

High Oral Challenge Success Rate in Almond-Sensitized Children

Erika Cherk MD¹, Julia Grissinger RN, BSN² and Victoria R. Dimitriades MD^{2*}

¹ Department of Pediatrics, UC Davis Medical Center, Sacramento, CA, USA.

² Division of Pediatric Allergy, Immunology, and Rheumatology, Department of Pediatrics, UC Davis Medical Center, Sacramento, CA, USA.

***Corresponding Author:** Victoria R. Dimitriades, MD, FAAAAI, Division of Pediatric Allergy, Immunology, and Rheumatology, Department of Pediatrics, UC Davis Medical Center, Sacramento, CA, USA.

DOI: <https://doi.org/10.58624/SVOAPD.2023.02.033>

Received: April 13, 2023 **Published:** April 25, 2023

Abstract

Overuse of non-specific nut allergy panel testing has led to unnecessary almond avoidance for many children when almond IgE levels are elevated, despite lack of exposure or reaction history. We hypothesized that children with almond sensitization *without a history of prior exposure* to almonds would tolerate almond oral challenge. This retrospective chart review looked at 28 pediatric patients who underwent an almond oral food challenge (OFC) at our center between January 2017 and April 2021. Patient characteristics, almond IgE levels, and challenge outcomes were compared between patients with and without previous almond exposure. Overall, 96% (27/28) of patients passed the almond OFC, with most patients reporting almond avoidance due to elevated peanut IgE levels and/or positive tree-nut panel testing conducted prior to seeing us in clinic. Almond IgE levels ranged from 0.35 to 17.20 IU/ml, without a notable difference between the levels of exposed and non-exposed groups. Children who are sensitized to almond *without prior exposure* have a very high likelihood of passing an almond challenge regardless of almond IgE levels. Pediatricians should refer their almond-avoidant patients for allergist-directed OFCs, as expanding a child's diet early can significantly lessen school and mealtime anxiety and dramatically improve the quality of life for these children and their families.

Keywords: Almond; Oral Food Challenge; Sensitization; Quality of Life

Introduction

Almond allergy is one of the most commonly reported tree nut allergies, with about 0.7% of the United States population reporting an almond allergy. [1,2] Currently, diagnosis is made through a combination of necessary clinical history, along with skin prick testing (SPT), serum-specific IgE levels, component testing (*Pru*), and oral food challenges (OFCs). [2-4] However, unlike for other tree nuts, there have been limited studies looking at OFCs in almond-sensitized patients, especially in those without documented history of exposure or reaction. [2,5] Moreover, both almond-specific SPT and serum IgE levels have been shown to be poor predictors of OFC outcome. [3,4] Thus, in the absence of clinical history, there is a high rate of false positive results. [2,5]

Unfortunately, overuse of non-specific nut allergy panel testing has led to unnecessary almond avoidance for many children when almond IgE levels are elevated, despite lack of exposure or reaction history. [1,2,5] Unnecessarily avoiding nuts is not without consequences. As highlighted by prior studies, nut avoidance can have a profound impact on both a patient and their family's quality of life (QOL), contributing to heightened levels of emotional stress (e.g. hypervigilance, separation anxiety, depression, at risk for school bullying) and more limited participation at social events (e.g. birthday parties, sleepovers, summer camps). [7,8]

Moreover, research has shown that reintroduction of nuts which were previously avoided can improve quality of life for patients and their families. [9] Hence, it is important to try resolve unnecessary nut avoidance by conducting OFCs whenever safely possible. In this capacity, pediatricians can play a central role in guiding patients to evaluation and reintroduction recommendations through an allergist.

