

Allergic Contact Dermatitis in Dermatologic Surgery: Review of Common Allergens

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With the growing number of dermatologic surgeries performed each year comes an increased potential for patient exposure and sensitization to allergens. Patients are exposed to many well-documented allergens in the preoperative, intraoperative, and postoperative settings during surgery. Postoperative skin complications of allergic contact dermatitis increase health care costs and cause patient suffering. Early recognition, diagnosis, and treatment by dermatologic surgeons are essential to decrease morbidity related to medically necessary and elective cutaneous surgeries. While a specific standard screening panel for cutaneous surgery-related allergens is not well established, we propose several categories of allergens be strongly considered and tested if a patient is suspected of having allergic contact dermatitis in an attempt to reveal pertinent allergens and prevent future exposures.

The dermatologic and cosmetic surgery division of dermatology has experienced significant growth in the last half century, with the advent of new technologies and materials. In 2012, more than 8 million medically necessary and cosmetic procedures were performed in the United States, of which 2.6 million were for skin cancer treatment.¹ Today, the dermatologic surgeon has a large armamentarium of tools, medications, and modalities intended to treat a variety of dermatologic conditions. Consequently, exposures to potential contact irritants and allergens are plentiful during the preoperative, intraoperative, and postoperative setting, and the surgeon should be aware of the potential for adverse hypersensitivity reactions to commonly used materials.

An estimated 15% to 20% of the general population suffers from contact allergy.² Allergic contact dermatitis (ACD) represents a true delayed type IV hypersensitivity and can range in its presentation from a mildly pruritic erythema to intensely pruritic vesicular, bullous, or indurated plaques. Although not lethal in nature, this disorder can be a cause of considerable morbidity. Many factors can play a role in the elicitation of ACD such as age, sex, skin barrier function, lifestyle, and occupational exposures. Despite the relative overall hyposensitization in the elderly, these patients are more likely to be allergic to neomycin, lanolin alcohols, paraben mix, and methyl dibromoglutaronitrile/phenoxylethanol than adult controls.³ Females have a 61% increased risk of ACD, presumably due to greater product use and exposure.⁴ Physicians and nurses share a high risk of developing ACD due to repetitive exposures

to allergens such as povidone-iodine, chlorhexidine gluconate, and rubber gloves.⁵

Identification of a preoperative, intraoperative, or postoperative allergen responsible for causing ACD in a patient can present a daunting task in dermatologic surgery. This is in part due to the fact that many of the allergens encountered during surgery are also found in the top 50 clinically relevant allergens as reported by Saripalli et al⁶ in 2003. Furthermore, discerning a temporal association between cutaneous reaction and specific allergen can be difficult to determine, making it nearly impossible to narrow down the allergen without specialized patch testing. Nonetheless, it is important that dermatologic surgeons are aware of the potential allergens that are related to the perioperative stages of surgery so that ACD can be properly identified and treated, to minimize morbidity.

PREOPERATIVE EXPOSURES

Before surgery begins, vigorous antiseptic practices are used to reduce contamination of the surgical site, followed by meticulous marking of the surgical site with sterile marking pens and finally, injection of local anesthesia. Although uncommon, topical anesthesia may be applied before surgical scrubbing practices to reduce pain related to the injection of local anesthesia. Each preparatory step along the way provides exposure to allergens that are proven in the literature to cause ACD.

Antiseptics

Selection of an antiseptic is based on the balance between broad-spectrum activity, rapid onset of action, persistent effect, and, conversely, low-irritant, allergenic, and toxic effects. The most commonly used agents include alcohol, chlorines (chlorhexidine gluconate and hexachlorophene), and iodophors (povidone-iodine). Other less commonly used agents include benzalkonium chloride, hydrogen peroxide, and thimerosal.

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Alcohols are rapidly acting, narrow-spectrum topical antiseptics with short duration of action. Despite the extensive use of isopropyl alcohol during minor biopsy procedures or major surgical procedures, there are few reports of ACD in the literature.^{7,8}

Chlorhexidine gluconate (Hibiclens) is a commonly used broad-spectrum preoperative antiseptic and preservative in topical skin products. It has a faster onset of action and is longer acting when compared with iodophors, and thus is commonly used in dermatologic surgery. However, because of the potential for ocular toxicity and ototoxicity, it is avoided around the eyes or ears. Considering its frequent use, reports of ACD are relatively rare, and irritant reactions are more commonly reported.⁹ This may be, in part, due to the act of vigorous scrubbing of the surgical site, which physically affects the barrier membrane predisposing individuals to an irritant dermatitis.

