

Case Report

Enteral Feeding Challenges in a Soy Allergic Patient

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Abstract Patients with food allergy can have life threatening and even fatal reactions on ingestion or even just contact with foods to which they are allergic. Because of this, patients are urged to carry epinephrine auto-injectors, and to advise food providers of their allergy. We report a patient with peanut and soy allergy who had anoxic encephalopathy as a result of an anaphylactic reaction to accidental peanut protein ingestion. Subsequent management was complicated by concurrent soy allergy, an important component of most tube feeding formulas in the intensive care unit. The implications for tube feeding are discussed.

Keywords soy allergy; peanut allergy; enteral feeding

1 Introduction

A patient in her early twenties with soy and peanut allergy accidentally ingested peanut protein that had been used in the preparation of an eggroll. The patient had been provided with an epinephrine auto-injector, but it was not available. This resulted in profound anoxic injury due to anaphylactic shock leading to respiratory and cardiac arrest. The patient was resuscitated with the aid of mechanical ventilation and required tracheotomy as well as tube feeding via a percutaneous gastrostomy tube. Due to soy allergy, conventional tube feeding products were problematic. This case illustrates both the risks of anaphylaxis from unsuspected food ingredients as well as the difficulties of tube feeding with bona fide soy allergy.

2 Case presentation

A patient ingested an eggroll that contained peanut butter and developed anaphylactic shock leading to cardiac arrest. The patient did not suspect that peanut butter was used in making the eggroll, did not advise the restaurant of the history of peanut allergy and strict need for avoidance, and was traveling without a previously prescribed epinephrine auto-injector.

The patient had severe peanut and mild soy allergy since childhood with prior episodes of anaphylaxis to peanut and had a history of consuming soy containing foods with local symptoms of pharyngeal pruritus but no systemic symptoms or history of anaphylaxis to soy. On the day of the anaphylactic event, the patient ingested an eggroll unknowingly made with peanut butter. Emergency medical services (EMS) were called but the patient progressed to respiratory arrest. On arrival of EMS, the patient had pulseless electrical activity. Intubation and resuscitation were performed in the field. Subsequently, the patient could not be weaned from the ventilator and required tracheotomy as well as percutaneous endoscopic gastrostomy (PEG) tube placement.

At the time the patient was seen by the allergy service on the ventilator, vital signs were blood pressure 97/68, heart rate 110 beats per minute, respiratory rate 21 breaths per minute, oxygen (O₂) saturation 99% on synchronized intermittent mandatory ventilation on 50% fraction of inspired oxygen (FIO₂), temperature 38.4 Celsius (C). Head, ears, eyes, nose, and throat examination were unremarkable. The patient had a tracheotomy. Cardiovascular exam revealed a regular rhythm with palpable distal pulses. Lungs were clear to auscultation bilaterally with symmetrical chest expansion. Abdomen was soft with good bowel sounds and no evidence of distension with PEG tube in place. On neurological exam, the patient was non-responsive to deep sternal rub, oculo-cephalic reflex was present, and no spontaneous movements were noted.

The clinical course was further complicated by status epilepticus secondary to anoxic encephalopathy, pneumonia, and urinary tract infection. Treatment with intravenous antibiotics and anti-seizure medication was being undertaken.

Tube feeds had been initiated. Adult enteral formulas are all soy-based and therefore were not used. Elecare (Abbott Nutrition, Columbus, OH, USA), a pediatric non-soy-based

hypoallergic formula, was started. However, the patient was not meeting caloric goals or protein requirements. Estimated nutritional needs were first assessed at 25–30 kcal/kg per the American college of CHEST physicians' equation [2]. Protein needs were assessed at 1.3–1.5 g/kg. Additional nutritional requirements were thought to be required due to poor neurologic function and sacral wounds that had developed secondary to being in a vegetative state. Nutritional needs were then reassessed to 35–40 kcal/kg and 1.5–1.8 g/kg protein.

Skin prick testing was performed to soybean, peanut, tree nuts as well as other common food allergens. The patient had an 8 mm wheal and a 35 mm flare to peanut and a 2 mm wheal and 15 mm flare to soybean. ImmunoCAP measurement of specific IgE to selected antigens was ordered to confirm the skin test results. Peanut was found to be strongly positive at 53.3 kU/L (Normal < 0.35 kU/L) and soy 7.2 kU/L. In light of the patient's history and the confirmed soy allergy results, it was decided to continue to avoid soy-based formulas for enteral feeding. The pediatric formula, Elecare, continued to be used and Juven (Abbott Nutrition, Columbus, OH, USA) was added to the regimen for protein supplementation.

3 Discussion

Food allergy can manifest in many forms. IgE-mediated food allergic symptoms most commonly include pruritus, urticarial rash or hives, flushing, and angioedema. The most severe reaction is anaphylaxis, defined as a life-threatening generalized or systemic hypersensitivity reaction that often includes multiple organ failure, hypotension, and shock. Peanut allergy is a serious and potentially life-threatening condition, accounting for the majority of severe anaphylactic reactions to foods [13].

Data from the United Kingdom and the United States indicate that the prevalence of peanut allergy has recently doubled and now likely exceeds 1% among school-aged children. Unlike milk and egg allergies, which may typically resolve during childhood, peanut allergy tends to persist throughout life [4].

