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CLINICAL CASE

Latex-fruit syndrome in a patient with Chiari type II malformation - A case report

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Abstract

Arnold-Chiari malformation is characterized by a downward displacement of both the vermis and cerebellar tonsils, associated with brain stem malformation and myelomeningocele. Latex allergy is a public health problem in this group of patients which is caused by immunological mechanisms Type I and IV. The clinical manifestations are diverse, consisting of any combination of: angioedema, rhinitis, conjunctivitis, asthma and anaphylaxis. Joint allergy to latex may present cross-reactions with other allergens contained in some fruits called latex-fruit syndrome, and the fruits most commonly involved are banana, avocado, kiwi, papaya, passion fruit, melon, pineapple, peach, chestnut, and others. The timely diagnosis of latex allergy allows preventive measures to be performed, thus reducing the risk of severe reactions such as anaphylactic shock. We report a case of latex-fruit syndrome in a patient with Arnold-Chiari malformation.

Key words: *Arnold-Chiari malformation. Latex allergy. Latex-fruit syndrome.*

Introduction

Chiari malformations are a heterogeneous group of disorders that are defined by anatomical anomalies of the cerebellum, brainstem, and craniocervical junction. They present a downward displacement of the cerebellum either alone or together with the spinal cord[1]. There are three main types: malformation of Chiari Type I (MC-I) is characterized by having abnormally shaped cerebellar tonsils that move below the level of the foramen magnum. Chiari II malformation (MC-II), also known as Arnold–Chiari malformation, is characterized by a downward displacement of both the vermis and the cerebellar tonsils, associated with malformation of the brainstem and myelomeningocele. The Chiari III Type malformation (MC-III) is the rarest of all, and it is characterized by cervical or occipital encephalocele with the displacement of the brainstem to the spinal canal and usually with sliding of the cerebellar tonsils[2]. Fornix anomalies and other structures in the fetal brain are probably responsible for the abnormalities in cognitive function that is frequently observed in individuals with myelomeningocele. These abnormalities have important effects on brain development being the main cause of cognitive deficits, attention deficit, poor executive skills, stridor, and apnea, and they are also responsible for high mortality[3]. Latex allergy is a public health problem in patients with risk groups, and within these vulnerable groups, patients with congenital malformations such as myelomeningocele have the risk of anaphylactic reactions to latex during surgeries or radiological procedures[4]. It has

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been documented that performing surgeries before 3 months of age was significant as a risk factor for developing latex allergy in patients with spina bifida (p=0.008, RM=5.4, 95% confidence interval=0.7–29.2)[5]. The prevalence of latex allergy in children with spina bifida or with urogenital anomalies varies between 32.6% in studies using skin tests and 34-72% in those based on serological tests[6]. At least 13 latex allergens have been identified; Hev b1 and Hev b3 are the allergens most assiduously involved in the sensitization of children affected by congenital malformations, Hev b2 and Hev b4 are the most important in the case of health workers, Hev b5 is recognized by the immunoglobulin E (IgE) of both groups, and finally, Hev b6 more frequently sensitizes the workers in the rubber industry[7]. The clinical manifestations are diverse, they can be local or systemic, they consist of any combination of: angioedema, rhinitis, conjunctivitis, asthma and anaphylaxis. They depend on the route of exposure to latex, the amount of allergen and personal characteristics[8]. Cutaneous manifestations are the most frequent, one of which is acute urticaria, which is caused by an immediate-type hypersensitivity (Type I) to the components of the protein present in latex. Another form of presentation is contact dermatitis caused by a mechanism of delayed-type immune injury (Type IV), which is diagnosed by patch tests[9]. In addition to allergy to latex proteins, cross-reactions can occur with other allergens that cross-react with proteins contained in some fruits; about 30-50% of patients allergic to latex show symptoms of allergy to foods derived from plants, especially fruits called latex-fruit syndrome which manifests clinically from an oral allergy syndrome to anaphylactic shock[10,11]. The fruits most commonly involved are banana, avocado, kiwi, papaya, passion fruit, melon, pineapple, peach, and chestnut. On the other hand, in patients with latex positive skin tests, 60% of these have the possibility of presenting latex-fruit syndrome and 100% of patients with a latex negative skin test can hardly present this syndrome. Latex can also be a dangerous allergen when it is hidden in other substances; some cases of postprandial anaphylaxis are attributed to contamination of food by the use of latex gloves in its preparation[12-15]. The clinical history is the most important diagnostic element, and it is essential to identify the risk categories to subject these patients to diagnostic tests. TIt is important to investigate in all patients with probable latex allergy, the presence of clinical manifestations caused by contact with latex objects (In children, peribucal angioedema occurs immediately after inflating balloons), it is also essential to evaluate unexplained episodes of urticaria or anaphylaxis[16]. Within the diagnostic tests, the intraepidermal (prick) tests are the diagnostic method for detection of Type I hypersensitivity which have a risk of minimal anaphylaxis with high sensitivity and specificity[17], *in vitro* tests such as specific serum IgE (ImmunoCAP) quantification tests have greater discordance than tests cutaneous and vary between 23 and 83%, and other non-standardized tests that can be performed during the diagnostic protocol are those of provocation; however, they are reserved if the skin tests are negative[18]. In the case of latex-fruit syndrome, for the diagnosis of food allergens it is advisable to perform a variety of skin tests known as intraepidermal tests with fresh food (prick to prick), this technique is more consistent with evidence of food exposure than intraepidermal tests made with commercial extracts[19]. On the other hand, until today, the best therapeutic and economic option is the avoidance of latex, and the treatment of clinical manifestations with pharmacotherapy is possible but unfortunately not curative[20]. The use of allergen-specific immunotherapy is controversial because it has variable efficacy and is limited by the frequency and severity of adverse reactions[21]. Finally, monoclonal antibody treatment is under investigation for use in patients with latex allergy, and only it has been prescribed in isolated cases under the indication “off label” combined with the use of specific immunotherapy with allergens[22]. The opportune diagnosis of latex allergy in patients of risk groups allows to implement the prevention measures of latex allergy; in this way, it is possible to reduce the risk of severe reactions, which will reduce both morbidity and mortality and, therefore, the costs of medical attention. We report the case of a patient with latex allergy and latex-fruit syndrome with a history of Arnold–Chiari malformation and lumbosacral myelomeningocele.