Hexachlorophene (pHisoHex) is an infrequently used long-acting chlorinated phenol antiseptic with fair gram-positive spectrum of activity. Given its potential for photocontact dermatitis,^{10–12} high irritancy, and teratogenic potential, it has fallen out of favor as a preoperative antiseptic in the dermatologic surgery community.

Povidone-iodine (Betadine) is a commonly used broad-spectrum antiseptic in dermatologic surgery and is the surgical preparation of choice around the eyes and ears. However, this is the most common cause of antiseptic-induced ACD.⁵ Approximately 50% of the povidone-iodine-induced ACD cases demonstrate sensitization to the noniodine component of the polyvinylpyrrolidone iodine. It is important to note that polyvinylpyrrolidone iodine components can cross-react with iodine-based radiopaque contrast materials and iodides in medications.

Benzalkonium chloride is a detergent and quaternary ammonium compound with a broad range of antimicrobial activity. It was first introduced as a germicide in the 1910s and became more widely used in the 1940s. It is used in commercially available disinfectants, sterilizers, contact lens solutions, acrylate-based liquid bandages, and plaster of Paris. This chemical is a well-known skin irritant, but on occasions it has also been reported to have allergenic properties.^{13,14} It has been suggested that many supposed cases of ACD from benzalkonium chloride are likely correlated to misinterpretation of irritant reactions.¹⁵

Permanent Markers

Only 2 reports have been published describing ACD to permanent markers. The first reported case was related to the dye of the solvent yellow 146 permanent marker used to outline an irradiation field after a breast lumpectomy for invasive ductal carcinoma.¹⁶ The second case was related to Abitol, a modified colophony product, found in the ink of the Edding 3000 blue permanent marker, which was used to outline the liposuction area preoperatively.^{16,17} Allergic contact dermatitis caused by permanent markers is an infrequent yet relevant finding.

Anesthetics

As the number of in-office dermatologic procedures continues to grow, reports of ACD from local anesthetics are increasingly documented

in the literature. Local anesthetics are classified as amides or esters depending on their intermediate chain. Esters (eg, benzocaine, tetracaine, procaine) are metabolized by plasma pseudocholinesterases and form para-aminobenzoic acid, a common allergen. Amides (eg, lidocaine, prilocaine, dibucaine) tend to be more stable and less allergenic and are metabolized in the liver by microsomal enzymes.¹⁸

According to the North American Contact Dermatitis Group's (NACDG's) most recent report on patch test results, benzocaine allergy prevalence was 1.8%, making it the most common anesthetic allergen, followed by dibucaine, lidocaine, tetracaine, then prilocaine.^{19,20} It is recommended that patients sensitized to benzocaine routinely avoid tetracaine and procaine because cross-reactions commonly occur.²¹

Lidocaine is the most widely used injectable and topical anesthetic for minor procedures in hospitals and clinics in both the United States and Canada.²⁰ It belongs to the amide class of anesthetics, which has less risk of inducing an allergic reaction than ester anesthetics. In the literature, type I reactions to lidocaine are much more commonly reported than delayed-type hypersensitivity reactions.²² According to the NACDG, the prevalence of allergy to lidocaine has been trending down to 0.7%.¹⁹ The high incidence has been suggested to be related to increased exposure to over-the-counter sources of lidocaine (Table 1).^{20,22,23} The most commonly reported cause of ACD to lidocaine is through the use of antihemorrhoidal preparations.^{24,25} To date, periodic reports of type IV hypersensitivity reactions to injectable lidocaine have been published.^{22,23,26–33} Delayed-type hypersensitivity to lidocaine may occur more frequently than previously thought.

