



Letter

Home-based program of maintaining unresponsiveness in children with allergic reactions to larger amounts of peanuts

Allergists currently advise most patients with peanut allergy to observe life-long avoidance. This is in contrast to milk and egg allergy, where many children are partly tolerant to the food and tolerance induction with food ladders is routine.¹ Twenty-one percent of children with proven peanut allergy at challenges appear to outgrow their clinical reactivity.² Furthermore, clinical trials using oral, subcutaneous, and epicutaneous peanut immunotherapy have demonstrated that patients vary in the amount of peanut needed to trigger a reaction and that desensitization and to some extent sustained unresponsiveness can be achieved in children and adolescents.^{2–4} There are currently no reliable biomarkers identifying which children will outgrow their peanut allergy or react only to larger amounts of the food.

At our tertiary pediatric allergy referral center in the United Kingdom, 41 (32%) of 130 children undergoing supervised open oral peanut challenges from 2012 to 2016 developed objective signs of an allergic reaction. Of these 41 patients, 31 (76%) reacted after eating more than 1 peanut (200 mg total weight).⁵ We hypothesized that in this group of children with a higher threshold of reactivity and non-anaphylactic reactions, it should be possible to maintain and increase the threshold amount of peanut required to induce an allergic reaction by regular exposure, irrespective of allergy test results. As proof of principle, Garvey et al⁶ from Cork, Ireland recently published the results of their home-based oral peanut immunotherapy program. It was not a formal research study but a case series based on clinical observations performed with motivated families in a university-based clinical practice. They described 10 children who previously experienced non-anaphylactic reactions to at least 4 g of peanut during a supervised hospital oral challenge. After 6 months on their program, all children could tolerate more peanut than the eliciting threshold at the initial oral challenge: a minimum cumulative dose of 4 g and up to 16 g of peanut. There were no significant adverse events and no need for additional clinical reviews.

From September 2015, our center supported a small group of children through a similar home-based oral peanut immunotherapy program. The aim of this case series review is to describe our center's experience in maintaining partial nonresponsiveness to peanut. After a formal oral peanut challenge, 6 children who had tolerated the equivalent of at least 1 peanut (≥ 200 mg by weight) in their oral challenge were invited to start consuming subthreshold amounts of peanut as determined by their oral challenge. Joining the program was a collaborative decision made after discussions initiated by the pediatric allergist. The most common reason for

patients being excluded was that the child had no interest in eating or did not like the taste of peanuts.

Although the aim was to start patients on one fourth of the threshold amount of peanut butter or shelled peanuts that caused the allergic reaction at the open challenge, the starting amount was individualized depending on how much peanut the patient felt comfortable eating. Patients were asked to consume the peanuts or peanut butter at least 3 times a week, doubling the amount, up to a maximum of 15 peanuts 3 times a week. Progress up the food ladder depended on their confidence and that of their parents and was formally reviewed in the clinic every 2 to 3 months. If patients had an allergic reaction, then they were instructed to stop eating the peanuts and contact their clinician. Patients who did not eat the peanut-containing food for more than 4 weeks were asked to contact their physician before recommencing the food. During the program, no patients informed the clinical team that they had missed more than 4 weeks. Allergy management plans, including use of epinephrine auto-injectors, were provided and regularly reviewed. As with the Cork program, ethics approval was not sought because children started with a quantity of food they already tolerated. Procedural details were clearly documented in the clinical records and clinic letters to the primary physician were copied to the family.

Data from the 6 children in the program 1 to 16 years old who reacted to at least 200 mg of peanut at formal open challenge with urticaria, superficial angioedema, and/or vomiting but no breathing problems are presented in Table 1. Four to 24 months into their program, all children could tolerate 1 to 6 peanuts 3 times a week. None of the children have had significant allergic reactions during up-dosing or the maintenance phase, and they have not required additional visits to the allergy center outside routine review. Furthermore, none of the patients contacted the physician between appointments because of allergic reactions.

