

THE DOCTOR'S SURGICAL/EXAMINATION GLOVES— PROBLEMS WITH AND WITHOUT THEM

JERE D. GUIN, M.D.

Can you remember when the only worry you had with surgical gloves was getting the correct size? Now, the number of concerns are incredible, for example: The cost of changing gloves for every patient, and twice that if we double glove for every surgical patient (as recommended).^{1,2} Pinholes before or during surgery, and worse a needle stick!³⁻⁵ Allergy to "protective" gloves in patients with hand eczema. Urticaria and anaphylaxis in doctors, nurses, dentists, and other health workers.^{6,7} Contact dermatitis to surgical gloves in physicians, nurses, dentists, and other health professionals.⁸ Contact urticaria to glove powder.^{9,10} Asthma,¹¹ rhinitis,¹² and other allergies to airborne antigens carried by glove powder.¹³ Urticaria and anaphylaxis in patients from their physician's gloves.¹⁴⁻¹⁶ Purpura from allergy to antigens in rubber.¹⁷ Pustulosis or pompholyx from rubber antigens¹⁸ and bacteria killed during sterilization.¹⁹ Depigmentation from rubber chemicals.^{20,21} Urticaria to rubber gloves used to protect the skin from irritancy or allergy.²² Contact dermatitis in patients from the physicians', nurses', or dentists' gloves.^{23,24} Development of contact urticaria to rubber gloves used to protect a patient with long standing contact eczema.²⁵ Cornstarch granulomas from glove powder.^{26,27} Talc granulomas on "contaminated" gloves.²⁸

ADDITIONAL CONCERNS

Now, add to all of this, some of the potential sources of allergy currently not reported. For example, rubber gloves do not produce good traction unless the rubber is treated in some manner. It is standard practice, therefore, to treat the thumb, index, and middle fingers with sodium hypochlorite or a similar process to provide sufficient traction for the surgeon. Could that cause another form of the "bleached rubber syndrome"? Probably, but, to my knowledge, no one has looked at this. We also should be using these fingers for patch testing

to the glove itself, but I do not know of a single publication recommending that as standard practice.

One might add to this the failure to protect the wearer from allergy. Examples are methylmethacrylate in the operating room²⁹ or glutaraldehyde in the office. Unexpected exposure can occur to rubber attacked by chemicals and contaminant chemicals (e.g., ethylene oxide on rubber gloves).³⁰ Once allergic to latex gloves, wearing them in the presence of other potential allergens causes broadening of the allergic base or extended allergen syndrome. There is also the potential failure to protect from virus exposure.³¹

CONTACT DERMATITIS

We also should consider asking about rubber allergy in preoperative histories. Perhaps a few do this, but the practice is not yet routine in our specialty. Is the problem that serious? Possibly. Contact urticaria to rubber occurs in 7.4% of doctors and 5.6% of nurses in the operating room.^{7,32} Could it kill someone? Certainly, if anaphylaxis occurs. It also could be a problem if someone, an allergic physician or nurse in a high risk situation, refused to wear gloves and acquired hepatitis or AIDS.

The cause of rubber urticaria is most often a "protein" weighing some 2000, 5000, and 30,000 daltons,^{33,34} with rare cases caused by rubber chemicals.³⁵ Not all rubber gloves³³ (or rubber condoms for that matter)³⁴ are equally allergenic, so it may be possible to reduce the risk when we learn how to eliminate this allergen in manufacturing. Contact dermatitis to latex, however, is caused by allergy to rubber chemicals and not rubber itself.

Contact sensitivity may already be manageable, as lists are available of the antigen content of gloves free of thiuram, the usual allergen.³⁶ By matching the patients' patch test reactions to a chart outlining allergen content, it is possible to reduce the risk considerably; however, we still need to do patch tests or prick tests to the product itself, as it may contain a minor allergen not found in our patch test series or an allergen generated during manufacture by chemical reaction or post-manufacture from exposure to reactive chemicals such as ethylene oxide.³⁰

From the Department of Dermatology, University of Arkansas College of Medicine, Little Rock, Arkansas.

Address for correspondence: Jere D. Guin, M.D., Department of Dermatology, University of Arkansas for Medical Sciences, 4301 W. Markham, Little Rock, AR 72201.

There are many esoteric diagnostic tests for IgE mediated allergy, but contact urticaria can be best confirmed by a "prick test."³⁷ Here, sterile glove material and sterile saline are agitated for from 1/2 hour or less, to a day or more, and a drop of the solution is put on the skin. Through this, the epidermis is pricked with a sterile needle. Both negative and positive controls are necessary. Sterile saline is used for the negative control and histamine solution for the positive control. Concentrations for the latter are not standard, but most authors use 2.75 mg/mL as this is the concentration of the product used to stimulate gastric acid secretions. No one should start this, however, unless adequate safety measures are in place. Sometimes, use testing is done with the fingers of the glove in question put on the patient's wet finger. Again, epinephrine should be at hand as well as the means of establishing an airway.