Topical lidocaine is often found in the eutectic anesthetic mixtures EMLA (Astra Pharmaceuticals, Wilmington, Del), BLT (Wedgewood Pharmacy, Swedesboro, NJ), and L-M-X (Ferndale laboratories Inc, Ferndale, Mich). EMLA is an oil-in-water emulsion of 2.5% lidocaine and 2.5% prilocaine with a wide array of uses. It has been reported that prilocaine is the agent that plays a role in allergenicity.³⁴ EMLA cream is contraindicated in patients with known history of sensitivity to amide-type anesthetics. BLT is a compounded topical anesthetic made of 20% benzocaine, 6% lidocaine, and 4% tetracaine. Because of the prevalence of benzocaine allergy, this is likely the most common cause of ACD from the use of topical BLT. L-M-X is another topical lidocaine cream, which to date has no reported allergic reactions in the literature.

PERIOPERATIVE EXPOSURES

Once the surgical site is prepped and draped, the dermatologic surgeon can start performing the task at hand. Although the focus is typically on performing a perfect excision and closure, each step along the way can expose a patient to allergens that may result in ACD. Therefore, the surgeon must keep in mind sources of potential allergy from tools and materials used during surgery.

Gloves

Over the past few decades, “universal precautions” have been adopted in both the medical and surgical settings for protection

TABLE 1. Selected Over-the-Counter Topical Medications Containing Lidocaine*

Brand Name	Manufacturer (Web Site)
Bactine Antiseptic Anesthetic First Aid Liquid	Bayer Consumer (www.drugstore.com)
Banana Boat Sooth-A-Caine Pain Relieving Gel	Sun Pharma (www.drugstore.com)
Band-Aid Hurt-Free Antiseptic Wash	Band Aid (www.uptodatenline.com)
Cool Aloe I.C.E. Lidocaine Gel	Hawaiian Tropic (www.hawaiiantropic.com)
Dr. Scholl's Cracked Heel Relief	Schering-Plough (www.drugs.com)
L-M-X (formerly ELA-Max)	Ferndale Lab Inc (www.drugs.com)
Gold Bond Medicated Anti-itch Cream	Chattem Inc
Mycitracin Plus	McNeil Consumer
Neutrogena Norwegian Formula Soothing Relief Anti-itch Moisturizer	Neutrogena Corp (www.uptodateonline.com)
Palmer's Medicated Aloe Vera Formula	E. T. Browns Drug Co
Solarcaine Aloe Extra Burn Relief	Schering-Plough (www.uptodateonline.com)
TheraPatch Cold Sore Patch	LecTec (www.lectec.com)
Topical Analgesic Cream for Bikini Area Irritation	Bikini Zone (www.uptodateonline.com)
Tribiotic Plus	Thompson Medical Company, Inc
Xylocaine ointment	Astra (www.uptodateonline.com)
Zilactin-L	Zila Pharmaceuticals (www.uptodateonline.com)

*Adapted from Mackley et al²² (2003) and Amado et al²³ (2007).

against blood-, serum-, or fluid-transmitted diseases such as HIV and hepatitis. Thus, the exposure rate to latex and nitrile rubbers has increased. Although latex hypersensitivity is primarily a type 1 nondelayed reaction, delayed-type hypersensitivity to natural rubber latex is rare.³⁵ Allergic contact dermatitis to rubber is most commonly due to added chemical accelerators and stabilizers. In a baseline study, thiuram (rubber accelerator) was the most common contact allergen in rubber gloves.³⁶ However, several authors have reported a decrease in the incidence of contact allergy to thiuram mix.³⁷ As the surgical setting changed from latex to latex-free sterile rubber gloves, there was an increased incidence of contact allergy reported to sterile gloves containing 1,3-diphenylguanidine (rubber accelerator) and cetylpyridinium chloride (lubricant for powder-free rubber gloves).³⁶ Currently, accelerators and stabilizers in latex-free gloves are the potential sources of ACD.

