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Special Topic

Recognition and Management of the Latex-Allergic Patient in the Ambulatory Plastic Surgical Suite

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Abstract

Allergic (IgE antibody-mediated) reactions to proteins retained in natural rubber latex (NRL), although decreasing in prevalence, are still a concern in many clinical practices due to possible sensitization of healthcare workers exposed to latex in the office setting and patients with histories of latex allergy who present in the office. In this article, the authors outline the risk factors for latex allergy, describe the symptoms of latex allergy, and provide direction on how to create an environment safe for medical care of latex-allergic patients. In addition, treatment of anaphylaxis to NRL is outlined, including precrisis steps in preparation for anaphylactic reactions in the office surgery setting. Many of the precautions outlined in this article could be extrapolated for a healthcare worker with known or suspected latex allergy.

Keywords

allergy, latex, ambulatory clinic

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Latex products are heavily utilized in modern medicine due to their superior barrier qualities, durability, flexibility, modulus, and elasticity. With the onset of the blood-borne pathogen epidemics such as hepatitis C and human immunodeficiency virus (HIV), the implementation of universal precautions (now known as standard precautions) in the 1980s resulted in a dramatic increase in latex glove use.¹ At that time, the content of protein allergens in finished gloves and other latex products made with a dipping method were very high. In addition, powdered latex gloves—which contained highly cross-linked cornstarch donning powder—efficiently carried latex into the ambient environment, leading to mucosal and respiratory tract contact, with subsequent allergic reactions. Latex allergy became widely recognized in the late 1980s and early 1990s, with numerous reports of intraoperative anaphylaxis in children with spina bifida^{2,3} and latex allergy in healthcare workers (HCW).⁴

RISK FACTORS FOR DEVELOPING LATEX ALLERGY

All patients who present for surgical procedures should be questioned about possible latex allergy. Patients at highest

risk include those who have a history of multiple surgeries, allergic disease, or spina bifida, or who are employed in occupations with inherent latex use (ie, healthcare workers).^{2,5,6} Individuals who have undergone multiple surgeries for urogenital abnormalities (which would require frequent urinary catheterizations) or those who have spina bifida are at the highest particular risk for latex allergy.⁷ In all individuals, a history of environmental or food allergies (atopy) increases the risk of latex sensitization and should be screened for during patient interviews.^{2,8} Allergic reactions to certain foods such as banana, kiwi, avocado, or stone fruits like cherries or peaches are also associated with latex allergy.

Furthermore, hand dermatitis is a risk factor for latex allergy, particularly among healthcare workers, who have a very high rate of irritant dermatitis of the hands that precedes or accompanies their allergy to natural rubber

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Table 1. Products That May Contain Latex

Respiratory products	Face mask Ambu bags Anesthesia circuits Bite blocks Endotracheal tubes Ventilator hose, bellows, balloons Suction tubing
Bandages/adhesives	Tape ^a Dressings Elastic bandages ^a Electrodes
Tubing/catheters	Rectal or urinary catheters ^a Drains ^a —Penrose drains, etc
Intravenous (IV) supplies	IV bags Injection ports Adaptors Tourniquets ^a
Patient assessment equipment	Blood pressure cuff and tubing Reflex hammer Stethoscope tubing Pulse oximeter
Medication administration equipment	Plastic syringes Vial tops/rubber vial stoppers Bulb syringes Medication droppers
Other equipment	Vascular stockings
Protective equipment	Gloves ^a Masks

Adapted from <http://www.latexallergyresources.org/topics/medicalProducts.cfm#SurgicalEquipment>

^aThese products are frequently made with a lower heat and reduced time of cross-linking of natural rubber latex in a dipping process.

latex (NRL).⁴ Physicians should ask about this problem specifically, as patients may forget to disclose it initially. Hand dermatitis can result from either allergic contact dermatitis or irritant contact dermatitis. Allergic contact dermatitis, a delayed-type hypersensitivity reaction, is generally caused by an allergy to chemicals retained in finished rubber products, such as gloves. In contrast, irritant contact dermatitis is not caused by an allergy to any particular product but is caused or exacerbated by frequent hand washing with harsh soaps. Regardless of the cause, the presence of hand dermatitis is a risk factor for developing latex allergy among healthcare workers.⁴

RECOGNITION OF LATEX ALLERGY

Suspicion of latex allergy begins with the history of risk factors, exposures, and reactions to latex. Confirmation of latex allergy is achieved through laboratory testing. When being seen for consultation prior to surgical procedures, patients with a possible latex allergy should have a workup

performed by an allergist prior to the surgical procedure. If there is no time to obtain such consultation, the incorporation of latex-safe precautions is indicated.

