Case report

Sunflower Seed-Induced Anaphylaxis in a Child: A Case Report

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ABSTRACT

We report the case of a 6-year-old boy with seasonal allergic rhinitis who presented with anaphylaxis approximately 1 hour after ingesting food containing sunflower seeds, followed by exercise. Acute serum tryptase was elevated (16.3 vs 5.4 ng/mL). Skin prick testing revealed polysensitization to inhalant allergens and positive prick-by-prick testing with sunflower seeds. The clinical presentation was consistent with probable exercise-facilitated sunflower seed-induced anaphylaxis. As sunflower seeds are increasingly incorporated into processed foods, sunflower seed allergy should be considered in the differential diagnosis of unexplained anaphylaxis.

KEYWORDS: food-dependent exercise-induced anaphylaxis, sunflower seed allergy

1. INTRODUCTION

Sunflower seeds are among the most widely consumed edible seeds worldwide, and its use in oil production accounts for approximately 20% of the vegetable oil consumed in Europe. Consumption of sunflower seeds is also increasing because of their widespread use in health foods, leading to greater exposure and a potentially higher risk of hypersensitivity reactions. Although rare, sunflower seed allergy has mainly been described in the literature as an occupational allergy [1]. The allergens contained in sunflower seeds remain poorly characterized. Known allergens include Hel a1, Hel a2, Hel a3, and 2S albumin, which are resistant to heat and peptic acid digestion.

We report the case of a 6-year-old boy who developed anaphylaxis following the ingestion of sunflower seeds combined with outdoor physical activity.

2. CASE REPORT

A 6-year-old boy presented to the pediatric emergency department with urticaria, angioedema involving the face and ears, dysphonia, hoarseness, and bronchospasm. Clinical findings were consistent with anaphylaxis. Symptoms occurred after the ingestion of meatballs containing various seeds (sunflower and sesame), which had probably been consumed for the first time. Shortly after ingestion, the child engaged in outdoor physical activity, which preceded symptom onset.

His past medical history was significant for mild seasonal allergic rhinitis. In the emergency department, intramuscular adrenaline was administered and serum tryptase levels were measured. Tryptase levels during the acute episode were 16.3 ng/mL, significantly elevated compared with baseline levels measured under asymptomatic conditions (5.4 ng/mL), confirming the diagnosis of anaphylaxis.

At discharge, the patient was prescribed an adrenaline auto-injector, together with symptomatic

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therapy consisting of antihistamines and corticosteroids, and was advised to avoid sunflower seeds and sunflower-containing products. The diagnostic workup was continued during follow-up visits, during which skin prick tests (SPTs) were performed, showing polysensitization to inhalant allergens, with positivity to mugwort pollen (3 mm), mixed grass pollen (5 mm), Bermuda grass (3 mm), olive tree pollen (3 mm), cypress pollen (3 mm), and *Alternaria* pollen (3 mm).

Prick-by-prick testing showed a strong positive reaction to sunflower seeds (10 mm), whereas tests for sesame seeds were negative.

Following the acute episode, the patient remained in good clinical condition, experiencing only one mild reaction of perioral hyperemia after accidental exposure to food contaminated with sunflower seeds.

3. DISCUSSION

3.1 Epidemiology

Cases of sunflower seed allergy have been reported since 1974. Reported allergic manifestations include bronchial asthma, angioedema, urticaria, oral allergy syndrome, and several cases of anaphylaxis. The literature mainly describes cases of occupational sensitization, particularly among bird keepers exposed to animal feed containing sunflower seeds.

The prevalence of hypersensitivity to sunflower has been evaluated in only a few studies. A 1994 study reported positive prick tests in 79% of bird keepers, whereas 21% of atopic patients showed positivity, suggesting an important role of occupational exposure [2]. Another study by Atis et al., conducted in a sunflower processing facility, further highlighted this association, showing higher rates of rhinitis and rhinoconjunctivitis among employees who were exposed to sunflower pollen compared with a control population [3].

Data regarding the prevalence of sunflower seed allergy in the pediatric population remain limited. A retrospective cohort study in a pediatric allergy clinic showed a cumulative incidence of 0.38%. The study further concluded that more than three quarters of patients presenting with this type of allergy had an additional diagnosis of atopy and that, although most reactions consisted of mild cutaneous manifestations, approximately one quarter fulfilled the criteria for anaphylaxis [4].

Sensitization to sunflower seed is considered more common than clinically relevant allergy; therefore, oral food challenge tests are recommended rather than relying exclusively on skin or laboratory testing. Moreover, evidence regarding tolerance to sunflower seed oil remains unclear. Some individuals with sunflower seed allergy do not develop reactions after exposure to sunflower oil, probably because of the low residual protein content after seed processing, whereas others experience allergic symptoms, including anaphylaxis, after ingesting foods contaminated with sunflower oil. A possible explanation for this inconsistency may relate to the specific allergen involved in sensitization [5,6].