Metals

In the manufacturing of surgical instruments, a variety of metals are utilized, including stainless steel with carbon alloy, chromium, nickel, and tungsten carbide. Currently, nickel is the most common allergen in all cases of ACD with a prevalence of 19.5%.¹⁹ Although modern surgical instruments are not expected to release nickel at significant levels to cause ACD, reports by Nettis et al³⁸ revealed that frequent exposure to nickel-plated instruments in the medical setting could increase the chance of developing a true nickel allergy. Therefore, nickel-free, stainless-steel surgical instruments should be used, especially in sensitized patients, and spot testing with dimethylglyoxime ammonia can be performed on equipment if manufacturing composition is uncertain. Cosensitivity between nickel and cobalt has been well documented in the literature and is likely due to their concomitant exposure in alloys.³⁹

Sutures

Textile fibers are known to produce dermatologic reactions ranging from acute to chronic irritant dermatitis, ACD, exacerbation or atopic dermatitis, and contact urticaria. Formerly, when silk, catgut, and chromicized catgut were used as surgical suture materials, allergic reactions were not uncommon.^{40,41} Currently, synthetic absorbable sutures such as polyglactin 910 and poliglecaprone 25 are used as alternatives, thereby decreasing hypersensitivity reactions. However, there are rare reports of allergic reactions to nonabsorbable sutures such as polyamide 6/6 fibers consisting of the monomer ϵ -caprolactam.^{42,43} Nylon sutures bear an equal risk of causing contact allergy because it contains the same monomer (ϵ -caprolactam). Despite the alleged hypoallergenic properties of polypropylene, there have been 3 reports of patch test–proven ACD.^{44–46} The process of sterilizing sutures using ethylene oxide^{47–49} and triclosan⁵⁰ and the addition of dyes for coloring sutures^{43,51} have also been associated with delayed hypersensitivity reactions.

Acrylates

Acrylic resins or cyanoacrylates (CAs) are polymers used in the manufacturing of adhesives, plastics, paints, and inks. In the surgical setting, sources of exposure to acrylates include disposable electrosurgical plates coated with acrylic-containing adhesives,^{52–54} the Prone Positioner (Hill-Rom, Batesville, Ind) used to support the head during prone-positioned procedures,⁵⁵ and surgical strips for wound closure. Prior sensitization to acrylates may come from exposure to methyl-CA in sculptured nails, occupational exposures in orthopedic surgical staff and dentists (bone and dental cements), previous surgical exposures to electrosurgical pads, and exposure with the use of over-the-counter Band Aid liquid Bandages.

In more recent years, ACD from the use of 2-octylcyanoacrylate topical skin adhesive (Dermabond; Ethicon Inc, Somerville, NJ) has been increasingly reported.^{56–59} There are several potential allergens in Dermabond including plasticizers to aid in the flexibility of the wound, stabilizers to prolong shelf life, polymerization inhibitors to delay transition from liquid to solid, and allergenic dye (D&C violet no. 2).⁵⁷ The monomer polymerizes upon contact with the skin creating functional glue. Consequently, any potential haptens are trapped by the keratinocytes and should prevent sensitization. With its increased use in medical and surgical settings has come increased reporting of ACD associated with the use of Dermabond on thin skin or open wounds. It is speculated that this scenario may allow for sufficient penetration causing Dermabond sensitization.⁵⁶ Although allergy to Dermabond is currently thought to be a rare event, clinicians and surgeons who use CA adhesives should be mindful of this potential complication.

Formaldehyde

Formaldehyde (formalin) is a preservative used in cosmetics, cleaning agents, and industrial products. In the surgical setting, skin exposure can occur from sterilization of instruments, disinfection of rooms, and fixation of tissue samples. Interestingly, highly sensitized patients can develop ACD from the mere presence of formaldehyde gas in a room from an open biopsy specimen container.⁶⁰ Sensitization commonly occurs before the surgical setting through exposure to wash-and-wear, wrinkle-free, or permanent press fabrics containing free formaldehyde, formaldehyde resins (melamine formaldehyde, ethyleneurea melamine formaldehyde and urea formaldehyde), or formaldehyde-releasing preservatives (quaternium-15, bromo-nitropropane-diol, diazolidinyl urea, DMDM hydantoin, imidazolidinyl urea and tris(hydroxymethyl)-nitromethane). In addition, the polymerized form of Dermabond (2-octylcyanoacrylate) is hydrolyzed in the body, creating formaldehyde, which can perceptibly be a potential cause of sensitization.

POSTOPERATIVE EXPOSURES

With the incidence of skin cancer and thus surgical excisions on the rise, optimizing postoperative wound care is paramount. It should be noted that topical medicaments (antibiotics and steroids) used with occlusive dressings and fixatives are often applied to inflamed or injured skin in the postsurgical setting, which can increase the chances of ACD.

