAGNOSIS OF FOOD ALLERGY IN ATOPIC ECZEMA/DERMATITIS SYNDROM IN PATIENTS OVER 14 YEARS OF AGE

Jarmila Čelakovská[1], Jaroslava Vaněčková[1], Květuše Ettlerová[2], Karel Ettler[1], Josef Bukač[3]

Charles University in Prague, Faculty of Medicine and University Hospital Hradec Králové, Czech Republic: Department of Dermatology and Venereology[1], Department of Medical Biophysic[3]; Department of Allergy and Clinical Immunology, Outpatient Clinic, Hradec Králové, Czech Republic[2]

***Summary*:** Few studies concerning the importance of food allergy in adolescents and adult patients with atopic eczema exist. The atopy patch tests with food have mostly been studied in infants and children since food allergy plays a role especially in this age group. *Aim:* The evaluation of the contribution of atopy patch tests in the diagnostic work-up of food allergy (to wheat, cow milk, peanuts, soya and eggs) in the patients with atopic eczema older than 14 years of age. *Method:* 120 patients were examined in the study in the diagnostic work-up of food allergy – 86 women and 34 men, the mean age 26.5 (s.d. 9.8) and the median SCORAD at the beginning of the study 32.9 (s.d. 14.0). Complete dermatological and allergological examinations in the diagnostic work-up of food allergy were performed (assessment of personal history, assessment of serum specific IgE, skin prick tests, atopy patch tests, diagnostic hypoallergenic diet, food challenge tests with egg, soy, wheat, cow milk and double – blind, placebo – controlled food challenge test with cow milk and wheat. The results of atopy patch tests were compared with the results of other diagnostic methods in the diagnosis of food allergy. *Results:* The food allergy to cow milk and wheat was confirmed in double – blind, placebo controlled food challenge test in few patients in our study (4 %). The suspicion of food allergy to egg is in 8 %, to peanuts in 13 % and to soya in 4 % of patients in our study. The assessment of atopy patch tests response seems to be of great importance. The reaction in atopy patch tests with more papules has the greatest diagnostic accuracy for predicting the result of challenge tests. At the beginning and at the end of diagnostic hypoallergenic diet the severity of atopic eczema/dermatitis syndrome was recorded in all patients enrolled in the study by evaluating SCORAD. The decrease of SCORAD was statistically important. *Conclusion:* Atopy patch tests alone cannot be used as a single test for the determination of food allergy in patients with atopic eczema/dermatitis syndrome but such a test, together with other diagnostic methods, can help to trace the food allergy.

***Key words**: Atopic eczema/dermatitis syndrome; Food allergy; Atopy patch tests; Open exposure test; Double – blind, placebo – controlled food challenge tests*

Introduction

Food allergy is now recognized as a worldwide problem in westernized nations, and like other atopic disorders, it appears to be on the increase (20). Food allergy is an adverse immunologic reaction, a number of IgE-, cellular-, and mixed IgE- and cell-mediated food hypersensitivity disorders have been described.

In atopic eczema/dermatitis syndrome (AE/DS), allergen – specific IgE antibody – bound Langerhans's cells play a unique role as nontraditional receptors (2). Ingestion of specific foods in patients with food allergy has been shown to provoke a markedly pruritic, erythematous, morbiliform rash. A murine model of food – induced atopic dermatitis has been reported (8).

The importance of food allergy in children with AE/DS is confirmed by extensive studies (19). Foods, such as cow's milk or hen's egg, can directly cause flares of AE/DS, particularly in sensitized infants to 3 years of age with atopic dermatitis (19). 80 % of them outgrow their food allergy. Inhaled allergens and pollen related foods are of greater importance in older children and adults.

The role of food allergy remains controversial in older children and adult patients suffering from AE/DS, few studies concerning the food allergy in this group of patients are available. Diagnosis of food allergy is based on personal history, measurement of specific IgE (serum specific IgE level, skin prick tests – SPT), atopy patch tests (APT), challenge tests (open exposure test – OET), double – blind, placebo controlled food challenge test – DBPCFC). DBPCFC

with the use of the lyophylized food and placebo (glucose) in gelatine capsules always remains the gold standard in the diagnosis of food allergy.