3.2 Sensitization Routes

Several reports indicate that sensitization may occur not only through ingestion, but also through inhalation and direct manipulation of the seeds. This phenomenon has been observed in workers handling sunflower seeds, and one report described two children with atopic dermatitis who became sensitized through impaired skin barriers [7].

3.3 Allergens and Cross-Reactivity

Sunflower pollen and sunflower seeds contain several proteins known to act as allergens. The most extensively described are Hel a1, Hel a2, Hel a3, and Hel a6.

Hel a1 is considered a major inhalant allergen. Although it has not yet been fully sequenced, it is believed to be homologous to the defensin family. This allergen is thought to be responsible for cross-reactivity with other members of the *Asteraceae* family, including *Artemisia vulgaris*.

Similarly, Hel a2 is a plant panallergen involved in cross-reactivity with other aeroallergens, such as olive tree pollen and ragweed pollen.

Hel a3 belongs to the lipid transfer protein (LTP) family, which consists of stable proteins that are resistant to heat denaturation and gastric digestion. LTPs are panallergens with highly conserved domains found in various plant-derived foods, including peach peel, apricots, and almonds. They represent one of the most common causes of food allergy in the Mediterranean area, likely because of the high consumption of these foods. The presence of this LTP allergen may explain allergic reactions to sunflower seed oil. Furthermore, this allergen may contribute to cross-reactivity among botanically unrelated seeds and foods.

Hel a6 is considered an inhalant allergen and is thought to be responsible for respiratory reactions [1].

Another sunflower allergen currently under investigation is the 2S methionine-rich protein (SSA) [8]. This molecule shows homology with other 2S proteins from Brazil nut and pistachio, explaining the possible cross-reactivity between these foods.

Food allergies are often insidious and difficult to characterize. Sunflower seeds are frequently incorporated into processed foods, and only a careful dietary history may allow identification of the causative allergen.

In our case, sunflower seeds were identified as the most likely trigger based on the temporal relationship between food ingestion and symptom onset, the clinical history, and the positive prick-by-prick test results. The diagnosis of an IgE-mediated allergic reaction was supported by the clinical presentation, elevated acute serum tryptase levels, and the prompt response to intramuscular adrenaline.

Physical exercise likely acted as a cofactor, enhancing the severity of the reaction. Exercise is a well-recognized augmentation factor in food allergy, as it may increase gastrointestinal permeability and facilitate allergen absorption. In addition, outdoor physical activity may have resulted in concomitant exposure to aeroallergens, including mugwort pollen, potentially contributing to mast cell activation in this polysensitized atopic child [9].

The patient's sensitization to mugwort pollen raises the possibility of

cross-reactivity between mugwort and sunflower seed allergens, as previously reported in the literature. However, the relevance of this mechanism in the present case remains uncertain because molecular diagnostics were not performed.

This report has several limitations. Oral food challenge combined with exercise provocation was not performed; therefore, a definitive diagnosis of food-dependent exercise-induced anaphylaxis could not be established. In addition, serum specific IgE measurements and component-resolved diagnostics, including assessment of Hel a3 and other sunflower seed allergens, were not available. Skin prick testing with peach or other LTP-containing foods was also not performed, precluding further evaluation of potential LTP sensitization.

4. CONCLUSION

Sunflower seed allergy is a rare but potentially severe cause of pediatric anaphylaxis. As sunflower seeds are increasingly incorporated into processed foods, bakery products, snacks, and mixed-seed preparations, this allergen should be considered when the triggering food is not immediately apparent. This case highlights the importance of a detailed dietary history, including hidden or less common ingredients, in children presenting with anaphylaxis.

This case also underlines the potential role of physical exercise as a cofactor that can increase the severity of food-related allergic reactions. The temporal relationship between sunflower seed ingestion, subsequent physical activity, and symptom onset supports a probable exercise-facilitated reaction.

Early recognition, prescription of an adrenaline auto-injector, patient and caregiver education, and appropriate dietary avoidance are essential to reduce the risk of recurrent reactions. Further diagnostic evaluation, including serum specific IgE and component-resolved diagnostics, may help clarify the sensitization profile in similar cases.

Ethical consideration

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Conflicts of interest statement

The authors declare no conflicts of interest in relation to this publication.

Authors' contributions

DC conceived the manuscript, wrote the first draft, and finalized it. GdC contributed to initial data collection and assisted in drafting the manuscript. AZ contributed to writing and finalizing the draft. PB conceptualized and supervised the project. All authors revised the manuscript and approved the final version.

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