Evaluation of acute-onset reactions suggestive of food allergy requires estimation of food-specific IgE antibodies. Various tests may be used to confirm or disprove the diagnosis, including prick skin tests (SPT) or specific serum antibody assay. Testing for the level of specific IgE antibodies is important in establishing if the reaction is IgE mediated. When undertaking SPT, food extracts are placed on the skin and pricked through with one of various devices. A subsequent wheal of > 3 mm is generally considered a positive result [13], but it is important to have positive and negative controls for comparison. Use of antihistamines interferes with prick skin testing. Both SPT and serologic studies have limitations in sensitivity and specificity based on

intrinsic characteristics of antigens and cross reactivity with related antigens. Patients may also respond to raw foods at skin testing but not to the cooked form. The effect of digestion on the antigen is also impossible to reliably control for.

Given the persistence of peanut allergy the risk for accidental exposure is an important concern and can result in devastating disability, as exemplified in our patient. A recent American study reported that 55% of children with peanut allergy had an accidental exposure over a period of 5.4 years [11]. The omnipresent nature of peanut in the food industry, in the form of cross contamination of foods and utensils, incorrect ingredient information in restaurants and on product labels, and mistakes in label reading further contribute to the risk of inadvertent exposure and can make dietary avoidance difficult.

Our patient was likely the victim of the common practice to use peanut butter to "glue down" eggrolls to prevent the ends from curling during the frying process [14]. In contrast to food manufacturing, cross contamination in a restaurant is more likely to lead to high-dose exposures, which may be linked to the growing frequency of severe allergic reactions occurring in restaurants [15].

Epinephrine auto-injectors should be provided to patients at significant risk for anaphylaxis due to food allergy, although estimation of risk is often difficult and false positive skin and serum IgE antibody tests are common. However, a study of 101 families prescribed self-injectable epinephrine revealed that only 71% had epinephrine on hand, 10% had devices beyond the labeled expiration date, and only 32% could correctly demonstrate proper use of the device [12].

Acute respiratory failure (ARF) requiring intubation and mechanical ventilation is the most common reason intensive care unit (ICU) patients cannot eat [1]. Because malnourishment is directly associated with poor outcomes, providing artificial enteral nutrition to replace full energy needs is a priority [8].

Nutritional support is now considered as a standard of care in the ICU [5]. The goals of nutritional delivery in critically ill patients are to provide nutritional therapy consistent with the patient's condition, prevent nutrient deficiencies, avoid complications related to nutrition delivery, and improve patient outcome. The main objective of nutrition in critical care is to obtain a calorie content of 25–35 kcal/kg/day [2]. The amount of calories is based on measurement of oxygen consumption (indirect calorimetry) as the reference, but this requires costly equipment and technical skills that are not widely available, as well as being time consuming [6]. Therefore, equations are used to assess nutritional needs.

Previous reports have shown that the calorie supply prescribed and that actually delivered are often below the

patient's calculated theoretical needs [3]. Unfortunately, a number of factors make the provision of optimal enteral nutrition difficult, including insufficient caloric targets, gastrointestinal dysfunction such as vomiting and diarrhea, repeated procedures and surgeries associated with interruption of enteral nutrition, feeding tube displacement, inadequate routine nursing procedures with delayed administration of the enteral feed, or premature enteral nutrition withdrawal [7].

Choosing the most appropriate tube feeding formula is a critical factor in achieving nutritional goals. A wide variety of commercially prepared formulas are available. However, a complicating factor in providing adequate nutrition in the critically ill patient arises when food allergies are present. Enteral formulations may contain milk, soy, corn, or egg products, all of which are common allergens [10]. This was especially challenging in our patient who is hypersensitive to soy and peanuts. The fat component of enteral formulations serves as a concentrated source of energy and a source of essential fatty acids. Long chain triglycerides (LCT) or medium-chain triglycerides (MCT) may be used in enteral formulations. Corn and soybean oil are the most common source of LCT [9].

Elecare, an amino acid-based hypoallergenic formula, was chosen for our patient. Hypoallergenic is defined as a diminished potential to cause an allergic reaction. This formula is unique in that it contains no soy allergen in its formulation. Elecare is also a specialized pediatric formula. While it could provide our patient with adequate calories, it provided an inadequate amount of protein to support the patient's hyper-metabolic stress state. An additional protein source was required that had to be peanut and soy free. Juven is a tube-feed nutritional supplement chosen because it is both soy and peanut free. It contains the amino acids L-glutamine and L-arginine as well as an amino acid metabolite, calcium beta-hydroxy-beta-methylbutyrate. Juven comes in the form of a packet administered via the feeding tube to supplement enteral formula feeds. The additional amino acids it supplies help to support wound healing and build lean body mass and support immune function [9].

4 Conclusion

Accidentally ingesting a peanut-containing product can lead to anaphylaxis in severely allergic patients, resulting in serious impairment and even death. There is a need to educate patients on avoidance measures to minimize inadvertent allergen exposures especially with meals prepared outside home. In addition, special considerations need to be made for patients who have food allergies and require enteral feeds. Allergy evaluation should be completed prior to committing a patient to specialized nutritional formulas that may not meet the patient's

caloric needs. Nutritional demands need to be assessed in critically ill patients and adequate supplementation should be administered with careful consideration of potentially significant food allergies.

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