The atopy patch test has received much interest in recent years as a model for studying the pathomechanism of atopic dermatitis and as a complementary test for diagnosis of protein allergens causing or maintaining AE/DS by airborne contact or by food (11). The first paper dealing with patch testing with foods dates from 1989 and describes a now discontinued commercial test DIMSOFT used since 1980 (3). Subsequently, a number of authors studied the APT with foods in AE/DS. Challenge – proven food allergy without systemic specific IgE has been diagnosed in children by several investigators and the APT has been positive in some of those patients (12, 13, 14, 15). Isolauri and Turjanmaa (7) found a very good correlation between positive patch test results and late reaction to food allergen in children. For daily clinical practice, however, the APT adds little to the predictive value of standard SPT and IgE measurement in the diagnosis of suspected food – related symptoms (10).

A general problem is that an APT with food have mostly been studied in infants and children since food allergy plays a role in this age group.

There are several aspects of APT that deserve further investigation to achieve a better standardization.

Aim of the study

The evaluation of the occurence of food allergy (to wheat, cow milk, peanuts, soya and egg) and the assessment of the importance of atopy patch tests for the diagnostic approach of food allergy in patients with atopic eczema older than 14 years of age.

Method

All patients (230) over 14 years of age with AE/DS (as defined by the criteria of Sampson and Seymour and modified by the method of Hanifin and Rajka) examined at the Department of Dermatology at the Faculty Hospital in Hradec Králové (Czech Republic) from January 2005 till February 2008 completed a questionnaire dealing with the severity of AE/DS and focused on suspected food allergy.

Inclusion criteria for the study: age 14 years and over, moderate and severe form of AE/DS, mild form of AE/DS with suspicion to food allergy or with suspicion to adverse food reactions. From 230 patients who completed the questionnaire, 54 patients were not enrolled into the study – they suffered from mild form of atopic eczema and had no suspicion of food allergy, 56 patients fullfilled the conditions for the study and were informed about this study, but they have not finished the diagnostic work – up of food allergy yet.

Altogether 120 persons were included into the study according to determined conditions in the period from January 2005 till February 2008: 86 women and 34 men entered the study with the mean age 26.5 (s.d. 9.8; min. age 14 years and max. age 54 years) and with the median SCORAD 32.9, s.d. 14.0 at the beginning of the study.

All patients included in this study were examined in the diagnostic work-up of food allergy (personal history, measurement of specific serum IgE level, skin prick tests, atopy patch tests, challenge tests after the diagnostic hypoallergenic elimination diet).

Discontinuation of an treatment with antihistamines and topical steroids for at least 5 days before the APT, SPT, OET and DBPCFC was recommended. Treatment with systemic steroids, UV therapy and topical immunomodulatory was not allowed at least 2 months before these tests.

All patients included into the study signed an informed consent form with all the performed tests in diagnostic work-up of food allergy (including the challenge test after the diagnostic hypoallergenic diet).

Tested food allergens

The most frequent food allergens were used in the testing procedure: white of egg, yolk, cow milk, wheat, soya and peanuts.

Scoring of AE/DS

Severity of eczema was scored according to the SCORAD score, with the assessment of topography items (affected skin area), intensity criteria (extent of erythema, oedema, crusts, excoriations, lichenification, xerosis), and subjective parameters (extent of itch and loss of sleep). The severity of AE/DS was evaluated by the SCORAD system at the beginning of the study (SCORAD I) and at the end of the specific hypoallergenic diet before the exposure test (SCORAD II).

Skin prick test and specific IgE

Commercial food extracts Alyostal (Stallergens, France) were used for skin prick tests (SPT).

SPTs were placed on the volar side of the forearm or on the back according to the extent of AE/DS. SPTs were carried out by a standardized method using lancets with a 1 mm tip. The results were read after 15 minutes and were assessed by comparison with the wheal induced by histamine (10 mg/ml) and negative control. A wheal with diameter greater than 3 mm in comparison with negative control was scored as positive.

