CLINICAL VIGNETTE

The Role of Oral Food Challenge in Food Allergy Diagnosis and Management

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Introduction

Food allergy is an abnormal immune response following exposure to a specific food protein. Multiple types of food allergies exist and reactions can be broadly categorized as immunoglobulin E (IgE)-mediated (type I hypersensitivity) or non-IgE mediated reactions. IgE-mediated food allergies are characterized by a wide range of symptoms involving the respiratory, skin, gastrointestinal, and cardiovascular systems. Severity of symptoms may vary, but patients with IgE-mediated food allergies are at-risk for anaphylaxis, which is a serious allergic reaction that can lead to death. Accurate diagnosis of food allergy is therefore crucial to guide patients on appropriate avoidance or elimination measures and to prevent such fatal reactions.

The diagnosis of food allergy is made with a combination of tools including clinical history, physical examination, skin-prick testing, in vitro testing, and food challenges. Obtaining a detailed history regarding food exposures and associated reactions is a critical initial step in evaluating IgE-mediated food allergy. Clinical history will often provide a basis of predictive probability to assist with interpretation of test results. Skin-prick test (SPT) or in vitro tests are often helpful but may be limited in the accurate diagnosis of food allergy. Negative predictive value of SPT is >95% suggesting a negative SPT can essentially rule out an IgE-mediated food allergy.[1] However, the positive predictive value of food SPT is <50% with risk for false diagnosis of food allergy especially if the clinical history does not correlate.[1] In vitro testing such as immunoassays or component testing quantify the level of food specific IgE in patient serum. The benefit of in vitro testing is that it is highly sensitive, but this is limited by a high false positive rate especially when total IgE is elevated. Higher results of SPT and in vitro tests may suggest a greater chance of reaction if the food of concern is ingested. However, both SPT results and in vitro testing IgE levels do not correlate directly with severity of clinical reactions. Oral food challenges (OFCs) are very useful in the diagnosis of food allergy when history and testing are inconclusive and for determining minimum dose to elicit a reaction to the food. Food challenges are gradually increased feeding of a particular food under physician observation. Oral food challenges are the gold standard in diagnostic evaluation of food allergy and can investigate reproducibility, elicitation dosage, symptoms, and even possible tolerance.[2,3]

The following two cases highlight the role of oral food challenges, performed per PRACTALL guidelines, as a necessary adjunct to clinical history, SPT, and immunoassay testing for the diagnosis and ongoing management of food allergies.[2]

Case 1

A 12-year-old boy was referred for a milk allergy. He had a history of flatulence and fussiness when transitioned from breastfeeding to milk-based formula at six months of age (no rashes or emesis). During breastfeeding, his mother was on an unrestricted diet including consumption of milk protein, which he seemed to tolerate (no atopic dermatitis or gastrointestinal symptoms). He was switched to soy formula, and on his first birthday, within minutes after drinking a small amount of milk, he developed projectile vomiting and a mild rash that resolved without medications. He had specific IgE testing at that time, which was 100 ku/L (level 6), and he was instructed to avoid all milk protein. As a toddler, he sporadically began to eat foods that contained baked milk (muffins) without reactions. However whenever he ate foods that contained milk that was less well-cooked, such as pancakes, he would vomit. He was given a prophylactic diphenhydramine with no progression of his symptoms. He had accidental exposure to milk based ice cream at age 11. After two bites, he developed itchiness in his throat and emesis that resolved with diphenhydramine. During this time, he continued to have testing to milk via serology with persistently elevated specific milk IgE (level 6).

At age 12, he had specific milk IgE level that was 46.1 ku/L (level 5) with a total IgE of 1020 and was told by his allergist to continue to restrict cow milk except in baked goods. When we evaluated him at UCLA, we discussed with the family that although his reaction was suspicious for an IgE-mediated reaction and that he had a positive specific IgE, he also had a very high total IgE, which may be falsely elevating his specific IgE. Furthermore, he had been tolerating baked milk and had not had oral exposure to unbaked milk in over 2 years. He was scheduled for a physician supervised oral challenge to cow milk to determine the clinical implication of the very high specific IgE to cow milk. During the oral challenge, he was able to tolerate a full serving of cow milk (8 oz.) without any reactions and has been drinking cow milk ad-lib since.

Case 2

A 3-year-old boy with mild atopic dermatitis and a history of skin blotchiness at 8 ½ months old with oral exposure to a small portion of bread that contained egg. The reaction resolved without treatment within a few minutes. He had been

breastfed, and his mother was eating eggs while breastfeeding prior to the reaction. He was skin tested and found to have a positive reaction to egg; he was advised to completely restrict egg in his diet (including within breast milk and baked goods), which he had been doing for 2 ½ years with no accidental exposure. At age 3, he had a specific IgE to egg that was 1.44 ku/L (level 2 out of 6) with a total IgE of 243 and skin prick test negative. Although his specific IgE was positive, since his skin test was negative, and he hadn't had oral exposure to egg in over 2 years, he was scheduled for a physician supervised oral challenge to baked egg with the goal to be able to tolerate 0.33 grams of baked egg (one serving). After his third dose (cumulative dose of 0.02 grams of baked egg), he developed rhinorrhea, cough, diffuse urticarial, itching, and erythema of posterior oropharynx (anaphylaxis). He was given epinephrine, diphenhydramine, famotidine, and prednisone with resolution of his symptoms within an hour and advised to continue to restrict egg in his diet.

Discussion

The two cases presented here emphasize the importance of oral food challenge in addition to detailed history, SPT, and in vitro testing for accurate diagnosis and management of food allergy. SPT and in vitro testing are suggestive for sensitization but do not necessarily predict clinical reactivity as seen in our patients above. Without incorporation of an oral food challenge, patients may be eliminating foods unnecessarily with a diagnosis based on testing alone and a remote history of reaction or a reaction that was not directly associated with the food. Conversely, patients with low reactivity by testing may have a false sense of security whilst being unknowingly at high risk for severe reactions.

In case 1, the patient had a high specific IgE to milk but is able to tolerate milk. In contrast, the patient in case 2 had a low specific egg IgE but developed anaphylaxis during the physician supervised oral challenge.

An accurate and thorough food allergy assessment should include a detailed history, diagnostic testing, and often a confirmatory oral food challenge to provide a more clinically relevant treatment plan.

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