Timing of symptoms in relation to latex exposure is important information to elicit from the patient. Symptoms that begin immediately (within an hour) after exposure to latex products are supportive of latex allergy,⁹ but some individuals may report delayed onset of symptoms. Additionally, healthcare workers exposed to powdered latex gloves may report symptoms consistent with occupational asthma, conjunctivitis, or rhinitis.^{10,11} However, history alone can lead to a false-positive diagnosis of up to 15%,^{12,13} so reliable confirmatory testing for latex allergy is needed.

US Food and Drug Administration (FDA)–approved, currently available confirmatory testing for latex allergy consists of blood tests evaluating for anti-latex IgE (the “allergy antibody”). These tests have a relatively high specificity^{14,15} (a positive test in the face of a suspicious clinical history carries a 98% chance that the patient has latex allergy) but should only be interpreted in the context of the history of the patient’s exposures and reactions. The current serologic tests should not be administered in the absence of a suspicious history, as many positive tests are likely to be false positives. Allergy skin testing to NRL, usually the most sensitive method of detecting sensitization to any allergen, has been hindered by higher rates of systemic allergic reactions to the skin test itself and failure to gain FDA clearance for the reagent for such testing.⁹

CARE OF PATIENTS WITH LATEX ALLERGY

Avoidance of latex is the only available management for patients with latex allergy. Physicians must be aware of the products that may contain latex protein allergens, in order to produce a safe environment for patients and healthcare workers with latex allergy (Table 1). Although the transition to powder-free latex gloves and/or latex-free examination and surgical gloves can be difficult,^{16,17} it is one of the most important steps in creating this safe environment.¹⁷⁻²⁰ Manufacturing practices have changed dramatically over the past decade, and fewer gloves are produced with powder, which means limited airborne contamination of the inhalable particles that carry latex proteins. Although it is inappropriate to use any latex products in direct contact with a patient or worker who has a known latex allergy, making a simple change to powder-free gloves will reduce the risk of inadvertent exposure from an environment contaminated by latex aeroallergen.

Preparing for a procedure on a latex-sensitive patient requires multiple steps (Table 2). One of the most important steps is assessing for the presence of latex-containing products and finding suitable alternative products or modifications. In 1997, the FDA began requiring labeling on all medical equipment containing natural rubber latex.²¹ However, the FDA does not require that combination products that contain latex as one component comply

Table 2. Steps to Ensure a Latex-Safe Office Visit or Surgical Procedure

Prior to the visit:
1. Assess the exam room or surgical suite for latex-containing products.
2. Find suitable nonlatex alternatives for use during the procedure, or prepare for modifications that can make the products safe for use with latex-allergic patients. *Be sure to include proper latex-free resuscitation equipment in the preparation for surgery for a latex-sensitive patient.
3. Schedule latex-sensitive patients for the first procedure of the day, which will decrease the risk of contamination from powdered latex surgical gloves used in other procedures.
4. Inform all staff of the patient's allergy and the precautions that must be taken.
5. Label the room that will be used as a "Latex-Free Room."
6. Label the patient's chart with information on his or her latex allergy.
7. Sterilize equipment for the procedure in a latex-free load.
During the visit:
1. Closely assess the patient prior to surgery, noting any skin rashes and documenting lung exam and blood pressure.
2. Place only nonlatex products (ie, bouffant, mask) on the patient.
3. Monitor the patient closely during the procedure for changes in respiratory function, blood pressure, or new skin findings.

Table 3. Signs and Symptoms of Anaphylaxis

System	Symptoms
Skin	Redness of the skin Urticaria (hives) Swelling of the face, lips, or tongue Pruritis ^a
Respiratory	Increased respiratory rate Stridor Wheeze Decreased oxygen saturation, cyanosis Nasal congestion, rhinorrhea, or sneezing ^a
Cardiovascular	Tachycardia Hypotension Chest pain ^a Shock Cardiac arrest
Gastrointestinal	Nausea, cramping abdominal pain ^a Vomiting Diarrhea
Neurologic	Anxiety, headache, dizziness, confusion ^a Feeling of impending doom ^a

^aThese symptoms may only be noted in patients who are alert.

with this law.²² Therefore, products such as rubber stoppers for medication vials, which may contain latex, are not included in the labeling requirements. There is