Methods

In order to better identify historical aspects of evaluation and patient characteristics that help to predict a successful OFC, we conducted a retrospective chart review of all pediatric patients who underwent an almond OFC at our institution between January 2017 and April 2021. OFCs were conducted per previously published protocols with multiple increasing doses up to an age-appropriate dose, followed by observation time for symptom monitoring and close follow-up. With appropriate local IRB approval, charts were reviewed for patient characteristics, almond IgE levels, and challenge outcomes in patients both with and without previous almond exposure. Geometric mean was used to compare almond IgE levels, as this has been shown to be a better measure of central tendency for positively skewed immunologic data. SPSS software was used for statistical analysis.

Results

A total of 28 pediatric patients (ranging from age 21 months to 18 years old, with a mean age of 7 years) underwent an almond OFC during the study period (Table 1). Overall, 96% (27/28) of study patients passed the almond OFC. In the unexposed and previously exposed groups, pass rates were 100% (23/23) and 80% (4/5), respectively. The patient who did not pass the OFC in the previously exposed group developed facial urticaria after ingesting 2 grams of almond protein. In both groups, most patients (93%) were avoiding all tree nuts due to elevated peanut IgE levels and/or positive tree-nut panel testing. For those with successful OFCs, almond IgE levels ranged from 0.35 kU/L – 17.20 kU/L in the unexposed group and from 0.35 kU/L – 2.07 kU/L in the previously exposed group. There was no notable difference between the geometric mean levels of unexposed (2.98, *SD* 3.41) and previously exposed (1.21, *SD* 2.32) patients with successful OFCs. Percent change between repeat almond IgE levels was examined in a select number of patients as a means to identify a pattern of tolerance to challenge; however, there was no statistically significant difference between the groups. Prevalence of allergic rhinitis, asthma, family history of food allergy, peanut avoidance, and peanut allergy between the exposed and unexposed groups was not statistically significant. Of note, 83% of the unexposed group had an atopic dermatitis diagnosis (compared to 25% in the exposed group), which was statistically significant ($p = 0.04$).

Table 1. Study Population Demographics and Atopic tendencies (n=28).

	Passed OFC		Failed OFC
	No prior exposure (n=23)	Exposure with perceived reaction (n=4)	Exposure with perceived reaction (n=1)
Age at OFC, mean (SD)	7 (3)	10 (7)	8 (0)
Sex, # (%)			
Male	18 (78)	2 (50)	1 (100)
Female	6 (22)	2 (50)	-
Race, # (%)			
Caucasian	17 (74)	3 (75)	-
Asian	3 (13)	1 (25)	1 (100)
Other, not specified	3 (13)	-	-
Atopy, # (%)			
Peanut Allergy, # (%)	16 (69)	2 (50)	-
Peanut Avoidance, # (%)	19 (83)	3 (75)	1 (100)
Tree Nut Avoidance, # (%)	22 (96)	3 (75)	1 (100)
Atopic Dermatitis, # (%)	19 (83)*	1 (25)	-
Allergic Rhinitis, # (%)	13 (57)	3 (75)	1 (100)
Asthma, # (%)	8 (35)	2 (50)	-
Family hx of food allergy, # (%)	7 (30)	3 (75)	1 (100)
Almond IgE at OFC, geometric mean (SD)	2.98 (3.41)	1.21 (2.32)	14.70
Percent change in geometric mean IgE levels (# patients with repeat almond levels)	-34% (13)	-62% (2)	-47% (1)

SD, Standard deviation

* Statistically significant by Fisher Exact Test, *P* value 0.04

Discussion

While having been looked at as a whole population previously, this specific challenge experience emphasizes that children who are sensitized to almond *without prior exposure* have a very high likelihood of passing an almond OFC even with elevated IgE levels. These results are consistent with prior studies, which have shown similarly high pass rates for general almond OFCs. [2,3,5] However, this study's emphasis that all unexposed pediatric patients who were challenged were able to tolerate almond, despite having higher IgE levels compared to the exposed group, adds more responsibility to the unique role of allergists in expanding a child's diet. Moreover, this further reinforces the discussion that IgE levels are more meaningful in patients with prior exposure and reinforces the importance of interpreting IgE levels in conjunction with clinical history. Of note, although this study expands upon the growing body of literature looking at expectations and outcomes of almond challenges in almond-sensitized patients without prior exposure history, this study was limited by smaller sample size (particularly in patients with a prior exposure to almond) at a single academic center.

