TAMILNADU Dr. J. JAYALALITHAA FISHERIES UNIVERSITY

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ON THE TOPIC

SEAFOOD ALLERGY – CAUSES, SYMPTOMS AND TREATMENTS

Submitted By

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INTRODUCTION

Fish and shellfish play an important role in human nutrition and in the world economy. Increased fish and shellfish consumption, there has been growing recognition of seafood allergies, Range from mild cutaneous reactions to life-threatening anaphylaxis and death. Food-related anaphylaxis is a growing problem worldwide .It is important that clinicians are prepared to recognize, treat, and prevent fish and shellfish allergies. They should the understand the epidemiology, biologic classification, and spectrum of cross-reactivity among seafood and with other potential allergens. Fish and shellfish are common causes of IgE-mediated food allergic reactions in both children and adults. A number of major allergens and cross-reacting allergens have been identified within the fish and shellfish families

Introduction to symptoms

Urticaria - Hives also known as urticaria, is a kind of skin rash with red, raised, itchy bumps

Anaphylaxis – it is a Serious allergic reaction and may cause deathIt typically causes: an itchy rash, throat or tongue swelling, shortness of breath, vomiting and low blood pressure

Angioedema - Swelling of the lower layer of skin and tissue . The swelling may occur in the face, tongue, abdomen, or arms and legs.

Dyspnea - Difficult breathing.

- **Wheezing**
- **Pruritus** - Severe itching of the skin
- **Eczema** - Dermartitis

Asphyxia - Deficient supply of oxygen to the body that arises from abnormal breathing.

Dysrhythmias – Abnormal heart beat

Myocardial infarction - Heart attack

Atopic disease(s) – Due to“hyperallergy”. A person with atopy typically presents with two or more of the following: eczema (atopic dermatitis), allergic rhinitis (hay fever), or allergic asthma.

Rhinitis - Irritation and inflammation of the mucous membrane inside the nose. Common symptoms are a stuffy nose, runny nose, sneezing, and post-nasal drip

Conjunctivitis - Conjunctivitis, also known as pink eye, is inflammation and irritation of eyes

Contact dermatitis - Contact dermatitis is a condition that makes skin red or inflamed after contact with an allergen or an irritant.

Hypersensitivity pneumonitis - Inflammation of lung due to inhalation of allergenic

Malaise - Feeling of discomfort, illness, or unease

Fatigue - Feeling of tiredness

Epidemiology

Approximately 4% of adults and 6% of children in US have a food allergy2.2% of the population having an isolated seafood allergy. Seafood allergies are more common

in adults than in children. Patients with fish and shellfish allergies remain affected lifelong. In food allergies admitted in emergency departments in the U.S., Shellfish allergy is number one food allergy.

In Singapore report shows that crustaceans are the important allergens.

- crustacea - 34%
- mollusks - 19%
- fish - 4% of the food allergies

In children in Spain

- fish - 30%
- Shellfish - 6.8% of reported food allergies
- 30% of cases involving children in Italy,
- 29% of cases of children in Philadelphia

Biologic Classification of Seafood

Seafood can generally be classified into four categories of organisms

- Fish
- Crustacea
- Mollusks
- Echinoderms

Most people with a seafood allergy are not allergic to all types of seafood. A basic understanding of the biologic classification of fish and shellfish can be helpful in guiding patients on selective avoidance diets.

Immunologic Mechanisms

Non-immunologic reactions and immunoglobulin E (IgE)–mediated reactions in food allergy. True seafood allergies are immunoglobulin E (IgE)–mediated reactions. Represent a failure of the body's oral tolerance mechanisms. Oral tolerance can be defined as "an active non-response to antigens delivered via the oral route" prevents uptake of allergenic proteins from the gut into the blood stream. suppression of the immune system's allergenic response to such proteins that enter the system. Under physiologic conditions, luminal barriers within the gastrointestinal (GI) tract prevent the uptake of most food allergens that enter the gut. Potentially allergenic proteins. Degraded into non immunogenic forms by gastric acid and digestive enzymes. IgA antibodies secreted by B cells in the gut bind foreign proteins and prevent their uptake. 2% of ingested proteins cross the protective epithelium of the GI tract intact. Absorbed into the bloodstream as immunologically active antigens. Usually do not cause allergic reactions. Body's innate mechanisms suppress the immune response to food allergens. Immune suppression begins when an intact antigen escapes the protective barriers of the gut. Taken up and presented by antigen-presenting cells (APCs), including B cells, dendritic cells, and macrophages. APCs then activate regulatory and suppressor T cells secretes, the suppressive cytokines transforming growth factor β (TGF-β) ,interleukin (IL)-10, By these steps, oral tolerance is achieved Immune system "ignores" the food antigen. When oral tolerance mechanisms will be failed, food allergies can develop True seafood allergies are type I immediate hypersensitivity IgE-mediated reactions. It involves APCs, T cells, and B cells

