Management of food allergies in children

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What is food allergy?
The European Academy of Allergy and Clinical Immunology (EACCI) guidelines propose that any adverse reaction to food should be called food hypersensitivity.[1] Food hypersensitivity can be either immune or non immune mediated. Food allergy is defined as a form of food hypersensitivity associated with a hypersensitive immune response. IgE mediated food allergy or non IgE mediated food allergy are used depending on the immune mechanisms involved.

The immunological basis of food allergy
Food proteins are broken down into small peptides and amino acids by digestive enzymes. In the normal situation, these dietary antigens are prevented from entering the tissues by physiological and immunological barriers in the gut. However, sometimes small amounts of intact food protein may be absorbed through the gastrointestinal tract and elicit an immunological response when presented to the T cells.

IgE mediated food allergy
The dietary antigens enter the body via the gastrointestinal or lung mucosa. Antigen presenting cells engulf the antigens and present them to a T cell. The T cell sends out messages to direct the rest of the immune response in how to deal with the antigen. For most foods this will normally result in the individual becoming tolerant i.e. not producing any immune response on subsequent exposure but in atopic individuals, the process stimulates the production of T helper 2 (Th2) cells, which direct B cells to produce IgE food specific antibodies to the antigen encountered. These IgE antibodies attach themselves to the surface of mast cells by special high affinity receptors on the cells. Once bound to the cells, they can remain in the tissues for months waiting to come into contact with the antigen they are activated against – this is called sensitisation.[2] Sensitisation can occur through breast milk or even in-utero[3] meaning that very young babies can present with IgE mediated food allergy.

On subsequent exposure to the antigen, the specific IgE antibodies recognise certain areas on the food protein called epitopes which allows the protein to cross-link with the antibody and cause mast cell degranulation and the immediate release of substances such as histamine, prostaglandins and leukotrienes which mediate the reactions that produce the symptoms of an IgE mediated allergic reaction. IgE mediated food allergy is often referred to as an 'immediate onset reaction' as the onset of symptoms occurs usually within minutes of ingestion of the food protein or up to two hours post ingestion and can result in anaphylaxis.

Non IgE mediated food allergy
Whilst the immune mechanisms involved in non IgE mediated food allergy are not as clearly understood as those involved in IgE mediated food allergy, the absence of IgE production has been clearly established.[4] The involvement of T helper 1 cells (Th1) and cells such as eosinophils are indicated. Non IgE mediated food

allergy is usually characterised by a delayed reaction occurring hours or even days after eating a certain food and as such is often referred to a 'delayed onset reaction'. The delayed onset of symptoms and the lack of simple diagnostic tests can make diagnosis of non IgE mediated food allergy challenging.

Prevalence

Food allergy usually manifests itself in early childhood and it is believed to affect between 1 to 6 per cent of children[5,6] depending on the specific allergen involved.

Common foods implicated in childhood allergies

Any food can cause an adverse reaction, but most reactions in children are triggered by ten foods; notably cows milk, hens egg, peanut and tree nuts, fish and shell fish, soy, wheat, sesame and kiwi. Of these, cows milk, egg and peanut are most frequently implicated in infants and children under 3 years of age.[7,8] In older children, the most common food allergies are peanut, tree nut, fish and shellfish.[9,10,11] Most children will not outgrow their allergy to peanut, tree nut, fish and shellfish, but the majority of children will outgrow their allergy to milk and eggs.[12,13]

The European Union has identified 14 major food allergens which are recognised as significant provokers of allergic responses and must be declared by law on pre-packaged foods if they have been added deliberately, however small the amount. These 14 food allergens are milk and milk products including lactose, egg, fish, crustaceans, cereals containing gluten including wheat, rye, barley, oats and spelt, peanuts, tree nuts i.e. almond, hazelnut, walnut, cashew, pecan, brazil, pistachio and macademia, soy, lupin flour, sesame seeds, mustard, celery and sulphur dioxide and sulphites at concentrations greater than 10mg/kg.[14]

Signs and symptoms

Food induced allergic reactions may present with symptoms and signs varying from a few hives to life threatening or fatal anaphylaxis. The most commonly involved target organs are the skin (urticaria, angiodema, pruritis, eczema), gastrointestinal tract (diarrhoea, vomiting, pain, blood in the stool, gastro-oesphageal reflux) and the upper and lower respiratory tracts (acute rhino-conjunctivitis, wheezing, coughing, stridor). Severe IgE mediated reactions with cardiorespiratory features are referred to as anaphylaxis and are potentially life threatening. Other symptoms such as food refusal or severe aversive feeding behaviour or problems progressing the weaning diet especially in children with eczema, which is difficult to control are seen in children presenting with non IgE mediated food allergy.

Whilst it is difficult to map symptoms specifically against IgE mediated or non IgE mediated reactions as many manifested symptoms can occur either as IgE mediated or as non IgE mediated reactions or as a mixed pattern of both, it is accepted that the onset of symptoms for IgE mediated food allergy occur within minutes or up to two hours within ingestion of the food and can result in anaphylaxis whilst the onset of symptoms of non IgE mediated food allergy can be hours or days post ingestion of the food and there is no risk of anaphylaxis.

Diagnosis

It is very important to have a diagnosis of food allergy made by a clinician who has knowledge and skills in this area. At present there is no cure for food allergy, but it is a treatable condition best managed with risk reduction. Compromised growth, poor nutritional status and poor quality of life are less likely with an accurate diagnosis and management.