The serum level of the specific IgE to the tested foods has been measured with the method of FEIA (Pharmacia CAP system, Uppsala, Sweden). The level of specific IgE higher than 0.35 kU/l was assessed as positive.

Atopy patch test

Atopy patch tests were performed on non – lesional, non – abraded, untreated skin of the back during a remission.

A technique similar to conventional patch tests was used by performing atopy patch testing – CURATEST (Lohmann Rauscher International GmbH Co. Germany) test

with a 12 mm large cup size. After discontinuation of antihistamines and topical steroids for at least 5 days and systemic steroids and UV phototherapy for at least 2 months, the atopy patch tests with native foods (egg's white, yolk, cow's milk, wheat, soy, peanuts) have been applied. Wheat powder and soy powder were used with vehicle – distillated water (1g of wheat powder or soya powder in 10 ml of distillated water), egg's white, yolk, cow's milk and peanuts were used in the native form as the fresh foods without any dilution. Single vehicle (distillated water) has been used as a negative control. The occlusion time of atopy patch test was 48 hours, the first results were evaluated 30 min after the removal of the tests and the second results were analysed 72 hours after the application of the tests.

Grading of positive APT reactions was according to the reccomendation of the European task Force on Atopic Dermatitis (EFTAD) Consensus Meetings (4):

? erythema
+ erythema, infiltration
++ erythema, infiltration, papules (up to 3)
+++ erythema, papules from 4 to many
++++ erythema, many or spreading papules
+++++ erythema, vesicles.

Test application and reading were performed by an investigator without the knowledge of the patients's history. Only reactions from + (erythema, infiltration) onwards were designated positive.

The skin reactions in the tests have been recorded by a camera.

We examined 30 nonatopic healthy individuals (they signed up the informed consent with the study) as a control group to perform the APT (20 women, 10 men, the average age 22,6)

The diagnostic hypoallergenic diet

The diagnostic hypoallergenic diet was introduced following the patient's informed consent. In the period of 2–3 weeks patients eliminated wheat, milk, and other suspected food allergens depending on the anamnestical data and results of our previous examinations (SPT, APT, and specific IgE in serum). Patients recorded the symptoms of AE/DS (the extent of involved skin, itching, sleeplessness) and other potential health problems in special tables. The severity of AE/DS was evaluated by the SCORAD system at the beginning of the study and then at the beginning and at the end of the specific hypoallergenic diet before open exposure test.

Open exposure test

Immediately after the elimination diet open exposure tests (OET) were performed, the patients consumed the food in the same form and dose. Open exposure tests with cow milk and wheat flour were performed in all enrolled patients. Other foods were tested when anamnesis and/or results of specific IgE (SPT, serum IgE) and/or APT were suspected for food allergy. Peanuts have not been tested in any challenge test because of the anaphylactic reaction danger. Open exposure test with soy and egg was performed only in patients without anamnestical suspicion of early reactions to these foods and under the conditions that these patients don't suffer from asthma bronchiale.

OET took two days; the first day the patient consumed the food at 8:00 a.m., the reaction was observed and in the case of no response the second dose of food was consumed at 18:00. If no response resulted, the last dose challenge was administered the following day at 8:00 a.m. The patient also recorded the reaction during 48 hours after the last dose. If the patient never had the allergic reaction with the severe anaphylactic reaction, was suffering only from AE/DS and the tested food was commonly in his meal before the diet, he performed the test in the home setting. The patients observed and recorded at home setting all the reactions during OET. If the patient suffered from asthma or experienced severe allergic reaction in his personal history, the test was carried out under a medical supervision. The food challenge results were scored as positive if one or more of the following objective and subjective clinical reactions were noted: erythema, urticaria, angioedema, vomiting, wheezing, abdominal pain, pruritus, or worsening of AE/DS. Early reactions were defined as clinical symptoms within 2 hours after administering the dose in OET and late symptoms if occurring after more than 2 hours. Combined reactions were added to late – phase reactions.