Now, why not use vinyl (usually PVC) gloves? This is fine for those with urticaria who are not allergic to corn starch used for glove powder, however, we can also see allergy to vinyl^{18,38} usually caused by additives.^{38,39} Some also question the tactile sensation with gloves⁴⁰ or even the adequacy of protection with some gloves, particularly vinyl.^{41,42} To make matters worse, I not infrequently encounter patients allergic to *both* rubber and vinyl. Elastyn, a synthetic styrene butadiene rubber product was at one time considered a safer substitute,⁴³ but this product is no longer available. Tactyton may well prove to be the solution unless the patient is allergic to glove powder made from corn starch. Latex gloves are an important medical device, and it would be hard to do without them. Hopefully, the enormous need will stimulate availability of an adequate number of alternate products, one can substitute for rubber sensitive patients. Cooperation between medical experts and industry is critically important in solving the problem, and a solution is in everyone's interest. The problem is receiving increased attention as most of the articles found in the search were written in the last few years.

REFERENCES

1. Dodds RD, Guy PJ, Peacock AM, et al. Surgical glove perforation. *Br J Surg* 1988; 75:966-968.
2. Dodds RD, Barker SG, Morgan NH, et al. Self protection in surgery: the use of double gloves. *Br J Surg* 1990; 77:219-220.
3. Dinehart S, Gross D. Surgical glove perforation in dermatologic surgery. *J Dermatol Surg Oncol* 1989; 15: 1226-1228.
4. Russell TR. A new method for detection of the leaky glove. A study on incidence of defective gloves and bacterial growth from surgeons' hands. *Arch Surg* 1966; 93:245-249.
5. Burke FJ. The incidence of undiagnosed punctures in non-sterile gloves. *Br Dental J* 1990; 168:67-71.
6. Gelb LN. Allergic reactions to latex-containing medical devices. *FDA Bulletin* July 1991.
7. Turjanmaa K. Incidence of immediate allergy to latex gloves in hospital personnel. *Contact Dermatitis* 1987; 17:270-275.
8. von Hintzenstern J. Frequency, spectrum and occupational relevance of type IV allergies to rubber chemicals. *Contact Dermatitis* 1991; 24:244-252.
9. van der Meeren HLM, van Erp PEJ. Life threatening contact urticaria from glove powder. *Contact Dermatitis* 1986; 14:190-191.
10. Fisher AA. Contact urticaria and anaphylactoid reaction due to corn starch surgical glove powder. *Contact Dermatitis* 1987; 16:224-225.
11. Seaton A. Rubber glove asthma. *BMJ* 1988; 296: 531-532.
12. Carillo T. Contact urticaria and rhinitis from latex surgical gloves. *Contact Dermatitis* 1986; 15:69-72.
13. Baur X, Jäger D. Airborne antigens from latex gloves. *Lancet* 1990; 335:912.
14. Pecquet C, Leydenier F, Dry J. Contact urticaria and anaphylaxis to natural latex. *J Am Acad Dermatol* 1990; 22:631-633.
15. Gerber AC, Jorg W, Zbinden S, et al. Severe intraoperative anaphylaxis to surgical gloves: latex allergy, an unfamiliar condition. *Anesthesiology* 1989; 71:801-802.
16. Taylor JS, Cassettari J, Wagner W, Helm T. Contact urticaria and anaphylaxis to latex. *J Am Acad Dermatol* 1989; 21:874-877.
17. Roed-Petersen J. Purpuric contact dermatitis from black rubber chemicals. *Contact Dermatitis* 1988; 18:166.
18. Schoel J, Frosch PJ. Allergic contact eczema caused by rubber containing substances simulating pustulosis palmaris. *Derm Beruf Umwelt* 1990; 38:178-180.
19. Shmunes E, Darby T. Contact dermatitis due to endotoxin in irradiated latex gloves. *Contact Dermatitis* 1984; 10:240-244.
20. Zaitz I, Proença NG, Droste D, Grotti A. Achromatizing contact dermatitis caused by rubber sandals. *Med Cutan Ibero Lat Am* 1987; 15:1-7.
21. O'Malley MA, Mathias CG, Priddy M, et al. Occupational vitiligo due to unsuspected presence of phenolic antioxidant byproducts in commercial bulk rubber. *J Occup Med* 1988; 30:512.
22. Nutter AF. Contact urticaria to rubber. *Br J Dermatol* 1979; 101:597-598.
23. Meeropol E, Kelleher R, Bell S, Leger R. Allergic reactions to rubber in patients with myelodysplasia. *N Engl J Med* 1990; 323:1072.
24. Goh CL. Contact allergy to surgeon's gloves in their patients. *Contact Dermatitis* 1989; 20:223.
25. Kleinhans D. Contact urticaria to rubber gloves. *Contact Dermatitis* 1984; 10:124-125.
26. Kirschen EJ, Naftolin F, Benirschke K. Starch glove powders and granulomatous peritonitis. *Am J Obstet Gynecol* 1974; 118:799-804.
27. Humphreys SR, Cameron AJ, Harrison EG. Acute granulomatous peritonitis due to starch glove powder. *Gastroenterology* 1972; 63:1062-1065.
28. Henderson WJ, Melville-Jones C, Barr WT, Griffiths K. Identification of talc on surgeons' gloves and in tissue from starch granulomas. *Br J Surg* 1975; 62:941-944.
29. Kassis V, Vedel P, Darre E. Contact dermatitis to methyl methacrylate. *Contact Dermatitis* 1984; 11: 26-28.

