Latex allergy in patients with spina bifida

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Abstract

Latex recently has been associated with severe intraoperative IgE-mediated anaphylactic reactions. Pediatric patients with meningomyelocele (spina bifida) appear to be specifically at risk for this type of reaction. This article provides background information on the etiology of latex allergies, identifies some commonly used dental products containing latex, recommends some alternatives to use, and suggests precautions the dental practitioner should take when treating high-risk individuals such as spina bifida patients. (Pediatr Dent 15:364–66, 1993)

Introduction

Latex is the sap of the *Hevea brasiliensis* tree. When this sap is processed to improve its commercial properties, it is called rubber. Rubber has been known to cause allergic-contact dermatitis but recently the number of allergic reactions reported by individuals exposed to medical latex has increased dramatically.[1-4] Latex allergy poses particular treatment concerns for the dental profession given the widespread use of latex products in the dental office.

The dramatic increase in allergic reactions has been evident particularly in children with meningomyelocele (spina bifida). Spina bifida patients undergo frequent urinary catheterizations and often require multiple corrective surgeries resulting in extensive exposure to latex products. The frequently repeated exposures increase the risk of developing an IgE-mediated reaction to rubber and create the potential for a severe intraoperative anaphylactic reaction in the dental office.[5-7]

The purpose of this paper is to provide an overview of latex allergy, to identify commonly used dental products containing rubber, to suggest substitutes for these products, and to identify specific concerns and treatment options for individuals with spina bifida.

Literature review

Allergic contact dermatitis from exposure to rubber is attributed to the low molecular weight agents added to the rubber sap to increase the durability, elasticity, and strength of the final synthetic product.[2, 8-11] The additives include vulcanizers, antioxidants, and surfactants. In recent years, the results of skin prick tests (SPT) and radioallergosorbent testing (RAST) indicate that immediate allergic reactions may be elicited by the water soluble proteins of rubber itself.[2, 8-10, 12] An allergy to latex can produce rhinitis, conjunctivitis, urticaria, bronchospasm, and in severe cases, may initiate a life-threatening anaphylactic reaction.[13]

An apparent increase in intraoperative allergic reactions prompted the Centers for Disease Control (CDC) to conduct an investigative survey in a Wisconsin children's hospital by reviewing surgical records from January 1989 through January 1991. The thorough review of records identified 11 individuals 3–14 years of age who had experienced 12 cases of intraoperative allergic reactions. Ten of these patients had meningomyelocele.[3] The CDC has since undertaken a nationwide survey of children's hospitals and has identified 25 other institutions with approximately 75 meningomyelocele patients who have experienced similar reactions.[3] One study suggests that up to 40% of meningomyelocele patients have IgE antibodies specific for rubber proteins.[2] It is believed that multiple exposures to latex products, beginning with surgical procedures in the neonatal period and perpetuated by the frequent urinary catheterizations required of meningomyelocele patients throughout their lives, contribute to the antibody formation that then results in immediate hypersensitivity allergic reactions. This has serious implications for dentists who treat patients with spina bifida.

Discussion

Rubber is capable of causing a delayed hypersensitivity reaction in susceptible individuals.[2, 8, 12, 14] This reaction is also termed a type IV hypersensitivity reaction and is manifested as a contact dermatitis. In this case it is believed to be a result of the individual becoming sensitized to the low molecular-weight chemicals that are added to the natural sap of the rubber tree to form commercial rubber. Type IV hypersensitivity is a T-cell mediated immune response.

In addition to the type IV hypersensitivity reaction, a different immune reaction now is being associated with rubber products. Rather than a delayed response to the chemicals added to the rubber tree sap, this reaction is in

response to the natural proteins of latex itself and is categorized as a type I hypersensitivity reaction.[8, 12, 13] This type of reaction involves the IgE immunoglobulin. In type I hypersensitivity reactions, mast cells bind to IgE. When an antigen—in this case one of the naturally occurring proteins of rubber—encounters the mast cell-IgE complex, the IgE becomes cross-linked with the latex protein-inducing mast cell degranulation.[15] Mediators, one of which is histamine, released during mast cell degranulation are responsible for the symptoms commonly encountered in allergies. Each individual responds differently in a hypersensitivity reaction. The most extreme response may result in anaphylaxis and death. In order for the latex proteins to cause systemic symptoms, it is felt that the protein must be released from the rubber product into the circulation.[16] It has been reported that vaginal or peritoneal membranes are the contact sites most often resulting in a serious hypersensitivity response.[7] In the dental setting, rubber gloves are in repeated contact with the buccal tissues where breaks in blood vessels may be common. This can provide direct access for the allergen into the systemic circulation during dental treatment.

Dentists must be acutely aware of the increasing number of latex hypersensitivity reactions being reported, particularly among individuals with spina bifida. Many items used routinely in the dental office or operating room contain latex, but substitutes exist for most. For example, vinyl gloves are available as a substitute for rubber gloves. Rather than using a rubber dam, alternative methods of isolating teeth from salivary contamination may be employed, including high-speed evacuation, cotton rolls, parotid duct shields, Svedopters and antisialagogues. (Table) When rubber products are simply unavoidable, precautions should be taken to prevent them from coming into direct contact with the sensitive mucosal tissues or being directly injected into the circulation.

