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Case Report

Beyond Traditional Triggers: A Case of Anaphylaxis Triggered by Dance After Wheat Consumption

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Abstract:

Background: Food-Dependent Exercise-Induced Anaphylaxis (FDEIA) is a type of anaphylaxis, that an individual does not exhibit symptoms solely from food consumption or exercise; however, the conjunction of these factors in a sensitized individual can precipitate anaphylaxis symptoms.

Case presentation: This case report discusses a 20-year-old female student diagnosed FDEIA triggered by prolonged dancing following wheat ingestion. Despite no prior allergic reactions to wheat, she experienced anaphylaxis, marked by urticaria, wheeze, and hypotension, after consuming cake and fruit juice at a party. The patient's past history comprised asthma and sleep deprivation, which are significant variables that may diminish the threshold for anaphylaxis. The diagnosis was confirmed with IgE testing for ω5-gliadin, the principal allergen linked to wheat in FDEIA instances

Conclusions: The paper underscores the need of identifying atypical triggers such as dancing and highlights the need for patient education and avoidance strategies to prevent future episodes.

Key words: food-dependent; exercise-induced; anaphylaxis;wheat

Introduction

Food-Dependent Exercise-Induced Anaphylaxis (FDEIA) was initially proposed in 1979 by Maulitz et al as an allergic reaction to shellfish ingestion subsequent to exercise [1]. FDEIA is a disorder characterized by the onset of anaphylaxis symptoms quickly after the ingestion of a specific food item post-exercise and physical activity. The onset age of FDEIA typically occurs during adolescence and the second and third decades of life [2, 3, 4]. Case reports have been documented across various ages, with the oldest recorded individual diagnosed with FDEIA being an 82-year-old man [5].

In this type of anaphylaxis, an individual does not exhibit symptoms solely from food consumption or exercise; however, the conjunction of these factors in a sensitized individual can precipitate anaphylaxis symptoms that vary from mild to severe and potentially life-threatening reactions. The literature has referenced many types of meals and physical activities associated with FDEIA. A review study indicates that wheat is the most prevalent food associated with food-dependent exercise-induced anaphylaxis (WDEIA). The most common sports and physical activities related to FDEIA are non-specified exercise, running and walking, respectively [2, 6].

The most important component of wheat that is related to the occurrence of WDEIA is ω5 gliadin (Tri a 19), which is a lipid transfer protein (LTP) in wheat. Other allergens in wheat have also been mentioned in FDEIA, but the prevalence is lower than ω5 gliadin [6].

According to a systematic review, about 59.7% of FDEIA patients have additional concurrent allergy conditions. The most common allergic conditions associated with this entity include asthma, atopic dermatitis, and allergic rhinoconjunctivitis [2]. Atopy, particularly allergic rhinitis, is a significant risk factor for repeated anaphylactic episodes in FDEIA [7].

In terms of the prevalence of FDEIA, it is uncommon, but it is probably underdiagnosed due to factors such as some emergency physicians' unfamiliarity with the condition and the mildness of symptoms in certain patients, which may lead to misattribution to diagnoses other than anaphylaxis. Research conducted in Japan revealed the frequency of FDEIA as 0.02% among high school students [8].

Several mechanisms have been proposed to explain FDEIA. Enhanced gastrointestinal permeability resulting from compromised epithelial cells is one such mechanism. On the other hand, the consumption of alcohol or some drugs such as non-steroidal anti-inflammatory drugs (NSAIDs) also increases gastrointestinal permeability. Exercise-induced inhibition of gastric acid secretion diminishes the breakdown of dietary allergens and the subsequent absorption of these allergens in their intact form across the

intestinal epithelial barrier. The issue is particularly significant for allergens like ω5 gliadin, which belong to the LTP family and exhibit considerable resistance to digestion [4].

Another mechanism postulated in the context of FDEIA is alterations in acid-base equilibrium. Intense physical activity results in a reduction of cellular pH, which may lead to mast cell instability [4, 9].

During exercise, blood flow is redistributed from visceral organs to the skin and skeletal muscles, enhancing the transport of food allergens, which retain a reasonably intact structure, to these areas that contain mast cells with a diminished threshold for degranulation [10].

Transient serum hyperosmolarity resulting from water evaporation from the airways during exercise, along with the heightened histamine release from basophils upon exposure to sensitizing allergens, constitutes another likely mechanism associated with FDEIA [4].

Research indicates that physical activity significantly influences the regulation of a complex inflammatory cascade and the expression of pro-inflammatory cytokines. The combination of physical activity with additional stressors might enhance inflammatory responses and lower the threshold for the manifestation of allergy reactions [1, 11].