If the open food challenge was negative, the patient put the food back to the common meal.

The severity of atopic eczema was evaluated during the average daily intake of food over a period of three months.

In case that physician or the patient recorded worsening of the AE/DS or some other reactions during the test with cow milk or wheat, the diagnosis of the food allergy to wheat or cow milk have been defined with more precision by a double – blind, placebo controlled exposure test (DBPCFC). DBPCFC with the use of the lyophylized food and placebo (glucose) in gelatine capsules was performed. Lyophilized cow milk and wheat flour were inclosed in opaque capsules. One capsule contained 250 mg of dried food. Three doses of capsules (31 capsules are in one dose) were administered with the same timing as in the open challenge test. In all patients there was 23.25 g of food administered in one test. We administered one placebo test per one food test. The first dose of DBPCFC was administered under the supervision of a medical doctor on an empty stomach gradually 1, 2, 4, 8, 16 capsules with 15minute intervals. The second and the third dose were served in a home setting. An early (two hours after the first dose) and the later reaction were observed. The diagnosis of food allergy was confirmed if challenge with food was positive and negative with the placebo. The patient continued in the elimination diet if DBPCFC was positive. If the test was negative the tolerance of the food in diet was proved.

If the patient refused the DBPCFC, the cow milk and wheat allergy was assessed on the basis of positive OET and

positive specific IgE (SPT and/or serum specific IgE) and/or APT and improvement of AE/DS after the elimination of this food from diet.

The diagnosis of food allergy to egg, peanuts and soy was assessed on the basis of anamnestical suspicion or positive OET and positive specific IgE (serum specific IgE, SPT) without performing the DBPCFC. The patients with the suspicion of the food allergy to egg, soy or peanuts according of our results eliminated these foods from common meal and the severity of atopic eczema was evaluated every three months in the period of 1–2 years.

Statistics – methods

Fisher's exact test was used for the evaluation of the importance of the diagnostic method in diagnostic work – up of food allergy with regard to the results of DBPCFC with cow milk and wheat flour. Specificity and sensitivity of APT was evaluated.

The severity of AE/DS was recorded by evaluating SCORAD – the difference between SCORAD I (at the beginning of the study before the elimination diet) and SCORAD II (in the end of the elimination diet) was evaluated with Wilcoxon Paired Rank test.

Results

Of these 120 patients, 35 (29 %) expressed specific IgE to one or more of six tested allergens – in 60 reactions. Positive SPT reactions were found in 51 patients (42 %) to one or more of the six tested allergens – in 92 reactions. Positive results of APT were found in 12 patients (10 %) – in 24 reactions. Positive result in DBPCFC with milk was recorded in one patient and in five patients with wheat. The frequencies of positive results of tested food in our group of patients and number of patients with suspected food allergy to egg, soy and peanuts is demonstrated in Tab. 1.

We performed open exposure tests with cow milk and wheat in all 120 patients and the results were compared with the results of skin prick test, spec. IgE, and APT.

From 13 positive OETs on wheat, the DBPCFC confirmed allergy on wheat so far in five patients, in seven contradicted and in one case the DBPCFC was not done because of pregnancy – this patient (with APT positive result ++) introduced wheat in diet and she has not recorded the worsening of atopic eczema. From 8 positive OETs on cow milk the allergy in DBPCFC was confirmed in 1 case, in 4 cases contradicted, in 1 case DBPCFC was not performed because of oral allergic syndrome, 1 patient refused and 1 case was described as intolerance of gelatin capsules (this patient has positive APT + for milk, she described nausea during swallowing the capsules, she eliminates milk for nausea, but she tolerates the milk products). Food allergy to cow milk was confirmed in one patient, but APT was negative. Food allergy to wheat flour was confirmed in five patients, but APTs were negative in them. There is suspicion of food allergy to egg in 10 patients, in two of them the

Tab. 1: The number of positive reactions to tested foods in performed examinations of 120 patients enrolled in the study.