This case series, albeit of a small number of children, independently supports the results of Garvey et al.⁶ By selecting children with well-controlled asthma and non-anaphylactic reactions to the equivalent of at least 1 peanut, we suggest that it is possible to safely maintain and increase peanut nonresponsiveness through a home oral immunotherapy program. Patients will continue to be encouraged to eat the equivalent of up to 15 peanuts (1 tablespoon of peanut butter) 3 times a week, although some will feel comfortable with only smaller amounts. As with any immunotherapy program, the main concern is anaphylaxis during up-dosing, intercurrent infection, or because of prolonged periods of noncompliance. Allergy management plans need to be reviewed regularly, including competence and availability of epinephrine auto-injectors. Patients should be carefully monitored for adverse events such as allergic reactions and eosinophilic esophagitis.⁷

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Table 1
Characteristics of Patients Undergoing Home Peanut OIT

Patient number	Age (y)	Sex	Clinical history of reactions to peanut	SPT reaction (mm)	Total IgE/peanut IgE/Ara h 2 (kAU/L)	Physician-supervised peanut oral food challenge	Home peanut OIT program
1	17	Female	At 4 y ate peanuts and within 5 min developed urticaria, facial swelling, husky voice, cold, and clinginess; mild asthma: no steroid inhaler; grass-induced rhinitis; on grass SLIT	10	1,000/12.8/—	Did not achieve stage 5 at 14 y: ate peanut 5 g and developed urticaria, angioedema, vomiting; given antihistamine only	24 mo into home peanut OIT program; no acute allergic reactions; started with 1 and now tolerates 6 peanuts 3 times/wk
2	15	Female	At 2 y ate roasted peanut and within 5 min developed itchy mouth, cough listless, agitation; no asthma	18	340/8.1/5.1	Did not achieve stage 4 at 12 y: ate peanut 1 g and developed lip swelling; given antihistamine only	20 mo into home peanut OIT program; no acute allergic reactions; started with ¼ and now tolerates 4 shelled peanuts 3 times/wk
3	7	Male	At 1 y ate peanut butter and within 5 min developed facial angioedema only; mild asthma: no steroid inhaler	7	910/3.4/0.7	Did not achieve stage 5 at 6 y: ate peanut 5 g and had large vomit	13 mo into home peanut OIT program; no acute allergic reactions; started with 2 and now tolerates 9 peanuts 3 times/wk
4	8	Male	At 6 y ate a peanut-containing chocolate bar and within 30 min developed generalized urticaria only; mild asthma: no steroid inhaler; mild allergic rhinitis	10	903/1.1/1.3	Did not achieve stage 5 at 7 y: ate peanut 5 g and developed localized urticaria on torso	6 mo into home peanut OIT program; no acute allergic reactions; started with 1 and now tolerates 4 peanuts 3 times/wk
5	2	Female	At 1 y was given peanut butter and within 5 min developed facial urticaria and angioedema only; no asthma	3	25/0/0	Did not achieve stage 3 at 1 y: ate peanut butter 200 mg and developed localized urticaria	9 mo into home peanut OIT program; no acute allergic reactions; started with peanut butter 100 mg and now tolerates peanut butter 2.5 g 3 times/wk
6	13	Male	No history of peanut consumption before challenge	3	100/0/0	Did not achieve stage 3 at 11 y: ate peanut 200 mg and developed abdominal pain, vomiting, anxiety, itch, conjunctivitis	14 mo into home peanut OIT; no acute allergic reactions; describes stinging in his mouth when taking peanut after missed doses; started with ½ and now tolerates 1 peanut 4–7 times/wk

Abbreviations: IgE, immunoglobulin E; OIT, oral immunotherapy; SLIT, sublingual immunotherapy; SPT, skin prick test.

In summary, published studies indicate that complete avoidance of foods to which children were previously partly tolerant can lead to more severe allergic reactions, whereas continuing to consume the food in an amount and form that is tolerated maintains non-responsiveness.^{8,9} We suggest that regular ingestion of tolerated amounts of peanut-containing food, as with cow's milk and egg, can decrease rather than increase the risk of future serious allergic reactions. Formal studies are required to determine if this is indeed the case.

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