Table 4. Diagnostic Criteria for Anaphylaxis

Anaphylaxis is likely with any of the following three criteria:
1. Acute onset (minutes to hours) of an illness that involves the skin, mucosal tissue, or both (hives, pruritis, flushing, swelling of the lips, tongue, uvula) and at least one of the following: - Respiratory compromise—dyspnea, wheeze, stridor, hypoxemia, tachypnea - Decreased blood pressure (BP) or associated symptoms of end-organ dysfunction—hypotonia, collapse, syncope, incontinence
2. Two or more of the following that occur rapidly after exposure to a likely allergen for that patient: - Involvement of the skin/mucosal tissue (hives, pruritis, flushing, or swelling of the lips, tongue, or uvula) - Respiratory compromise—dyspnea, wheeze, stridor, hypoxemia, tachypnea - Decreased BP or associated symptoms—hypotonia, collapse, syncope, incontinence - Persistent gastrointestinal symptoms—cramping abdominal pain, vomiting
3. Reduced blood pressure after exposure to a known allergen for that patient: - Infants/children: low systolic BP (age specific) or >30% decrease in systolic BP - Adults: systolic BP less than 90 mm Hg or >30% decrease from baseline

controversy about the risk of allergic reaction from these vial stoppers, but experiments with repeated puncture of multiple-use vials have shown detectable levels of latex allergen.²³ Therefore, unless the manufacturer has provided specific information on the product, it is best to assume that there may be latex present, with a concurrent risk of reaction. To decrease the risk, we recommend selecting single-use vials or new (never previously punctured) multiuse vials and/or "popping the top" (removing the rubber stopper) when dispensing medication to latex-allergic patients. Other products that may contain latex, including blood pressure cuffs and stethoscope tubing, can be covered with cloth in order to maintain a safe environment for the patient.

Another helpful step is to schedule the patient's procedure as the first case of the day, after the room has been thoroughly cleaned and before there is possible contamination from latex products during the course of the day. (Conversion of an office and/or surgical suite to powder-free gloves may render this recommendation irrelevant.) Signs should be placed outside the operating room noting that the procedure will be latex-safe, and the patient's personal identification band should indicate that the patient is allergic to latex. It is very important to document the steps taken in the office to plan for and to protect patients who have latex allergy. Implementing a preoperative checklist can be very helpful in ensuring that your office is adequately prepared.

SYMPTOMS OF AN ALLERGIC REACTION

The symptoms and criteria for diagnosing anaphylaxis are presented in Tables 3 and 4. Symptoms of latex allergy can differ among patients, and patients with known allergies may not have the same allergic reactions with each exposure. Symptoms of allergic reactions can range from localized discomfort, redness, pruritis, or hives (urticaria) after

Table 5. Treatment of Anaphylaxis

Immediate management of anaphylaxis
1. Administer epinephrine 0.2 to 0.5 mg maximum (0.01 mg/kg of the 1:1000) intramuscularly (IM) or intravenously (IV) (medication can be repeated if there is no response or only transient response).
2. Place the patient in a recumbent position, with legs elevated.
3. Provide normal saline fluid bolus if an IV is available.
4. Administer 100% oxygen via nonrebreather mask.
5. If the patient is on a beta-blocker and remains hypotensive after epinephrine, administer glucagon 1 to 5 mg IV (20–30 µg/kg), followed by an infusion of 5 to 15 µg/min, titrated to clinical effect.
6. If wheezing is present, nebulized albuterol may be used.
7. Find trigger of anaphylaxis and remove if possible.
Secondary management of anaphylaxis
1. Antihistamines: diphenhydramine (H1-blocker) and ranitidine (H2-blocker)
2. Steroids: IV steroids or oral steroids
3. Observation: two to six hours or overnight if the initial reaction was severe

contact with the allergen^{4,24} to initial local reaction with anaphylaxis on repeat exposure^{3,25} to anaphylaxis as the first evidence of sensitivity to latex.²⁶

Cutaneous manifestations of latex allergy may consist of flushing, hives, or angioedema. Hives can manifest as a localized symptom after contact with latex products, or they can spread diffusely over the entire body even when contact with the latex allergen was localized. Hives appear as erythematous, raised lesions with irregular borders. The lesions are intensely pruritic and will blanch when the skin is compressed over the lesions. Recognition of urticarial eruptions is important, as some reactions will begin with urticaria and progress if untreated or if the exposure is not promptly removed. Other cutaneous manifestations of an acute allergic reaction include angioedema, which, when it involves the tongue, larynx, or uvula, can be life-threatening.

Respiratory symptoms of latex allergy are more common in healthcare workers. As stated previously, aerosolized powder from powdered latex gloves has been shown to carry latex proteins and is a cause of occupational asthma in latex-allergic healthcare workers.^{20,27} Because of the dissemination of allergenic proteins from powdered latex gloves, the elimination of these gloves from hospitals and clinics has been a major pillar in the effort to decrease the sensitization among both employees and patients.^{19,20,28} It is important to note that removal of powdered latex gloves alone does not remove the risk of reaction.²⁰ Rooms must be thoroughly cleaned after the presence of powdered latex gloves for the safety of the allergic patient.