Food	APT	Skin prick tests	Spec. IgE	OET (from 120 patients)	Personal history	DBPCFC	Food allergy in patients – % from 120 /positive APT reactions from these patients
Soy	6	24	3	1	4	–	5–4 % (3)
Peanut	6	25	14	–	16	–	16–13 % (4)
Cow's milk	3	6	9	8 (confirmed 1x DBPCFC)	14	1 1x intol.*	1– 0,8 % (0)
Wheat	4	12	6	13 (confirmed 5x DBPCFC)	5	5	5–4 % (0)
Egg yolk	3	11	13	9	9	–	9–7,5 %(2)
Egg white	2	14	15	10	9	–	10–8 % (2)

APT: Atopy patch test, OET: Open exposure test, DBPCFC: Double – blind, placebo – controlled food challenge, * 1x intol.: intoleration of gelatine capsules during the DBPCFC in patient with APT positive result to cow milk, but this patient tolerates milk products.

Tab. 2: The reactions in atopy patch tests with tested food allergens (wheat, cow's milk, soy, egg white, egg yolk, peanuts) in 120 examined patients.

Number of patients, number of reactions	The APT reactions	Food allergy	The APT result evaluated according to EFTAD
10 in 16 reactions	erythema	Not confirmed	Negative
12 in 24 reactions	11x erythema, infiltration,	Not confirmed	Positive +
	8x erythema, infiltration, papules up to 3	5x suspected food allergy	Positive ++
	5x erythema, infiltration, papules from 4 to many	5x confirmed (oral allergic syndrome, positive OET)	Positive +++

APTs are positive to egg (APT reactions evaluated as ++ and +++). In 16 patients there was suspicion of food allergy to peanut, APTs were positive in four of them (APT reactions evaluated as ++,+++). Suspicion to food allergy to soya was in five patients and APTs were positive in three of them (APT reaction evaluated as ++,+++).

The occurence of various reactions in atopy patch tests with tested food allergens according to EFTAD (wheat, cow milk, soy, white, yolk, peanuts) and the comparison with the occurence of food allergy in 120 examined patients is summarised in Tab. 2.

The food allergy in patients with the positive reaction in atopy patch tests evaluated as erythema and infiltration (+) was not confirmed in eleven cases. The food allergy in patients with the reaction in APT evaluated as erythema, infiltration, papules up to 3 (++) was confirmed in five

Tab. 3: Positive reactions in atopy patch tests (APT) in 12 patients (from 120) in comparison with other performed examinations.

Pacient	Personal history	APT	Spec. IgE	SPT	OET	DBPCFC	Food allergy
H.J. ♂ 23	soy + (OAS)	soy +++	soy +	soy +	soy n.d.	n.d.	soy
K.I. ♀ 19	– – – –	peanut++ – – –	– – – –	– – yolk + white +	peanut n.d. – – –	n.d.	–
K.J. ♀ 25	– – cow milk + (nausea)	peanut + cow milk + wheat +	– – – – –	– – – – –	peanut n.d. – cow milk + – wheat –	intolerance of gelatin capsules	– nausea – cow milk
P.L. ♀ 20	– –	yolk ++ white ++	– –	– –	yolk + white +	n.d.	yolk white
M.M. ♀ 27	soy + peanut + (OAS)	soy ++ peanut ++ wheat ++	– –	soy + peanut +	soy n.d. peanut n.d. wheat +	n.d. pregnant	soy peanut wheat not confirmed
V.J. ♀ 16	soy + peanut + (OAS) –	soy +++ peanut ++ cow milk + – yolk ++	 peanut + cow milk + wheat + –	soy + peanut + – – – –	soy n.d., peanut n.d. cow milk – wheat + yolk –	wheat +	soy peanut wheat
L.J. ♀ 24	–	yolk +++ –	– –	– –	yolk + white +	n.d.	yolk white
D.B. ♀ 18	– cow milk +	soy + cow milk +	– –	– –	soy – cow milk –	n.d.	–
P.M. ♂ 23	peanut + (OAS)	peanut +++	–	–	peanut n.d.	n.d.	peanut
T. A. ♀ 25	– – –	soy + wheat + white +	– – –	– – –	soy – wheat – white –	n.d.	–
Š.I. ♀ 27	peanut + (OAS)	– wheat + soy +	peanut+ – –	– wheat + –	– wheat – soy –	n.d.	peanut
S.J. ♀ 54	peanut + (OAS)	peanut +++	– – –	– yolk + white+	peanut n.d.	n.d.	peanut

