



Anaphylaxis Due to *Aedes* Mosquito Bites: Case Report And Literature Review

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Abstract

Allergic reactions to mosquito bites are underdiagnosed and undertreated but can cause life-threatening anaphylaxis particularly in patients with underlying allergic rhinitis and asthma.

We report a patient who developed two episodes of local allergic reactions due to mosquito bites, then subsequently developed anaphylaxis after the third mosquito bites.

Introduction

Allergic reactions to mosquito bites are underdiagnosed and undertreated. It is well known that visitors or immigrants to an area with indigenous mosquitoes to which they have not been previously exposed are at higher risk for severe reactions to mosquito bites. In addition, Immune-deficient patients and young children are also considered at greater risk for severe reactions. It is immune mediated response in nature, with the involvement of IgE, IgG and T lymphocyte-mediated hypersensitivity reactions. In general, a mosquito bites can cause a variety of reactions, most commonly a local reaction; a small, itchy red skin lesion, which develops within few minutes and usually less than half an hour from the time of bite and resolve spontaneously over hours. However, in some instances, it could cause more serious reactions like large red swelling or blistering lesions and in rare occasions may be accompanied by fever and joint swelling. The most serious reaction to mosquito bite is the development of anaphylaxis; a life-threatening condition that is characterized by generalized hives, angioedema and respiratory distress that may subsequently end by cardiopulmonary arrest if not treated. As with other allergies, prevention is the best approach.

Case report

We report a 25-years old female patient, who presented with history of three episodes of allergic reactions due to mosquito bites, that subsequently caused anaphylaxis. The patient gave history of moving from high

altitude where she was resident and no previous exposure to *Aedes* mosquito, to a new home at sea level, where the environment was hot and humid, because of new job assignment. At her new housing area, she noticed commonly existing *Aedes* mosquito. Subsequently after initial exposure to mosquito bites, a local erythema and swelling developed at the site that required local steroid creams and oral antihistamine to resolve her symptoms over hours. However, the third exposure to *Aedes* mosquito bites led to severe large local swelling, itchy erythematous rash, shortness of breathing and wheezing. The patient was living close to the hospital, therefore she was seen in the emergency room within short time, where she was treated with nebulized bronchodilator and oxygen via face mask, high dose hydrocortisone 200mg intravenously and intravenous antihistamine. She was observed in the emergency room for several hours till she improved, then discharged home with referral to our allergy clinic for assessment and advice.

The patient's history review revealed that she has allergic rhinitis and a mild-intermittent asthma on inhaled bronchodilator when needed. The patient initial reactions to *Aedes* mosquito were alarming but were taken lightly by the patient till she had the third exposure to *Aedes* mosquito bites where she developed anaphylactic reaction. The skin prick tests (SPT) were performed with recombinant mosquito saliva allergens and environmental aeroallergens then measured in milli meter (mm) in diameter after fifteen minutes of the procedure. The results showed that histamine (positive control) was 5x6 mm, glycerin (negative control) was 0x0 mm,

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Aedes mosquito 4x5mm, house dust mites was 6x7mm, cat was 4x5mm, weed mix 4x4mm, tree mixture 4x4mm, grass mixture 4x5mm, aspergillus 3x4mm, and yeast mixture 3x3mm (in diameter). The radioallergosorbent test (RAST) for mosquito was high-to-moderately positive; 15.7 ku/ml. The patient was diagnosed to have anaphylaxis to *Aedes* mosquito bites based on the history given and confirmed by SPT and positive RAST. The underlying allergic rhinitis and asthma probably increase patient susceptibility to life-threatening anaphylactic reactions. Anaphylaxis action plan was undertaken; patient education were undertaken, emergency use of Epi-pen autoinjector; 0.3mg IM was explained, the use of mosquito repellents (basil, fennel and synthetic DEET) and optimizing allergic rhinitis and asthma treatments.