Clinical Case

A 12-year-old male patient presented with no history of familial atopy, immunodeficiency, or autoimmunity. Pregnancy and birth: pregnancy number: 2, mom’s age: 20 years old, pregnancy diagnosis month: 5th month, prenatal checkups: 5 consultation, use prescription drugs: vitamins and folic acid, prenatal diagnosis of open caudal myelodystrophy by ecografy. Was the birth cesarean at 38 weeks of gestation, Apgar score: 7/9, birth weight: 3,150 kg, birth length: 51 cm, omphalorrhexis: 10 day. Nutrition and feeding: breastfeeding: 3 months, ablation: 9 months. Feeding without problems or restrictions. Abnormal psychomotor development requires treatment with early stimulation for 4 years. Personal medical history: Chiari type II malformation, it

Table 1. Chronology of surgical procedures

Surgery	Indication	Age	Complications
Myelomeningocele plasty	Chiari malformation Type II	Newborn	None
Ventriculoperitoneal shunt	Hydrocephalus	Newborn	Valvular dysfunction
Ventriculoperitoneal shunt	Hydrocephalus	30 days	None
Hydrocelectomy	Hydrocele	6 months	None
Ventriculoperitoneal shunt	Valve replacement	3 years	None
Extracorporeal lithotripsy	Renoureteral lithiasis	11 years	None

was treated surgically in the postnatal period without presenting apparent complications, other surgical antecedents (Table 1). Infectious background has recurrent urinary tract infections since age 11 of age secondary to bladder lithiasis. Allergic background: at 6 years of age, he presented with Type B adverse reaction to diclofenac characterized by acute urticaria and dyspnea. The patient is not allergic to iodinated contrast media. His allergic disease began in 2009, the patient presented wheals located in his right arm, andioedema in his eyelids and pruritus, previously the patient had contact with a latex glove during blood test. For that reason he was taken to the emergency room where he was prescribed antihistamines. He has also presented angioedema on the lips to contact with balloons and pharyngeal pruritus with fruits such as mango and papaya. It is sent to our office for immunoallergic evaluation. Physical examination: awake and alert; oriented to person, place and time. Scissor gait. Rest of physical examination normal. Workup. Skin tests were done with prick technique, positive result to Latex and Quercus, confirming allergic etiology mediated by specific IgE. Prick to Prick tests, positive results to mango and papaya, confirming latex fruit syndrome. Finger test was normal, discarding mechanism of delayed-type immune injury. Blood studies: Immunological studies were performed. In conclusion, it is important to make a detailed clinical history and make diagnostic tests in order to identify patients at risk of latex allergy, and thereby avoid anaphylaxis during the procedure where latex is used (Figs. 1 and 2, Table 2).