SPT: skin prick test, OET: open exposure test, DBPCFC: double – blind, placebo controlled food challenge test, OAS: Oral allergic syndrome to examined food in personal history, n.d.: not done, white: egg white, yolk: egg yolk

reactions from eight reactions. The food allergy in all patients with the reaction in APT evaluated as erythema, infiltration and more papules (+++) was confirmed.

The patients with positive reactions in atopy patch tests according to EFTAD and the comparison with other performed examinations are demonstrated in Tab. 3.

The questionable reactions in APTs with native food (only erythema) were described in other 10 patients. In comparison with anamnesis, specific IgE, SPTs, and OET were these reactions concluded as negative – Tab. 2.

In 30 non – atopic healthy individuals (20 women and 10 men, the average age od 22.6 years) as a control group, we performed the APTs in the same design as in examined patients, we recorded erythema to milk in one subject patient, no other reactions were recorded.

During performing APT, the reaction to aqueous solution (negative control) as erythema was recorded in 1 patient from 120 patients (0.8 %). Adverse effect such irritation from adhesives was recorded in 1 patient (0.8 %), local itching without erythema and other reactions were recorded in three patients (2.5 %). No other adverse effects were recorded.

Irritative reactions in performing APT were recorded in six patients (5 %). This reaction was recorded as erythema and infiltration in all tested areas including in the area with negative control; decrescendo fenomena was recorded.

The diagnostic hypoallergenic diet (which always preceded the exposure test) was completed in 120 patients. During the course of such diet, improving in the severity of AE/DS was recorded by evaluating SCORAD (Tab. 4).

Tab. 4: Assessment of the severity of AE/DS (SCORAD) in the beginning of diet (SCORAD I) and at the end of the diagnostic hypoallergenic elimination diet before the open exposure test (SCORAD II).

Number of patients	Scorad I	Scorad II
120	31.32±13.6	23.57±9.99

Statistics – results

Statistical calculation proved the high specificity in APT – from 30 health individuals examined with APT, we recorded in one subject erythema to milk, no other reactions were recorded. Specificity of APT is calculated to 100 %. As a single parameter, the APTs showed the best specificity compared with specific IgE measurements, SPTs, or both.

The sensitivity of APT was low (0.1). We suppose, that the calculation of sensitivity of APT has no reason, because of low number of really confirmed food allergy (we suggest as really confirmed food allergy the patients with positive DBPCFC). The sensitivity varies in APT from 0.18 to 0.89 in different studies (23).

As for cow milk, relation was found only between results of SPTs with confirmed food allergy in DBPCFC, but no relation was found between results of specific IgE, APT and history with DBPCFC.

As for wheat flour, relation was found only between results of specific IgE with confirmed food allergy, but no relation was found between results of SPTs, APTs and history with really confirmed food allergy in DBPCFC.

In the course of specific diagnostic hypoallergenic diet, improvement in the severity of AE/DS was recorded by evaluating SCORAD.

Discussion

In our study the food allergy to cow milk and wheat was confirmed in DBPCFC in few patients (4 %). Early reactions (pruritus, flash) and late reactions (exacerbation of atopic eczema) were recorded in the patient with allergy to cow milk. In patients with confirmed food allergy to wheat flour, early reactions – erythema, papules around the mouth, asthma and late reactions as the worsening of atopic eczema were recorded.

