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Atopy patch test in examination of food allergy in patients suffering from atopic dermatitis

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ABSTRACT

Aim: The evaluation of the importance of atopy patch tests in patients suffering from food allergy to egg's white and yolk, peanuts, soy, cow's milk and wheat. **Methods:** 240 patients were examined. Complete dermatological and allergological examination was performed in all patients including specific IgE, skin prick test, atopy patch test and the challenges tests. **Results:** The specificity of atopy patch tests is for soy 96%, for egg 95%, for wheat 95%, for peanuts 99% and for milk 99%. The sensitivity of atopy patch tests is for soy 62%, for egg 35.7%, for wheat 16.7%, for peanuts 20.8% and for milk 50%. **Conclusion:** The specificity of atopy patch tests may be considered good; regarding the sensitivity, the high percentage of false negative results should make us believe that these tests are not conclusive.

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KEYWORDS

Atopic dermatitis; food allergy; atopy patch tests; skin prick tests; specific IgE; challenge tests

Introduction

This study evaluates our experiences with atopy patch test in the examination of food allergy in patients suffering from atopic dermatitis (AD).

In patients with suspected food allergy, which is thought to be aggravating AD, it is important that any food avoidance measures suggested are based on a detailed history and supportive evidence from objective allergy tests as the measurement of specific IgE (serum specific IgE level – sIgE, skin prick tests – SPT), atopy patch tests (APT) and challenge tests: open exposure test, double-blind, placebo controlled food challenge test, which remains the golden standard in diagnosis of food allergy (Niggemann et al., 2001).

The APT is defined as a patch test procedure to assess the delayed type of hypersensitivity reactions against those protein allergens known to elicit IgE-mediated type I reactions in atopic patients. This patch test procedure uses intact protein allergens instead of haptens in an optimized test setting and with a special reading key (Wollenberg & Vogel, 2013). The food patch testing has gained popularity and has been included as a potential test to assess for food allergy not only for AD, but also for eosinophilic esophagitis and food protein-induced enterocolitis syndrome, although its role still remains unclear (Edwards & Martinez, 2014). A general problem is that an APT with food has

mostly been studied in infants and children since the 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 this work is to evaluate the contribution of APTs in examination of food allergy in patients suffering AD. The food allergy to egg's white and yolk, peanuts, soy, cow's milk and wheat was examined in 240 patients suffering of AD and the food allergy to these foods was confirmed in our several studies (Čelakovská, Ettlerová, Ettler, Vaněčková, & Bukač, 2015b).

Methods

After discontinuation of antihistamines and topical steroids for at least 5 days and systemic steroids and UV therapy for at least 2 months, the SPTs, specific IgE, the APTs to egg's white and yolk, peanuts, soy, cow's milk and wheat were examined.

APT's were performed on non-lesional, non-abraded, untreated skin of the back during a remission. A technique similar to conventional patch tests has been used by performing atopy patch testing – CURATEST F strip (Lohmann & Rauscher International GmbH, Germany) with a 12 mm cup size. The APTs with native egg's white and yolk, peanuts, soy, cow's milk and wheat were applied. Wheat powder and soy powder were used with vehicle-distillated water (1 g of wheat powder or soya powder in 10 ml of distilled 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 APTs was 48 h, the first results were evaluated 30 min after removal of the tests and the second results were analysed 72 h after the application of the tests. Grading of positive APTs reactions was similar to the criteria used in conventional contact allergy patch testing with the modifications of the European task force on Atopic dermatitis (EFTAD) Consensus Meetings (Darsow et al., 2004, 2010). Only reactions from erythema, infiltration onwards were designated positive. The challenge test with egg's white and yolk, soy, cow's milk and wheat were performed in all patients with positive results at least in one of the diagnostic methods to examined foods (sIgE and/or SPT and/or APT and/or history). The diagnostic hypoallergenic diet was recommended to introduce before this open exposure test. The comparison between the APT results and really confirmed food allergy was performed; according to these results, we have calculated the specificity and sensitivity of the APTs.