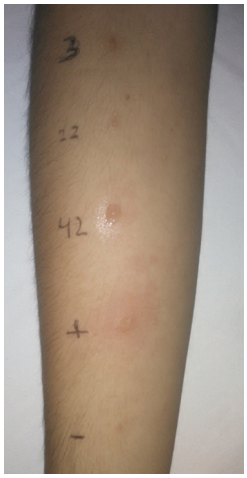

Figure 1. Interpretation of skin test results by Prick; negative control D = 1 mm, allergen #3 (*Quercus* spp.) D = 4 mm, allergen #12 (*Fraxinus* spp.) D = 2 mm, allergen #42 (latex) D = 6 mm, and positive control (histamine) D = 11 mm.

Discussion

Patients with Chiari malformations are notoriously the group with the highest prevalence of latex allergy, and these patients require repetitive surgeries or urine catheters, so they are at risk of developing a latex allergy. The main risk factors that have been described are the atopic background and the number of surgical interventions to which these patients have been subjected. Our case was a 12-year-old male patient with a history of Arnold–Chiari malformation who required at birth surgical management for the closure of myelomeningocele and placement of a peritoneal ventricular bypass valve with a change per month due to dysfunction of the same, adding three surgeries in the first 3 months of age, having a high risk of latex allergy coinciding with what is described in the literature. Latex allergy manifests itself acutely or chronically through immunological and non-immunological mechanisms. In our case, the patient presents with acute urticaria and facial angioedema due to the immunological mechanism of Type I IgE-dependent lesion. In addition to the allergy to latex proteins, cross-reactions with proteins contained in fruits may

Table 2. Immunological data of the patient with latex-fruit syndrome

Parameters	Results	Reference values for age	Unit of measurement
Blood count			
Hemoglobin	17	14-18	g/dl
Platelets	267	150-500	miles/mm^3
Leukocytes	5.48	4.5-11	miles/mm^3
Lymphocytes	2.41	0.9-5.2	miles/mm^3
Monocytes	0.32	0.16-1.0	miles/mm^3
Neutrophils	2.34	1.40-8.00	miles/mm^3
Eosinophiles	0.38	0.00-0.70	miles/mm^3
Basophils	0.02	0.00-0.20	miles/mm^3
Lymphocyte subpopulations			
CD3	1720	690-2540	cel/μL
CD4	788	410-1590	cel/μL
CD8	734	190-1140	cel/μL
Relation 4/8	1.01	1.5-2.1	
Immunoglobulins			
IgG	1010.0	700-1600	mg/dl
IgA	186.0	70-400	mg/dl
IgM	84.5	82 (41-149)	mg/dl
IgE	237.9	00200	UI/ml
Complement			
C3	94.7	80-180	mg/dl
C4	18.6	10-40	mg/dl
Acute-phase reactants			
PCR	0.2	0.00-3.00	mg/l
VSG	1	0.00-10.00	mm/h

IgE: immunoglobulin E.

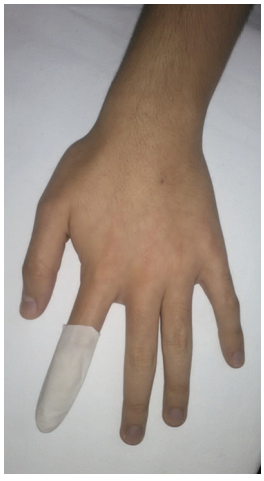

Figure 2. Finger test.

occur due to the highly allergenic composition, a condition known as latex-fruit syndrome. The diagnosis by clinical history is fundamental for the identification of patients in situations of risk, and the next step of the diagnostic algorithm is the realization of skin tests, followed by the determination of specific IgE and provocation tests; in our case, the diagnostic approach was initiated with the complete clinical history, and latex allergy was confirmed with standardized skin tests, being positive for latex and *Quercus* spp. considering a second diagnosis of pollen-fruit syndrome; the prick-to-prick tests for fruits were made for mango and papaya resulting positive. The finger test was negative, ruling out a type IV injury mechanism. Hev b1 and Hev b3 are the allergens with greater allergenicity in patients with spina bifida; however, the component diagnosis was not completed due to the high costs involved in its realization. In conclusion, it is important to identify patients with risk of latex allergy, through diagnostic resources available to avoid complications during procedures involving contact with latex such as anaphylactic shock.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

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