The suspicion of food allergy to egg is in 8 %, to peanuts in 13 % and to soya in 4 % of patients in our study. Patients with the suspicion of food allergy to peanuts described oral allergic syndrome as early reactions after the ingestion of peanuts in their history, open exposure test was not done because of anaphylactic reaction danger in these patients. Early reactions (pruritus, oral allergic syndrome, erythema) and late reactions (new eczematic lesions) were described in patients during open exposure tests with egg. Early reactions (oral allergic syndrome, erythema, pruritus) were recorded in all patients with suspected food allergy to soya.

Children with atopic disorders tend to have a higher prevalence of food allergy; about 35 % of children with moderate to severe atopic dermatitis have IgE mediated food allergy (5) and about 6 % – 8 % of asthmatic children have food – induced wheezing (16). But 80 % of them outgrow their food allergy. Inhaled allergens and pollen related foods are of greater importance in older children and adults. Adolescents and adults with AE/DS also react to foods, but reaction to classical food allergens such as hen's eggs and cow's milk are not as common as in childhood and pollen – related foods are of greater importance in them (24). In one study about 45 % of adult patients with atopic eczema dermatitis syndrome and birch pollen allergy were found to have worsening of their eczema within 48 hours of ingesting Bet v 1- containing foods, even in the absence of noticeable immediate oral symptoms (17).

The evaluation of food allergy begins with a thorough historical and physical examination. The history should determine the possible causal food, quantitity ingested, time course of reaction, and other factors (exercise, aspirin, alcohol).

For IgE – mediated disorders, skin prick tests provide a rapid means to detect sensitization. However, a positive tests response does not necessarily prove that the food is casual. Negative SPT responses usually confirm the absence of IgE – mediated allergic reactivity. A positive SPT response might be considered confirmatory when combined with

a recent and clear history of a food – induced allergic reaction to the tested food (22). Serum tests determining food – specific IgE antibodies (CAP System) provide another modality to evaluate IgE – mediated food allergy. Undetectable serum food – specific IgE levels might be associated with clinical reactions for 10 % to 25 % (20).

The double – blind, placebo – controlled oral food challenge is the gold standard for the diagnosis of food allergies (1). According to Niggemann, however, even DBPCFC may sometimes be misleading (15). The clinical history results, skin prick test results, and the results of specific IgE antibodies in serum indicate which food should be evaluated by challenge tests.

A number of investigators have examined the use of the atopy patch test in addition to skin prick tests for the diagnosis of non – IgE – mediated food allergy, primarily in patients with atopic eczema dermatitis syndrome and allergic eosinophilic esophagitis (11, 23).

Isolauri and Turjanmaa found a very good correlation between positive atopy patch tests results and late reaction to food allergen in children with atopic eczema/dermatitis syndrome (7). One study has investigated the APT with food in children and adults using the same design (21). This study used peanuts, which cannot be compared with other studies. The authors found that an APT positivity was more frequent in children younger than 6 years compared with older children and adults. Recently, the prevalence and agreement with clinical history and specific IgE of positive APT reactions was investigated in 314 patients with AE/DS in remission at 12 European centres (4). The authors recommend that the clinical relevance of positive APT reactions is still to be proven by standardized provocation and avoidance tests and may also depend on the APT model. We report the study, where atopy patch tests are used in diagnosis of food allergy in patients older 14 years of age with AE/DS and we compare the APT results with other results of examination in diagnostic work-up of food allergy, including elimination diet and oral challenge test, with regard to late reaction especially. Only two patients with positive results in OET to cow milk and wheat (without IgE reactivity) had the positive response in APT (+,++), but the diagnosis of food allergy in those patients was not confirmed in DBPCFC because of intolerance of gelatine capsules in one patient and because of pregnancy in another patient. Patients with confirmed food allergy to wheat flour and milk in DBPCFC had no reactions in APT tests.