Clinical Manifestations

Clinical manifestations of fish and shellfish allergies are similar to other IgE-mediated food allergy reactions, ranging from mild urticaria to life-threatenin anaphylaxis. In a U.S. survey, doctors assistance was required in55% of finfish reactions, 40% of shellfish reactions. IgE-mediated reactions are generally rapid in onset. Allergic symptoms developing within minutes to an hour of exposure.Most reactions occurring within 30 minutes.Delayed onset of symptoms may occur 3 to 24 hours after exposure. In 25% to 30% of cases, a 2- phase reaction occurs patient will appear to recoverthen experience a late-phase reaction repeating symptoms after an asymptomatic period of 1 to 72 hours

Symptoms of seafood allergy are mostly related to the method of exposure Ingestion, cutaneous contact, and inhalation Ingestion - Signs and symptoms Itching and urticarial.

Angioedema— swelling of the lips and tongue

Pulmonary manifestations including dyspnea, wheezing, and chest tightnessGastrointestinal complaints such as nausea, vomiting, diarrhea, and abdominal cramping, Shock. Direct contact of the allergenic food with the oral mucosa causes pruritus and angioedema of the lips, tongue, throat, and palate—a set of symptoms known as oral allergy syndrome (OAS). In patients with underlying atopic disease, exposure to fish and shellfish allergens can cause severe eczema

- asthma symptoms
- Skin contact results in
- dermatologic symptoms, and

- Inhalational exposure typically causes
- respiratory symptoms like asthma

In one case study, a 2-year-old fish-allergic child experienced facial urticaria and angioedema after her grandfather, who had eaten fish 2 hours earlier, kissed her. In another report, a shellfish-allergic patient experienced anaphylaxis after kissing her boyfriend who had recently ingested shrimp.

In one survey, more severe reactions occurred following inhalational or dermal exposure rather than ingestion. These allergic individuals were able to consume the offending antigen without significant problems

Vascular problem- common in patients with seafood allergies it includes

- Hypotension.
- A subjective “sense of doom”
- Respiratory distress progressing to asphyxia
- Dysrhythmias
- Myocardial infarction
- Near-fatal and fatal reactions may start with only mild symptoms, such as OAS, before rapidly progressing to cardiovascular collapse
- Risk factors for severe anaphylactic reactions are
- the presence of other atopic disease(s)
- unplanned ingestion of sea food
- rapid onset of symptoms
- failure to treat with epinephrine
- history of prior anaphylaxis

Occupational Seafood Allergy

Most reactions are associated with direct contactinhalational exposure during cutting, cleaning, cooking, or drying of seafood. Occupational reactions have been reported in a variety of seafood workers, includingFishermen, Seafood processing workers, Canners, Restaurant cooks, Delivery personsOther workers associated with the seafood industry

Occupational seafood allergy can manifest as

- Rhinitis
- Conjunctivitis
- Asthma
- Urticaria
- Contact dermatitis
- OAS

Snow crab workers had

- 33% incidence of asthma
- 24% incidence of skin rash
- 18% rate of rhinitis or conjunctivitis

In a survey of occupational allergies in seafood workers in Australia and South Africaskin reactions accounted for 78% to 81% of reported problemsasthmatic symptoms (7% to 10%)nonspecific allergic symptoms (9% to 15%)Although rare, vascular problem related to occupational seafood exposure has been reported

Handling of following seafood causes occupational asthma

- Oysters, clams
- Shrimp, prawns
- Fish
- Snow and king crabs
- Lobsters
- Abalone
- Powdered marine sponges
- Cuttlefish,
- Clam liver extract
- In one case study, shark cartilage powder caused a fatal occupational asthma attack

Symtoms of hypersensitivity pneumonitis

- Dyspnea
- Fever
- Chills
- Cough
- Malaise
- Chronic low-level allergen exposure
- Severe dyspnea
- Fatigue
- Weight loss
- Fever and chills may be absent

Diagnosing a seafood allergy can range from simple to complex There are number of hidden allergens in foods, as well as seafood allergy mimics (such as seafood toxins and allergens present in seafood parasites), that can easily go unrecognized. Many non-seafood products contain fish and shellfish, often unknown to the consumer. For example, imitation crab meat is usually made of pollock or monkfish. Surimi, which is processed fish meat usually derived from Alaskan pollock in the United States, is commonly used for seafood-flavored snacks, sauces, flavors, “meatless” hot dogs, sausages, pepperoni sticks, imitation crab, and pizza toppings. Anchovies are a routine ingredient in Caesar salad dressing . Many pills and medications contain chitin, a component of the outer skeleton of crustacea and other arthropods.