Results

The food allergy was confirmed to milk in 2 patients (0.8%), to wheat in 6 patients (2.5%), to peanuts in 48 patients (20%), to soy in 8 patients (3%) and to egg in 14 patients (6%) (Čelakovská et al., 2015b). At this study, the APT was recorded as positive to milk in 3 patients, to wheat in 13 patients, to peanuts in 11 patients, to soy in 14 patients and to egg in 16 patients. We performed the comparison between the APT results and really confirmed food allergy in the open exposure test; according to these results, we have calculated the specificity and sensitivity of the APTs (Table 1). The specificity of APT for testing food allergens is for soy 96%, for egg 95%, for wheat 95%, for peanuts 99% and for milk 99%. The sensitivity of APT for testing food allergens is for soy 62%, for egg 35.7%, for wheat

Table 1. The results of APT in patients suffering from food allergy.

Examined food	No. of patients with confirmed food allergy in the challenge tests	No. of patients with APT positive results	True positive APT results	False positive APT results	False negative APT results	Specificity of APT (%)	Sensitivity of APT (%)
Milk	2 (0.8%)	3	1	2	1	99	50 ^a
Wheat	6 (2.5%)	13	1	12	5	95	16.7 ^a
Peanut	48 (20%)	11	10	1	38	99	20.8
Soy	8 (3%)	14	5	9	3	96	62 ^a
Egg	14 (6%)	16	5	11	9	95	35.7

^aRegarding the sensitivity of APT for soy, milk and wheat, we cannot make definitive conclusions, because of small number of positive results in APT.

16.7%, for peanuts 20.8% and for milk 50%. Regarding the sensitivity of APT for soy, milk and wheat, we cannot make definitive conclusions, because of small number of positive results in APT.

Discussion

The question of food allergy in patients suffering from AD was evaluated in the several studies (Čelakovská, 2015; Čelakovská & Bukač, 2011, 2015a, 2015b; Čelakovská, Bukač, & Ettler, 2015; Čelakovská & Ettlerová, 2009; Čelakovská, Ettlerová, Ettler, & Bukač, 2015; Čelakovská, Ettlerová, Ettler, & Krčmová, 2010; Čelakovská, Ettlerová, Ettler, Vaněčková, & Bukač, 2011; Čelakovská, Ettlerová, Ettler, Vaněčková, & Bukač, 2015a, 2015c; Čelakovská, Ettlerová, Vaněčková, & Ettler, 2011). The APT has received much interest in recent years as a model for studying the pathomechanism of AD and as a complementary test for diagnosis of protein allergens causing or maintaining AD by airborne contact or by food. A number of investigators have examined the use of the APT in addition to SPTs for the diagnosis of non-IgE-mediated food allergy, primarily in patients with AD and allergic eosinophilic esophagitis (Mohrenschlager, Darsow, Schnopp, & Ring, 2006; Turjanmaa et al., 2006). 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 (Niggemann, Reibel, & Wahn, 2000; Niggemann et al., 2005). A good correlation between positive patch test results and late reaction to food allergen in children suffering from AD was found (Isolauri & Turjanmaa, 1996). 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 (Mehl et al., 2006). The prevalence and agreement with clinical history and specific IgE of positive APT reactions was investigated in 314 patients with AD in remission at 12 European centres (Darsow et al., 2004). 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. According to Edwards, the sensitivity, specificity and predictive values, vary widely from 0% to 100%, depending on the study (Edwards & Martinez, 2014). Given this large variation in test results, food APT use in isolation is not recommended at this time and according to some authors, additional studies are needed to standardize, improve accuracy and reproducibility, and determine its role in the evaluation of allergic diseases (Edwards & Martinez, 2014).

We report this study, where APTs are used in diagnosis of food allergy in patients older 14 years of age in diagnostic work-up of food allergy. According to our results, the specificity of APT may be considered good, because it is over 95% in each type of food allergy. Regarding the sensitivity, we have a small number of observations, but in the case of peanuts or eggs the sensitivity is 20.8% and 35.7% respectively, and that means, that 80% (25% respectively) of test results are false negative. APT was a useful tool in diagnosing of food allergy to egg in two patients at this study; these patients had no positive results in SPT and sIgE, but the delayed reactions appeared during the open exposure test.

According to our results, APTs can be considered only as an additional diagnostic tool that can be used in specialized institutions. This test could be used in some patients suffering from AD and with suspicion to food allergy without predictive specific IgE or in patients with severe form of AD with unknown trigger factors.

Conclusion

According to our results, the specificity of APT may be considered good, because it is over 95% in each type of food allergy. Regarding the sensitivity, in the case of peanuts or eggs the sensitivity is 20.8% and 35.7% respectively, and that means, that 80% (25% respectively) of test results are false negative. The possibility of such high percentage of false negative results should make us believe that these tests are not conclusive.

Notes on contributors

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