It is routine for individuals with spina bifida to undergo multiple corrective surgeries and therefore experience repeated exposures to latex products. Additionally, the frequent urinary catheterizations using latex tubing further expose sensitive membranes to latex proteins. Slater recommends allergy testing for any patient at high risk for latex allergy, including spina bifida patients and individuals with severe urogenital defects.[4] Testing today is most often by RAST and best interpreted through proper referral to an allergist. However, there is a significant discordance between clinical history and the allergy testing currently available.[4] Therefore, it is important to always recognize the potential for an allergic reaction before treating a high-risk patient. Every precaution should be taken to avoid latex products when treating spina bifida patients regardless of their reported allergy status or previous clinical experience. Necessary preventive measures can thus be taken prior to treatment to reduce the risk of a serious anaphylactic reaction.

Preventive measures begin with substitutions for known latex products. If doubt ever arises as to whether a product contains rubber, its use should be avoided until the manufacturer can be queried. Since the spread of latex allergens by absorption to cornstarch has been documented, latex glove packages should not be opened near spina bifida patients and hands should be thoroughly washed between patients.[17] Premedication for the high-risk patient with diphenhydramine should be considered if invasive procedures are planned that potentiate the chances of circulatory contact with latex proteins. Medications for treating allergic reactions should be close at hand and the care provider versed in their dosages and delivery methods. These include injectable epinephrine and diphenhydramine. Parents of spina bifida patients should be educated about latex allergies, cautioned to avoid contact with latex products in the home and should consider having their children allergy tested. The dentist must remember that contact with the buccal mucosa by a latex product has the potential to cause a severe, life-threatening anaphylactic reaction in a susceptible spina bifida or other allergic patient.

Table.

Latex Product	*Alternative*
Rubber gloves	Vinyl gloves
Rubber dam	High-speed suction
	Cotton rolls
	Parotid duct shield
	Svedopter
	Antisialagogues
Prophy cups/polishing points	Prophy brush
Bite blocks	Gauze on mouth prop
Rubber sleeves on mouth props	Gauze on mouth prop
Rubber stoppers in anesthetic carpules, IV tubing, or multiple dose medication vials	None
Induction mask	Vinyl induction mask
Breathing bag	None
Tourniquet for starting IVs	Velcro strap
Toys/balloons	Stickers
	Coloring books

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Much medical practice unsupported by scientific foundation

MDs often accept new technology uncritically

Medical innovations are too often uncritically accepted and applied by physicians, often to the harm of patients, according to a commentary published in the *Journal of the American Medical Association.*

"The road to medical progress has been littered with potholes—or, more accurately, craters," writes David A. Grimes, from the Department of Obstetrics, Gynecology and Reproductive Services, San Francisco General Hospital.

"Much, if not most, of contemporary medical practice still lacks scientific foundation. Recent reviews of emerging technologies suggest that little progress has been made in requiring rigorous evidence of efficacy or validity before adoption and dissemination of new technologies." Citing use of DES (diethylstilbestrol) to improve pregnancy outcome and recommendations for bottle-feeding over breast-feeding, Grimes says, "some 'new' technologies have clearly harmed people... Responsibility for this medical malfeasance lies primarily with physicians, although consumers have often demanded unproved technologies."

Among those technologies in current use unsupported by evidence, Grimes points to electronic fetal monitoring during labor, which was widely adopted during the 1970s without the good evidence. "When the requisite randomized controlled trials were finally done, the consensus was striking: routine electronic fetal monitoring confers no demonstrable benefit to the fetus, yet poses a significantly increased risk of operative delivery (e.g., cesarean delivery or forceps) for the woman. After two decades of use, electronic fetal monitoring has not been shown to be superior to intermittent auscultation with a stethoscope."

Grimes says while there is growing enthusiasm for "evidence-based medicine," barriers to critical assessment of technologies persist. He cites "seduction by authority," or giving the prestigious proponent of a technology more weight than the scientific evidence; the "false idol of technology" that American physicians "seem to worship;" inertia to change; a medical education system which produces "'scientific illiterates' who are filled like an overstuffed sofa with the products of science, but who are not scientific in their approach to clinical questions or new technologies."

Grimes points to efforts in technology assessment and medical appropriateness by the U.S. Preventive Services Task Force, the Agency for Health Care Policy and Research, the American Medical Association, the RAND Corporation, and the Academic Medical Center Consortium, as institutional responses to the problem.

Grimes writes: "'Doing everything for everyone' is neither tenable nor desirable. What *is* done should be inspired by compassion and guided by science—and not merely reflect what the market will bear. The methods to assess technologies are well-accepted and widely available; what remains to be seen is whether we as a profession and a nation have the moral courage to use them."