The diagnosis of food allergy to soy and egg was determined according the results of personal history, specific IgE, SPT and open challenge test. The diagnosis of food allergy to peanuts was determined without challenge tests. From five patients with the suspected allergy to soy, there were three patients with positive results in APT evaluated as ++ or +++; food allergy to soy was strongly suspected from the anamnesis together with positive results of specific IgE or skin prick tests in these patients. It seems, that positive results in APT together with positive IgE level or skin prick tests and positive anamnestical data makes open exposure test superfluous for suspected soy allergy, but our group of patients with positive results in APT is limited to make definite conclusions. Roehr concluded in his study (18) that in children the combination of positive APT results and measurement of levels of specific IgE makes double – blind placebo controlled food challenges superfluous for suspected cow's milk and hen's egg allergy.

Ten patients were suspected of food allergy for egg. Only in two of them there are the positive results in APT with the white and yolk, but these three patients are without positive IgE to this allergen and without suspected history. We performed the open exposure tests with these food allergens. In these two patients the positive results in APT were confirmed, the late reaction to these food allergens during challenge tests was observed as worsening of AE/DS during 8 hours after the first dose of allergen, so APT tests were especially useful in diagnosis of food allergy to egg in these patients with AE/DS.

The suspicion of food allergy to peanuts is in16 patients in our study, but only in four of them the positive atopy patch tests were found. Anamnestical data as oral allergic syndrome as early reaction and as well the worsening of atopic eczema during 8–10 hours after ingestion of peanut were recorded in these patients. The positive results in atopy patch tests in other two patients was not confirmed in other diagnostic methods – these patients showed no reactions after ingestion of peanuts and the specific IgE and SPTs were negative in them.

In comparison with the studies performed in children, the number of positive APTs is lower in our study, one hypothesis may be that the skin of children is thinner and allergens can penetrate easier to the antigen – presenting Langerhans cells. Other studies have found that there is no specific IgE to wheat in many cases of exposure – proven wheat allergy in children (in which APT result is positive) (9).

To date, the APT with foods is not well standardized and various methods in preparing the test materials are likely to cause controversial results. Until validation data are available, fresh foods should be preferred for testing over commercial extracts. Foods have been used with and without vehicles leading to similar results in some studies (23).

The assessment of APT response seems to be of great importance. A recent study proposed a standardized interpretation of APT in children with AE/DS and suspected food allergy, indicating that the presence of both infiltration and at least seven papules had the greatest diagnostic accuracy for predicting the outcome of DBPCFC (6). This is in agreement with our study where really the reaction in APT with at least 7 papules has the greatest diagnostic accuracy for predicting the result of OET.

According to Mehl study (10), the APT demands a highly experienced test evaluator. Mehl investigated 437 children referred for evaluation of suspected food allergy, performed

1700 APTs and concluded, that the predictive capacity of the APT is improved when combined with specific IgE or the SPT, oral food challenges become superflous in only 0.5 % to 14 % of study patients.

Conclusion

The food allergy to cow's milk and wheat was confirmed in double – blind, placebo controlled food challenge test in few patients in our study (4 %). The suspicion of food allergy to egg is in 8 %, to peanuts in 13 % and to soya in 4 % of patients. The sample size is small to make conclusions, but it seems, that atopy patch tests alone cannot be used as tests for the determination of food allergy in patients with AE/DS but such test in complex with other diagnostic methods can help to trace the food allergy (especially with the regard to the late phase of allergic reaction). The assessment of APT response seems to be of great importance.

Our work was draft in a manner to continue as an epidemiological study for the investigation of the share of food allergy in adolescents and adult patients with atopic eczema.

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Abbreviations:

AE/DS – atopic eczema/dermatitis syndrome
SPT – skin prick test
APT – atopy patch test
DBPCFC – double-blind, placebo controlled food challenge
EFTAD – European task Force on Atopic Dermatitis
FEIA – fluorescenc enzymatic immunoassay
IgE – Immunoglobulin E antibodies
OAS – oral allergic syndrome
OET – open exposure test
SCORAD – system for evaluating the severity of atopic eczema
s.d. – standard deviation

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Corresponding author:

Jarmila Čelakovská, M.D., Department of Dermatology and Venereology, Faculty Hospital and Medical Faculty by Charles University, Hradec Králové, Czech Republic; e-mail: jarmila.celakovska@seznam.cz