Multiple factors have been identified as exacerbating elements in the manifestation of FDEIA, which lower the threshold for an allergic reaction to the food to which an individual has developed sensitivity. Medications like NSAIDs, beta blockers, and angiotensin-converting enzyme inhibitors, infections, alcohol consumption, and factors that elevate body temperature such as hot and humid conditions and sleep disturbances, augment the likelihood of FDEIA. Additional factors, including premenstrual and ovulatory periods in women, as well as seasonal pollen exposure, have been suggested as contributing elements in individuals with pollen sensitivity [2, 12, 13].

The gold standard test for diagnosing FDEIA is the provocation test, which includes a food challenge, an exercise challenge, and a combined food and exercise challenge, but these challenge tests are not recommended due to the possible risks of severe and life-threatening reactions [2, 3, 4]. Challenges are mostly done in research fields. While a positive challenge confirms the FDEIA, a negative challenge does not rule out the diagnosis [8].

If the patient's symptoms are indicative of anaphylaxis occurring shortly after food consumption and physical activity, without a prior history of anaphylaxis related to food or exercise individually, and in the absence of alternative diagnoses, FDEIA is the most probable diagnosis. A skin prick test or serum assay to assess the presence of specific IgE for the particular food is essential to confirm the diagnosis [3].

The management of acute anaphylaxis in FDEIA parallels that of other anaphylactic reactions. The primary treatment involves an intramuscular injection of 0.01 mg/kg epinephrine 1:1000 in the anterolateral thigh. Additional treatments encompass antihistamines, corticosteroids, oxygen therapy, inhaled beta2 agonists, fluid therapy, and vasopressor medications if required [4, 7].

The principle of long-term therapy is based on the exclusion of the offending food. It is recommended to avoid food consumption, especially the culprit food 4-6 hours before and 1-4 hours after exercise [7].

Enhancing the patient's knowledge of contributing factors, such as alcohol intake and NSAID usage, is beneficial in diminishing the likelihood of FDEIA recurrence. The patient is advised to wear a medical alert bracelet to notify others of his or her status in an emergency.

In certain individuals who do not comply with instructions, the risk of anaphylaxis may be reduced by administering prophylactic medications such as cromolyn sodium or H1 antihistamines prior to meals [4]. Nonetheless, in a recent updated review study premedication with antihistamines, oral corticosteroids, and leukotriene receptor antagonists is not recommended [7]. Certain studies have indicated the advantages of omalizumab, misoprostol, and allergen immunotherapy as treatments for certain individuals with FDEIA. These preventive medications are not a replacement for avoidance in any manner [4, 7, 14, 15].

Case presentation

We report a case of a 20-year-old female university student with a history of asthma, who was referred to the emergency department due to the abrupt onset of pruritic skin lesions accompanied by nausea, chest tightness, dizziness, and lightheadedness at a party. She consumed cake, pastry, and fruit juice, and had a history of extended dancing following her meal at the party. No history of alcohol or NSAID consumption was noted within 24 hours preceding the anaphylactic reaction; nevertheless, the patient's sleep duration in the three days prior was below their usual pattern. She had a history of two instances of identical symptoms occurring during the prior two years. In the emergency department, the examination revealed diffuse urticarial lesions on the face, trunk, and limbs, accompanied with mild swelling of the lips. She exhibited end-expiratory wheeze, tachycardia, and hypotension. The patient was diagnosed with anaphylaxis based on the symptoms and treated with 0.5 mg of epinephrine 1:1000 administered intramuscularly. The blood tryptase level was not assessed in the emergency room or subsequently due to the unavailability of a kit.

Inhaled salbutamol, antihistamine, and corticosteroid injection were administered to manage the patient's symptoms at the emergency room. After six hours, based on the assessment of the patient's symptoms, she was discharged with a prescription for an epinephrine auto-injector and advised against consuming the foods ingested during the party. The patient was referred to an allergist for additional evaluations.

She was visited by an allergist several weeks' post-discharge. The history was re-evaluated. She had no prior history of allergies to any specific food or medication; nonetheless, she recounted two identical occurrences occurring in the last two years, both following dancing at a party. She had a history of asthma, which had been managed from the age of six and remained stable in recent years, with infrequent use of inhaled salbutamol, particularly during episodes of the common cold. She also has a history of occasional allergic rhinitis symptoms in recent years.

Her blood cell counts and liver enzymes were within normal limits. She was positive for □5-gliadin IgE (1.33 kUA/L; negative < 0.3 kUA/L). She was negative for milk, cheese, egg whites and yolks, nuts, seeds, and fruits.

Despite the patient's prior consumption of bread and other wheat-containing products without incident, medical history and investigations indicated a diagnosis of WDEIA. Consequently, epinephrine was administered, and essential recommendations were provided to mitigate the risk of anaphylaxis.

