Case Study: Introduction of peanut in high risk infants

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No conflicts of interest
Acknowledgement: I would like to thank Dr Shaunagh Emanuel for the illustrations

S Afr J Clin Nutr 2018;31(2):26-29

Introduction

Peanut allergy is a major public health concern estimated to affect between 0.5-2% of children,[1-3] and is one of the most common causes of food-related anaphylaxis.[4] Peanut allergy usually begins early in life and tends to be persistent in at least 80% of cases.[5] There is no known "cure" for peanut allergy, though specific oral tolerance induction is being used to try and desensitise patients, but is in most cases not leading to permanent tolerance. Therefore, much attention has been paid recently to investigate strategies for the prevention of peanut allergy. Prevention of peanut allergy would have a significant impact on the individual as well as, potentially, at a public health level in view of recent evidence of an increase in peanut allergy in many parts of the world.[2,4]

The LEAP study (Learning Early About Peanut Allergy), published in 2015, was a pivotal trial in the realm of peanut allergy prevention.[6] This study enrolled 640 children at high risk of peanut allergy, which was defined, for this study, as infants between 4 and 11 months of age with severe eczema and/or egg allergy. At study entry, LEAP participants were stratified according to skin prick test (SPT) result to peanut into those with a negative SPT response (n = 530), a primary prevention group, and those with a measurable SPT response (1–4 mm), n = 98, a secondary prevention group as they were considered sensitised but not allergic to peanut at study entry. Participants with a SPT of greater than or equal to 5 mm were excluded because of their high risk of established peanut allergy. Patients were randomised to consume at least 2 grams of peanut protein thrice weekly or avoid peanut-containing food until 5 years of age, at which stage a peanut oral food challenge was performed. Results showed a significant reduction in peanut allergy in the early consumption group (Figure 1).

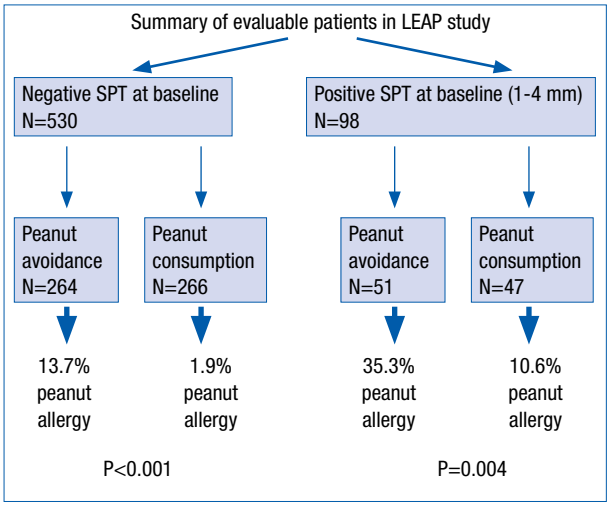

Figure 1: Summary of LEAP Study Outcomes[6,7]

Implications of the LEAP study and guidelines for the prevention of peanut allergy

The significant reduction in peanut allergy in the early consumption group led to international effort to develop practical clinical recommendations on peanut allergy prevention. A consensus statement regarding implementation of LEAP findings was published in 2015 on behalf of 9 international professional societies.[8] In addition, the National Institute of Allergy and Infectious Diseases (NIAID) published addendum guidelines for the prevention of peanut allergy in the United States in 2017,[9] an addendum to the 2010 *"Guidelines for the diagnosis and management of food allergy in the United States"*. Recommendations for peanut introduction in infants are summarised in Table 1 and Figure 2 below.

What amount of peanut protein should be given?

Based on the LEAP study, the first dose of peanut protein should be a cumulative dose of around 2 g of peanut protein (Table 2). Thereafter, the total minimum amount of peanut protein should be 6–7 g per week, consumed over 3 or more feedings per week.[6,9] It is not yet known if other amounts and frequencies of ingesting peanut would have the same results.

Table 1: Recommendations for peanut introduction in infants according to risk stratification[9]

Infant criteria	Recommendations	Earliest age of peanut introduction
No eczema and no other food allergies	Introduce peanut-containing foods	In accordance with family preferences and cultural practices, but no need to delay beyond 6 months
Mild to moderate eczema	Introduce peanut containing foods	Around 6 months
Severe eczema,* egg allergy or both	Evaluation by sIgE measurement and/or SPT, and if necessary, an OFC. Based on test results, introduce peanut-containing foods (see Figure 2 and Table 2)	Around 4–6 months

*Severe eczema defined as persistent or frequently recurring eczema with typical morphology and distribution assessed by a health care provider, requiring frequent need for prescription strength topical corticosteroids or calcineurin inhibitors despite appropriate use of emollients.
Abbreviations: OFC: oral food challenge; sIgE: specific Immunoglobulin E; SPT: skin prick test