Anaphylaxis is the manifestation of a severe allergic reaction. It is characterized by the acute onset of symptoms involving two or more of the following systems: respiratory, cardiovascular, cutaneous, or gastrointestinal

(Table 3).²⁹ However, anaphylaxis is also likely in patients who experience only a drop in blood pressure after exposure to a known allergen. Respiratory symptoms can include increased respiratory rate, wheeze, stridor, and bronchospasm, whereas cardiovascular symptoms include hypotension. Gastrointestinal symptoms are often overlooked in anaphylaxis and can include severe abdominal pain, vomiting, and diarrhea. Patients who are conscious during anaphylaxis also report having a feeling of impending doom and/or a metallic taste in the mouth. Severe allergic reactions often develop precipitously and can happen with or without a previous history of sensitization to latex or other allergens.^{2,3,26,30}

MANAGEMENT OF ANAPHYLAXIS

Being prepared for the treatment of an allergic reaction or anaphylaxis onset is essential. Physicians must be ready to treat intraoperative anaphylaxis in all patients, as the first manifestation of an allergy may be during a surgical procedure,^{2,26,30} and allergic reactions to latex can be fatal.²¹ Recognizing an allergic reaction and responding promptly can decrease the risk of fatal or severe outcomes.³¹ The symptoms of anaphylaxis can be diverse, as discussed previously (Tables 3 and 4). In sedated patients, blood pressure, respiratory rate, and skin reactions can be the first notable changes signaling anaphylaxis. All emergency resuscitation equipment in the operating room should be latex-free, as any patient—not just known latex-allergic patients—could be having an anaphylactic reaction to latex.

Treatment of suspected anaphylaxis (Table 5) should be prompt. Epinephrine is the single most important treatment. Immediate treatment is intramuscular epinephrine (0.3 mL of 1:1000 epinephrine, or 0.3 mg).²⁹ There is no contraindication to the administration of epinephrine in patients experiencing anaphylaxis, and it may be repeated multiple times if the patient continues to have symptoms.³¹ Epinephrine may be administered intravenously (IV) if the patient already has established IV access, but it may result in a higher rate of complications. If IV administration is necessary, it should be given slowly; there is a risk of inducing fatal arrhythmia if the wrong dose is provided. IV epinephrine may be best reserved for a low-dose continuous drip in patients with prolonged hypotension.²⁹

After the first dose of epinephrine, the patient should also be placed in a recumbent position with the lower extremities elevated, to increase venous return to the heart and the brain.³² Positioning the patient upright during anaphylaxis where there is no respiratory compromise has led to severe hypotension and cardiac arrest, presumably due to reduced venous return to the heart.³² Fatal anaphylaxis has been linked to both late administration of epinephrine and patients who were left in a seated position. If the patient has an IV in place, an isotonic fluid bolus should be given to increase intravascular volume. Patients who are taking beta-blockers may not initially respond to

epinephrine as a result of the medication's blockage of the beta-adrenergic receptors in the cardiovascular system. After the initial dose of epinephrine, these patients may benefit from glucagon 1 to 5 mg IV over five minutes, followed by an infusion of 5 to 15 µg/min titrated to clinical response.

Adjunct therapies for anaphylaxis should not be substituted for epinephrine, which immediately treats anaphylaxis. These adjunct therapies include oxygen, β -agonists such as albuterol (for wheezing), antihistamines, and corticosteroids. Antihistamines such as diphenhydramine (H1-blocker) and ranitidine (H2-blocker) have a delayed onset and do not affect hypotension; therefore, they should only be administered after emergency medications. Although there are no randomized controlled trials of corticosteroids in anaphylaxis, it is thought that administration of steroids after stabilization of an anaphylactic reaction may help to decrease the risk of a biphasic reaction (where a recurrence of symptoms may occur up to 28 hours after the initial reaction).^{29,31} In our practice, after initial treatment and stabilization of the patient, we will often prescribe a three-day course of diphenhydramine, ranitidine, and prednisone.

Patients should be carefully observed after an episode of anaphylaxis. There is no consensus on the amount of time needed for observation, so it should be tailored to the patient based on the severity of the reaction, response to treatment, and medical history. Prior to discharge, patients should be warned of the risk of late-phase reactions and educated about the signs and symptoms of anaphylaxis. Patients should be prescribed a self-injectable epinephrine (EpiPen; Dey Pharma LLP, Basking Ridge, New Jersey) for treatment of possible late-phase reactions, and they should be instructed to immediately call 911 and seek medical attention if a late-phase reaction occurs.

CONCLUSIONS

Patients who report latex allergy or who are at risk for latex allergy (such as those who have undergone multiple surgeries or are employed in the healthcare field) require thorough presurgical evaluation of their history of exposures and reactions to latex. Performing procedures on patients with confirmed latex allergies requires preparatory measures. These include scheduling these patients with the initial appointment of the day, to decrease the risk of room contamination and airborne transfer. If a patient does experience an allergic reaction, prompt recognition of anaphylaxis and treatment with epinephrine decreases the risk of fatal outcomes.

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