Throughout the twelve-month follow-up of the patient, adherence to recommendations, including the avoidance of wheat-containing foods for a minimum of four hours prior to and one to four hours following exercise, resulted in no further episodes of anaphylaxis.

Discussion and conclusions

FDEIA is uncommon yet important because of its possibly lethal consequences. The symptoms during the acute phase resemble those of other types of anaphylaxes, varying from mild to severe episodes [2]. Recognizing FDEIA is essential, as the interplay of food and exercise can precipitate anaphylaxis under certain conditions that may not be readily evident. Common triggers encompass conventional physical activities such as running, jogging, walking, cycling, and swimming; however, lesser-known activities like dance may also have a substantial impact [12].

The patient, a 20-year-old female, aligns with a typical demographic profile identified in previous FDEIA research. The start of FDEIA typically occurs during adolescence or early adulthood, specifically between the ages of 20 and 30. Our case corresponds to this age profile, corroborating the typical demographic patterns observed in FDEIA patients.

A particularly interesting aspect of our case is the impact of cultural influences on the reporting of physical activities such as dancing. In areas or communities where dancing is traditionally discouraged or forbidden, patients may be reluctant to reveal this behavior to healthcare professionals. This may complicate the diagnostic process, resulting in delayed or missed diagnoses. In contrast, the majority of recorded FDEIA cases associated with alternative activities do not encounter similar societal stigma, resulting in their more frequent documentation in patient histories.

This observation is noteworthy as it implies that the underreporting of activities such as dancing may lead to the overall underdiagnosis of FDEIA in specific populations.

Conversely, the failure of physicians to obtain a thorough medical history and to ask targeted questions about dancing activities prior to the onset of an anaphylactic episode—especially among young females within culturally and religiously distinct communities—can lead to delays in diagnosis and an increased risk of repeated, potentially preventable, severe reactions. Perkins and Keith underscored the significance of a comprehensive patient history in identifying FDEIA, especially when the patient does not identify specific activities as possible triggers [12]. This case illustrates the necessity for clinicians to ask specific, culturally sensitive questions about all forms of physical activity, particularly those that the patient may not readily disclose.

In this case, sleep deprivation was recognized as an exacerbating component, aligning with earlier research findings. A study by Medrala et al. indicated that some drugs, including NSAIDs, as well as conditions like sleep deprivation and alcohol intake, can diminish the threshold for anaphylaxis [13]. Although the patient did not ingest NSAIDs, her recent sleep deprivation likely contributed to a diminished threshold for anaphylaxis. This finding corresponds with the extensive literature that highlights the cumulative impact of several variables in FDEIA. Additionally, a history of atopy is a substantial risk factor for recurrent episodes in FDEIA [2], which was present in our patient as asthma and recent allergic rhinitis.

The present case adheres to typical diagnostic protocols for WDEIA, featuring a positive IgE test for ω5-gliadin. Comparable diagnostic patterns have been noted in other research, wherein specific IgE to ω5-gliadin is indicative of WDEIA diagnosis [15]. The gold standard test, which entails a combined food and exercise challenge, was not conducted in our instance due to potential hazards and life-threatening reactions [3,4].

The management of our patient was in line with established guidelines for treating anaphylaxis. The immediate administration of intramuscular epinephrine was essential for managing the initial symptoms, succeeded by antihistamines and corticosteroids to stabilize the patient. This method aligns with treatment methods detailed in several case reports and reviews. Srisuwatchari et al. emphasized that prompt administration of epinephrine is crucial to avert lethal consequences in FDEIA incidents [7]. The patient was advised to obtain an epinephrine auto-injector upon discharge, emphasizing the necessity for patients to be equipped with emergency medication for potential recurrence episodes.

In terms of long-term management, our patient was recommended to avoid wheat consumption within a specific time window before and after exercise, which is a cornerstone of FDEIA prevention [3]. Furthermore, educating the patient about aggravating factors like sleep deprivation, as observed in our instance, is an important part of reducing the risk of future anaphylactic episodes.

In conclusion, FDEIA, though uncommon, is a severe type of anaphylaxis. The present case demonstrates how unnoticed activities, such as dancing, can act as triggers, often resulting in delayed diagnosis. During evaluations, clinicians must consider all physical activities and educate patients about the need of avoiding particular meals when exercising. Understanding and controlling this allergic disorder through patient education and avoiding aggravating variables is critical to preventing repeated anaphylaxis.

Abbreviations

FDEIA: Food-dependent exercise-induced anaphylaxis; WDEIA: Wheat-dependent exercise-induced anaphylaxis; LTP: Lipid transfer protein; NSAID: Non-steroidal anti-inflammatory drug; pH: potential of hydrogen

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Ethics approval and consent to participate

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Consent for publication

Consent for publication was obtained from the patient.

Competing interests

The authors declare no conflicts of interest in association with the present study.

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