The clinical and diet history are paramount in aiding the diagnosis of food allergy. Information pertaining to the time between ingestion and reaction of the food, amount of food needed to cause a reaction, the frequency and reproducibility of the reactions, the signs and symptoms observed and whether the food was raw or cooked are all areas that need to be addressed in addition to the age of the child at the onset of symptoms and family history of atopy.

Skin prick tests (SPT) (measures specific IgE attached to mast cells in the skin) and specific IgE blood tests (measures levels of circulating specific IgE to allergens in circulation) are useful adjuncts to a good clinical history if IgE mediated food allergy is suspected and are the only validated diagnostic tests available. Testing should be focused on the suspected food identified by the clinical and diet history. Multiple tests (e.g. food panels) are not recommended. SPTs are a simple, effective, cheap, quick and extremely safe means of assessing sensitivity to a wide range of food allergens. The SPT is performed using commercial allergens or fresh foods. The latter is known as the prick to prick test(PPT). Fresh foods are used because food allergens specifically those of fruit and vegetables, may be destroyed during the preparation of commercial extracts or in some cases because no commercial extract is available. The specific IgE test is more invasive, there is a delay in obtaining results and it is more expensive, but it is useful in the presence of severe skin disease, if the patient is taking symptomatic medications or if dermatographism is suspected. There is no role for vega testing, kinesiology, hair analysis and pulse testing or IgG in the diagnosis of food allergy.

Interpretation of the results of the SPT or Specific IgE tests must be read in conjunction with the clinical and diet history as the presence of IgE in the skin or in the blood only indicates that an individual is sensitised to an allergen and not necessarily that he or she is clinically allergic. However, negative results are extremely useful in ruling out IgE mediated food allergy. A positive SPT (if the wheal diameter is at least 3mm larger than the negative control in children older than 2 years (15) and at least 2mm larger in children younger than 2 years (16)) indicates with 50 per cent positive predictive accuracy that the child may have a true IgE mediated allergy to the food. More specific clinical decision points for both SPT and specific IgE blood tests are available in the literature and can give a good indication of which children may or may not need to undergo a hospital or home based food challenge.[17,18] Neither SPT or specific IgE levels predict the severity of the reaction.

The only method for diagnosis of non IgE mediated food allergy is an elimination diet (i.e. single food exclusion diet, multiple – food exclusion diet, few foods diet or elemental and protein hydrolysate formula diets) followed by reintroduction of the food or a food challenge. The elimination diet must be determined by a dietitian based on a detailed clinical and diet history supported by a food and symptom diary.

Food challenges are an integral part of the management of food allergy in children, where they are used to confirm presence or absence of symptoms caused by ingestion of a food allergen. Food challenges are usually conducted in a hospital setting where medical support is available to treat allergic reactions

should they occur. However, improved understanding of tolerance where the anticipated reaction risk is low, is allowing for the recommendation of home based food challenges under medical and dietetic supervision and adherence to home challenge protocols.

Dietary management

Dietary management is the cornerstone in all cases of confirmed IgE mediated food allergy and in the diagnosis and management of non IgE mediated food allergy.

Access to an experienced paediatric dietitian is imperative to ensure that nutritional status and growth are maximised despite the exclusion of key food groups and that the child and family are educated about the use of suitable free from substitutes, label reading, risk of cross contamination and given practical information on recipes, how to deal with nurseries, childminders, carers and school, eating out, going on holidays and birthday parties in addition to advice on medi alert products such as awareness jewellery, badges, stickers, key rings with logos.

Diagnosis and management of food allergy in infants under one years of age poses a particular challenge to health care professionals as either breast or formula milk are the sole sources of nutrition for the first 4 – 6 months of life and thereafter continue to be a major source of the infant's nutrition in addition to the weaning diet. Faltering growth, bone demineralisation and aversive feeding behaviours are well documented complications due to inappropriate diagnosis and management. Cows milk protein allergy (CMPA) is most frequently implicated in infants and can present in the exclusively breast fed infant as well as the infant taking a cow's milk based infant formula milk. It can also develop when mum is weaning off breast feeds and changing over to a cow's milk formula milk or when spoon feeds are introduced into the diet. Breast feeding is the feed of choice and should never be stopped as a result of a diagnosis of CMPA. Management should focus on the maternal diet and only if symptoms persist should an alternative milk substitute be introduced. Amino acid based formulas are the preferred formulas of choice in this group of infants. If an infant reacts to a cows milk based formula milk, an extensively hydrolysed formula milk is recommended. All infants with a diagnosis of CMPA must be referred to a dietitian so that advice can be given regarding the formula of choice and on how to manage a milk free weaning diet.

An experienced dietitian can complete SPTs , train the parents, child and other carers on how to administer adrenaline if such medication is indicated and advise on management of home based food challenges or when a hospital based challenge should be conducted.

Conclusion

Food allergy is an adverse reaction to certain foods that is mediated by the immune system and includes IgE mediated and or non IgE mediated food allergy depending on the immune mechanisms involved.

Dietary elimination under the supervision of an experienced dietitian and determined by a detailed allergy focused history, with or without SPT and specific IgE blood tests, followed by the re-introduction of the food or a food challenges, remain the gold standard in the diagnosis of food allergy and in the determination for resolution or persistence of the food allergy.

A diagnosis of food allergy with a potential risk of anaphylaxis and the prescription and carriage of adrenaline can have a profound impact on quality of life for the patient and their families and the effects should not be underestimated. This impact arises both from the distress caused by the symptoms and the constant need for vigilance to avoid allergens.

The challenge for all health care professionals working in this field of medicine is in correctly diagnosing food allergy and advising on appropriate management strategies in order to ensure nutritional adequacy of the diet, maximise growth potential and improve quality of life for the children and their families.

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