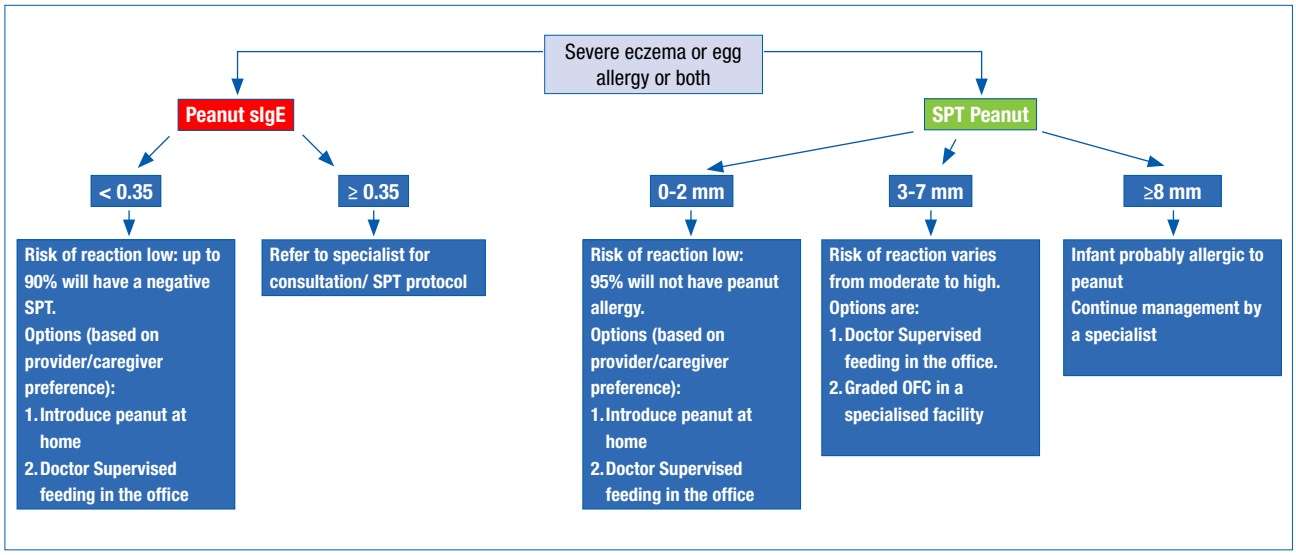

Figure 2: Peanut protein introduction in infants at high risk of peanut allergy[7,9]
Abbreviations: OFC: oral food challenge; sIgE: specific Immunoglobulin E; SPT: skin prick test

Table 2: Typical peanut containing foods and portion sizes[7,9]

Food	Typical serving containing 2 g of peanut protein		Feeding tips
Peanut butter	8–10 g (2 teaspoons)		Mix with warm water, breast milk or formula milk for a smoother texture. In older children, mix with pureed fruit or vegetables.
Peanuts	8 g peanuts = approx. 10 whole peanuts or 2½ teaspoons of ground peanuts (whole peanuts are a choking hazard in young children under the age of 3 years)		Add ground peanuts to a portion of yoghurt or pureed fruit
Peanut flour (50% peanut protein)	4 g Approximately 2 teaspoons		Mix with yoghurt, apple sauce or apple juice.
Bamba snack	17 g (2/3 of a 28 g packet or 21 sticks)		For a smooth texture, mix with warm water/infant milk and mash well.

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Case presentations

The following 3 cases demonstrate different scenarios and outcomes in infants at high risk of peanut allergy.

CASE 1

Background: Patient MB, a 7-month-old infant, presented with severe relapsing eczema since the age of 3 months. At 6 months, she developed an urticarial rash around the mouth after scrambled egg introduction. The infant was still being breastfed and selected solids, mainly fruits and vegetables, were being consumed. She had never eaten peanut before, and had not yet consumed cow's milk products, soya, wheat or fish.

Examination revealed a well-nourished infant with diffuse moderately severe eczema.

Skin prick test results *(generally ≥ 3 mm is considered positive):* Egg white 4 mm, fresh raw egg white 7 mm, peanut 2 mm. Cow's milk, soya, hake fish, wheat: 0 mm.

Risk assessment: Results confirmed an IgE mediated egg allergy. Although this infant falls into the high risk category for the development of peanut allergy in view of eczema and egg allergy, the low skin prick test result of 2 mm was reassuring, though high enough to introduce the peanut under initial observation.

Treatment Plan: An office based short peanut challenge was performed in 2 stages: 0.5 g peanut and then 1.5 g peanut protein (in the form of peanut butter) with observation for one hour.

Outcome: The peanut challenge was passed with no immediate reactions. The patient was advised to include peanut in the diet, around 2 g three times a week. Eczema and egg avoidance management was discussed. The mother was counselled to include other allergenic foods such as cow's milk, fish and wheat in the infant's diet. The infant was reassessed for eczema 2 weeks later and again 6 months later: the eczema improved and peanut was being consumed regularly with no reactions.