Seafood parasites Eg: parasite *Anisakis simplex***.** IgE-reactivity against *A. simplex* to be higher than that against any specific fish tested, suggesting that sensitization to *Anisakis* allergen is more common than sensitization to any fish allergens. A common mimicker of IgE-mediated seafood allergy is scombroid poisoning Scombroid intoxication usually within 10 to 30 minutes of ingestion, the histamine produces symptoms that mimic IgE-mediated allergy Perioral tingling and burning sensations

- Flushing
- Urticaria
- Gastrointestinal complaints
- Tachycardia
- Hypotension

Other types of seafood poisoning (ciguatoxin, diarrheic shellfish poisoning, and others) may result in a variety of physical complaints, but these are usually clinically distinct from IgE-mediated allergic reactions.Similarly, seafood-associated illness may occur

secondary to bacterial and viral etiologies, such as poisoning due to toxins (botulism, *Staphylococcus*) or gastroenteritis from bacterial or viral infection.These illnesses also tend to be clinically distinct from IgE-mediated reactions

Diagnosis

A critical step in diagnosing seafood allergy, or any other food allergy, is obtaining a thorough and accurate history, including

- specific symptoms
- timing of the reaction
- prior history of similar reactions
- presence of known food allergies
- any factors that increase the severity such as exercise

Patients should also be questioned about possible contaminants or hidden allergenic ingredients. Research suggests that medical history alone is insufficient in diagnosing food allergy. Skin prick testing patients with suspected seafood allergy, SPTs (Skin prick tests) are a relatively safe and inexpensive, Commercial extracts are not available for every seafood species; therefore, mixed extracts are often used Additionally, actual raw or cooked food itself can be used for skin testing . SPT may be harmful in patients with a history of severe anaphylactic reaction to the seafood being tested or in patients with significant skin disease

- SPTs
- Highly sensitive
- Excellent negative predictive value
- Poor positive predictive value
- RAST

In vitro diagnostic methods, such as measurement of serum food-specific IgE by radioallergosorbent test, such as the can also be useful screening tools, particularly for patients in whom skin testing is contraindicated. Thus, many patients with positive RAST testing may not have allergic disease when exposed to the allergen in question.

Atopy patch tests (APTs)

Atopy patch tests (APTs) have also been evaluated as useful tools in the diagnosis of food allergy. In the classic patch test, the suspected allergen is applied to a piece of cloth or paper, which is then placed on intact skin and covered with an impermeable barrier for 24 to 48 hours and the patch is then removed and the skin examined. Very little predictive value to the standard SPT and IgE measurements in the diagnostic workup of suspected food allergies and thus cannot be routinely recommended. Although the methods described previously are useful in diagnosing food allergies, diagnosis of occupational allergies often requires a different approach, especially in the case of occupational asthma due to inhalation of a seafood allergen. If the allergic individual notes the onset of asthma symptoms related to work exposure, and there is improvement during weekends or vacation, occupational asthma should be suspected. Asthma is verified by appropriate pulmonary function tests If failed, inhalation of methacholine or histamine to document airway hyper reactivity. Such evaluation can be performed at the workplace or in a controlled laboratory environment

- Pulmonary function test
- Methods in use
- Western blotting
- Molecular genetics
- ELISA
- Mass spectrometry

Fish and Shellfish allergens Treatment

Strict avoidance. Few cases of successful rush immunotherapy with foods have been described ,Very risky .Immunotherapy for food allergy was first described by Freeman in 1930.Rush immunotherapy is the administration of multiple injections either in a single day or over several days to bring normal condition. The risk of adverse reactions, including systemic reactions, is higher than with traditional allergen immunotherapy schedules. Children are at even greater risk for adverse reactions with rush immunotherapy. These patients are pretreated with antihistamines and corticosteroids

Management

The management of seafood allergy does not differ from that of other food allergies and requires instructions on avoidance and education about treatment of reactions in the event of accidental exposure. Patients must be counseled about accidental exposure to food allergens via cross-contact (ie, inadvertent exposure to the allergenic food by contamination of "safe" foods with small amounts of the culprit food). With seafood, this typically occurs at seafood counters, restaurants, and as a result of shared equipment (especially fryers). Reactions due to contact with contaminated saliva through kissing or sharing of utensils have also been reported. Patients must read all food label. As per United States law the presence of eight specified allergenic food. These eight foods include fish and crustacean shellfish (as well as milk, eggs, tree nuts, peanuts, wheat, and soybeans).This legislation is followed since January 2006.Seafood components can appear in unexpected foods, as well as in non-food items. As an example, fish gelatin is a food additive derived from fish skin. Usual doses of fish gelatin are tolerated by most fish allergic persons, but anaphylactic reactions have been reported many of the

allergenic proteins in seafood are stable and could be vaporized or released in steam during cooking. Although airborne exposures to food allergens are unlikely to cause anaphylaxis, respiratory reactions may occur from being near cooking fish or in fish markets. Accordingly, all individuals diagnosed with IgE-mediated seafood allergy should have an epinephrine auto injector(s) available at all times Patients who have experienced anaphylaxis should have a written Anaphylaxis Action Plan

Conclusion

Prevention is better than cure.

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