Conclusions

Overall, these study findings should not only encourage pediatricians to refer their unexposed, almond-avoidant children to allergists to conduct more OFCs (as has been considered for other tree nut avoidances) [3,6], but should also reassure parents that it is safe for their child to continue almond consumption at home—even if avoiding other nuts. Allergist-led initiatives to expand a child's diet early can dramatically improve QOL for unexposed, almond-avoidant children and their families. Without the stress of unnecessary food avoidance, children and their families will likely have lower levels of school and mealtime anxiety, allowing them to feel more comfortable attending social gatherings, trying new restaurants, and traveling. [7,8] Furthermore, since almond-containing products are becoming increasingly portable and common as peanut-substitutes and in dairy alternatives, the ability to eat almonds can allow children to feel more similar to their peers. Having this sense of similarity and normalcy can promote deeper connections with peers, decreasing the risk of childhood alienation and bullying, and thereby improving childhood development and mental health. [7-9] Finally, although allergist-directed introduction of almonds as soon as safely possible is a step in the right direction, it is only part of the solution—this should be combined with standardized approaches and further educational efforts to prevent the more general use of non-specific nut allergy panel testing.

Conflict of Interest

The authors declare no conflict of interest.

Acknowledgement

None

Funding

None

IRB Exempt: ID# 1621838-1, University of California, Davis IRB Clinical Committee

References

1. Gupta RS, Warren CM, Smith BM, Blumenstock JA, Jiang J, Davis MM, et al. The Public Health Impact of Parent-Reported Childhood Food Allergies in the United States. *Pediatrics* 2018; 142(6):e20181235
2. Virkud YV, Chen YC, Stieb ES, Alejos AR, Renton N, Shreffler WG et al. Analysis of Oral Food Challenge Outcomes in IgE-Mediated Food Allergies to Almond in a Large Cohort. *J Allergy Clin Immunol Pract*. 2019; 7(7):2359-2368.e3
3. Hsu C, Yong M, Pozin J, Makhija M, Singh AM. Clinical Predictors and Outcomes of Oral Food Challenges Illustrate Differences Among Individual Tree Nuts. *J Allergy Clin Immunol Pract*. 2021. 9(10):3728-3734.e1
4. Brettig T, Dang T, McWilliam V, Peters RL, Koplun JJ, Perrett KP. The Accuracy of Diagnostic Testing in Determining Tree Nut Allergy: A Systematic Review. *J Allergy Clin Immunol Pract* 2021; 9(5):2028-2049.e2.
5. Baker MG, Kattan JD. Review of 400 consecutive oral food challenges to almond. *Ann Allergy Asthma Immunol* 2019; 122(2):189-192.
6. Couch C, Franxman T, Greenhawt M. Characteristics of tree nut challenges in tree nut allergic and tree nut sensitized individuals. *Ann Allergy Asthma Immunol* 2017; 118(5):591-596.e3.

7. Dantzer JA, Wood RA. The impact of tree nut oral food challenges on quality of life and acute reactions in nut allergic patients. *J Allergy Clin Immunol* 2019;7(2):698-700.e1.
8. Feng C, Kim JH. Beyond Avoidance: the Psychosocial Impact of Food Allergies. *Clin Rev Allergy Immunol* 2019; 57(1):74-82.
9. Flammarion S, Santos C, Romero D, Thumerelle C, Deschildre A. Changes in diet and life of children with food allergies after a negative food challenge. *Allergy* 2010; 65(6):797-798.

Citation: Cherk E, Grissinger J, Dimitriades VR. High Oral Challenge Success Rate in Almond-Sensitized Children. *SVOA Paediatrics* 2023, 2:2, 59-62.

Copyright: © 2023 All rights reserved by Dimitriades VR., et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.