Practice point: In patients at high risk of peanut allergy, after initial assessment, peanut can be successfully introduced into the diet in many cases according to the "LEAP" recommendations, and a potential peanut allergy avoided.

CASE 2

Background: Patient KD, a 5-month-old boy, presented with severe relapsing difficult-to-control eczema from 3 months of age. He was exclusively breastfed and not yet on any solids. Examination showed a well-grown infant with diffuse severe chronic eczema.

Skin prick test results: Egg 3mm, fresh raw egg white 10 mm, cow's milk 3 mm, fresh cow's milk 7 mm. Peanut, soya, hake fish, wheat 0 mm.

Risk assessment: He was assessed as having a very high probability of egg and cow's milk allergy. Although the patient fell into the high risk category for peanut allergy in view of severe eczema and egg allergy, the negative skin prick test was reassuring and expedited peanut introduction was encouraged.

Treatment Plan: Eczema, egg and cow's milk avoidance management was discussed. Simple solid purees including fruits and vegetables were introduced. Two weeks later, an office based short peanut challenge was performed in 2 stages: 0.5 g peanut and 1.5 g peanut with observation for one hour.

Outcome: The peanut challenge was passed. The patient was advised to include peanut in his diet, around 2 g three times a week. When he was reassessed for his eczema 1 month late, peanut was being consumed with no reactions.

Further course: At 6 months, the patient unexpectedly reacted to cashew nut. Thereafter, he went through a fussy stage and refused regular peanut butter, resulting in no consumption of peanut products for 2 months. At 8 months of age, peanut was reintroduced and led to an urticarial rash around the mouth and vomiting. A skin prick test to peanut was repeated 2 weeks later: this time positive at 5 mm.

Practice point: The LEAP study protocol involved consumption of peanut at a minimum of 6–7 g per week for the first 5 years of life. Whilst it is not known if shorter periods or different amounts of ingestion would prevent allergy, cessation of consumption of peanut after initiation may result in the development of peanut allergy in some patients. Therefore, in patients at high risk of peanut allergy, if peanut consumption has been initiated, it should be encouraged on a regular basis.

CASE 3

Background: Patient AM, a 6-month-old boy, had moderate to severe relapsing eczema from 3 months of age. He was still being breastfed and was also receiving some pureed vegetables. The mother was worried that the baby broke out in macular rashes when the she herself had consumed egg and dairy.

Skin prick test results: Egg 3 mm, fresh raw egg white 5.5 mm, cow's milk 5 mm, fresh cow's milk 8 mm, peanut 3.5 mm. Soya, hake fish, wheat 0 mm.

Risk assessment: The infant was assessed as having a high probability of egg and cow's milk allergy. The risk of peanut allergy was moderate to high based on the 3.5 mm positive SPT result.

Treatment Plan: Eczema management was discussed, and egg and cow's milk avoidance implemented in both the mother and child. A formal peanut challenge was performed with 5 incremental doses of peanut butter, with a cumulative dose of 2.5 g peanut protein. The infant was observed for 2 hours after last peanut dose.

Outcome: The peanut challenge was passed. The patient was advised to include peanut protein in the diet, around 2 g three times a week.

Further course: Three days later, when the mother gave the first home instalment of peanut butter, the patient reacted within 15 minutes with urticaria around the mouth, followed 1 hour later by

profuse vomiting and a loose stool. This settled with oral fluids and a quick-acting antihistamine.

Practice point: Even in the LEAP study, some patients in the consumption group became allergic during the course of the study. Unfortunately, after the promising initial peanut challenge (which may have possibly represented a rapid desensitisation in this case), the patient presented with symptoms of a true peanut allergy, and peanut avoidance with regular follow-up was advised.

Conclusion

The LEAP study[6] provides level 1 evidence that healthcare providers should recommend introducing peanut-containing products into the diet of "high risk" infants (those with severe eczema and/or egg allergy) early on in life, between 4 and 11 months of age. This is ideally done after evaluation by an allergist to assess the appropriateness of early peanut introduction and to help implement it practically. The dietitian is a key resource in guiding solids introduction and appropriate sources of certain allergens. Those with a low positive peanut skin prick test (3–7 mm) may benefit from an observed incremental peanut challenge. However, as the three presented cases demonstrate, peanut allergy cannot be prevented in all infants, and even in the early consumption group, up to 10% can develop a peanut allergy if they have a low positive skin prick test.[6]

The LEAP study[6] included a high-risk population and cannot make recommendations on the benefit of early peanut introduction in the general or low-risk populations. In general, guidelines do not recommend delaying any major allergen's introduction into the diet, even in the low-risk population.

What is certain is that healthcare providers will need to be a major source of education and support for patients in order to implement early introduction of allergenic foods such as peanut. The opportunity should be taken at routine healthcare checks to identify the patient at risk of food allergy, and refer them in a timely fashion so that preventive strategies can be implemented early, where possible.

Acknowledgements

I would like to thank Dr Shaunagh Emanuel for the illustrations.

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