30. Moneret-Vautrin DA, Laxenaire MC, Bavoux F. Allergic shock to latex and ethylene oxide during surgery for spina bifida. *Anesthesiology* 1990; 73:556-588.
31. Marin J, Dragas AZ, Mavsar B. Virus permeability of protective gloves used in medical practice. *Zentralbl Hyg Umweltmed* 1991; 191:516-522.
32. Turjanmaa K. Incidence of immediate allergy to latex gloves in hospital personnel. *Contact Dermatitis* 1987; 17:270-275.
33. Turjanmaa K, Laurila K, Mäkinen-Kiljunen S, Reunala T. Rubber contact urticaria. Allergenic properties of nineteen brands of latex gloves. *Contact Dermatitis* 1988; 19:362-367.
34. Turjanmaa K, Reunala T. Condoms as a source of latex allergen and cause of contact urticaria. *Contact Dermatitis* 1989; 20:360-364.
35. Belsito BV. Contact urticaria caused by rubber. *Dermatol Clin* 1990; 8:61-66.
36. Rich P, Belozzer ML, Norris P, Storrs FJ. Allergic contact dermatitis to two antioxidants in latex gloves: 4,4'-thiobis (6-tert-butyl-meta-cresol) (Lowinox 44S36) and butylhydroxyanisole. *J Am Acad Dermatol* 1991; 24: 37-43.
37. Turjanmaa K, Reunala T, Räsänen L. Comparison of diagnostic methods in latex surgical glove contact urticaria. *Contact Dermatitis* 1988; 19:241-247.
38. Estlander T, Jolanki R, Kanerva L. Dermatitis and urticaria from rubber and plastic gloves. *Contact Dermatitis* 1986; 14:20-25.
39. Kanerva L, Jolanki R, Estlander T. Organic pigment as a cause of plastic glove dermatitis. *Contact Dermatitis* 1985; 13:41-43.
40. Brunick AL, Burns S, Gross K, et al. Comparative study: the effects of latex and vinyl gloves on the tactile discrimination of first year dental hygiene students. *Clin Prevent Dent* 1990; 12:21-25.
41. Gerhardt GG. Results of microbiological investigations on the permeability of procedure and surgical gloves. *Zentralbl Hyg Umweltmed* 1989; 188:336-342.
42. Korniewicz DM, Laughon BE, Butz A, Larson E. Integrity of vinyl and latex procedure gloves. *Nurs Res* 1989; 38:144-146.
43. Fisher AA. Management of dermatitis due to surgical gloves. *J Dermatol Surg Oncol* 1985; 11:628-631.

The Efficacy of Tests and the Polygraph

Several highly publicized episodes illustrate our continuing faith as a society in a flawed diagnostic test. In May, Roger Coleman, a convicted murderer who vociferously maintained his innocence, was executed in Virginia after failing a polygraph test conducted on the morning of his execution. The same month, Caspar Weinberger, the former Secretary of Defense, used a polygraph test to support his claim that he never lied to protect former president Ronald Reagan in the Iran-Contra scandal. In June, a federal grand jury indicted Weinberger on felony counts of perjury, obstruction of justice, and making false statements related to the scandal. In October 1991, Anita Hill, who alleged that she was sexually harassed by Supreme Court Justice Clarence Thomas during the early 1980s, sought to buttress her credibility by taking a polygraph test (which she was said to have passed).

The polygraph—or "lie detector"—test purports to offer the diagnostic confidence that can be found with precise medical tests, such as electrocardiography or serum electrolyte determinations. Such diagnostic confidence, however, is far more difficult to achieve in the complex and often subjective psychological realm of truth and deception. The limitations of polygraph evaluations can be appreciated by applying the tools that physicians use to interpret other diagnostic tests.

Lie detection by the polygraph assumes that telling a lie causes specific and reproducible physiologic responses related to the arousal of the autonomic nervous system. In turn, it is assumed that an experienced polygraph examiner can elicit these responses routinely. In fact, these crucial assumptions remain unproved. Autonomic arousal may be caused by deception, but it may also be caused by myriad potentially confounding factors, ranging from stress, fear and anxiety to anger and embarrassment. Deception itself cannot be measured directly. *From Steinbrook R. The polygraph test—a flawed diagnostic method. N Engl J Med* 1992; 327:122-123.