Discussion

The mosquitoes are globally existing and usually more active in hot and humid environment and exert a global health threat with potentially large fatalities rates worldwide by transmitting lethal infections such as malaria, dengue, and yellow fever. In addition, mosquitoes bites can trigger allergic reaction that range from large local skin reactions, but in some occasions, systemic reactions including urticaria, angioedema, and anaphylaxis [1–8]. There are certain population who may be at higher risk for an allergic reaction to a mosquito bite including outside workers or frequently exercising outdoors, young children, people not previously exposed to the local mosquito bites, and immunocompromised patients, i.e; HIV or cancer [9]. Having said that, very severe reactions with systemic symptoms to mosquito bites could develop in patients with Epstein-Barr virus-associated T/natural-killer cell-associated lymphoproliferative disorders [10]. However, naturally acquired desensitization to mosquito saliva is more common in children ('skeeter syndrome'), with local allergic reactions that usually improve spontaneously with age, during long-term exposure to mosquito bites or both [11,12]. The reactions to mosquito bites are immunologically mediated in nature, that include severe local and systemic reactions involve immunoglobulin E, immunoglobulin G, and T-lymphocyte-mediated hypersensitivities in response to allergens in mosquito saliva [13]. There have been efforts to improve the reagents, but these are not commercially available worldwide [14]. Sirichit Wongkamchai et. al, reported that, the protein profiles of saliva, salivary glands and whole-body extracts were comparatively analyzed from four common mosquito species of Thailand and/or South East Asia; including *Aedes aegypti*. Mosquito saliva was the most important allergens that caused specific IgE responses found in the allergic subjects. The identification of major allergens in mosquito saliva having MWs of 36, 32 and 22 kDa, which could potentially improve the development of specific recombinant allergens, the diagnosis and ultimately specific immunotherapy [15–16]. *Aed a 3*, *Aedes aegypti*, is a major mosquito salivary allergen. Its recombinant form has biological activity and is suitable for use in skin tests and serum IgE assays in mosquito-allergic individuals [17].

Large local reactions to insects are generally not treated with immunotherapy but, at least there is improvement in the size of local reactions with the use of venom immunotherapy [18]. Ariano R and R. C. Panzani reported disappearance of local reactions due to mosquito *Aedes* and symptoms of allergic rhinitis in all twenty patients treated for 18 months

with specific immunotherapy extract of the whole body of the mosquito *Aedes communis*, used for strong local immediate and delayed reactions, which was correlated with a statistically improvement of symptom and drug consumption scores [19]. Opasawatchai A et al. studied 64 mosquito-allergic and 22 non-allergic healthy control subjects and concluded that the majority of mosquito-allergic subjects who live in the tropics have IgE reactivity to these allergens, which is important for development of diagnostic tests, component-resolved diagnostics, and future immunotherapy for mosquito allergy in tropical countries [20].

The use of mosquito repellents (i.e., basil, fennel and synthetic DEET) remain the most important preventive measures to avoid mosquito bites. However, the recommendations of American Academic of Allergy, Asthma and Immunology include consulting an allergy/immunology specialist who can help to establish the diagnosis of anaphylaxis and its cause when a patient developed anaphylaxis, and to carry epinephrine autoinjector for emergency use. However, for localized symptoms due to mosquito bites, other measures to relieve symptoms which include elevation of the affected area and apply ice to reduce swelling and pain, to apply over-the-counter lotion to the affected area, to clean blisters with soap and water without breaking them, and if itching persists, then to try topical steroids or oral antihistamines. But to consult a physician if the swelling progresses, systemic symptoms develop, or the area appears infected [21].

Conclusion

Allergic reactions to mosquito bites are underdiagnosed and undertreated and may cause life-threatening anaphylaxis. Recombinant mosquito saliva allergens with biological activity were developed, that will significantly improve diagnosis of mosquito allergy, its management and eventually will improve specific immunotherapy for patients with systemic reactions. .

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