Fixatives

Compounded tincture of benzoin (CTB) and Mastisol (Ferndale Laboratories Inc) are frequently applied to the skin to increase the adherence of surgical tape or other adhesive bandages. Several reports of ACD to tincture of benzoin and Mastisol have been reported in the literature.^{61–64} Mastisol offers superior adhesive qualities and has a lower incidence of ACD compared with CTB.⁶⁵ However, it should not be used on patients allergic to CTB because

of the frequent cross-reaction with Mastisol.⁶² Sasseville et al⁶¹ suggest prudent avoidance of CTB, and possibly Mastisol, in patients allergic to fragrance mix, colophonium, tea tree oil, and sesquiterpene lactones.

Dressings

In the past few decades, wound dressings have shifted from simple dry wound coverings to dynamic multicomponent-layered dressings that can promote wound hydration, healing, hemostasis, and immobilization and prevent infection and hematoma/seroma formation. Adhesive materials in these dressings often lead to inflammation of the skin in the immediate area under the dressing, causing an irritant dermatitis, but sometimes also lead to contact sensitization and ACD. Common allergens in adhesives include colophony, Abitol, abietic acid, benzoyl peroxide, rubber accelerators, antioxidants, and acrylates.³ Of these allergens, colophony (rosin) is the most frequent cause of ACD from adhesives. Abietic acid and Abitol are the main sensitizing components.

More than 50 cases of ACD to Duoderm have been reported in the literature and are frequently due to the tackifying agent Pentalyn, a modified colophonium.^{66–68}

Most skin reactions related to adhesive tapes and bandages are mechanical in nature. Widman et al⁶³ investigated the incidence of true ACD in patients who reported to have an “allergy” to medical adhesive bandages. Interestingly, none of the subjects had a positive patch test reaction to the over-the-counter tapes and bandages. Instead, 8% and 73% of patients had an irritant reaction to at least 1 over-the-counter tape or bandage after it had been left on for 2 and 7 days, respectively.⁶³ This finding is in line with previously reported data favoring the prevalence of irritant contact dermatitis to medical adhesive tapes and bandages.⁶⁹

Antibiotics

It is well documented that the incidence of bacitracin and neomycin contact dermatitis has significantly increased over the years, likely attributed to their increased use and availability. Topical antimicrobials are the most commonly purchased medications, used by the general public in the United States for everything from simple abrasions and cutaneous infections to routine wound care.⁷⁰ Several studies have shown that ACD from the use of postoperative topical antibiotics is a significant phenomenon in dermatologic surgery (Table 2).^{71,72} According to the most recent NACDG retrospective review, neomycin was the second most common allergen and the most common sensitizer in the group, with bacitracin a close second.¹⁹ Several reports of contact allergy to polymyxin B have been reported after long-term use for otitis.⁷³ From the data available, mupirocin and polymyxin B seem less likely to cause an ACD. Tea tree oil is an increasingly popular essential oil known for its potential antiseptic properties. A number of cases of ACD from tea tree oil are cited in the literature with a prevalence rate of 1.4%.^{19,74–76} Coreactivity between bacitracin and neomycin leads one to question the use of bacitracin in

TABLE 2. Studies Comparing Postprocedural Rates of ACD

Agent	Gette et al, ⁷¹ (%)	Smack et al, ⁷² (%)
Neomycin	2.3	N/A
Bacitracin	1.9	0.9
Mupirocin	0.0	N/A
Polymyxin B	0.0	N/A
Vehicle	N/A	0.0

N/A indicates not available.

patients with a known allergy to topical neomycin. Since polymyxin and bacitracin are both isolated from *Bacillus* species, the potential for allergic cross-reactivity between these 2 certainly exists.⁷⁷

Given the relatively low rate of closed wound infections seen after ambulatory dermatologic surgery, it is important to compare the risks of infection versus ACD to preparations used in routine wound care to prevent infections. Several studies have looked at the ratio of risk to reward when topical antimicrobials are used in the postoperative setting.^{71,72} According to the clinical study by Smack et al⁷² comparing the postoperative use of bacitracin ointment versus petrolatum on closed wounds, there was no significant benefit with respect to infection rates (2% in the petrolatum group vs 0.9% in the bacitracin group, $P = 0.37$) or healing outcomes. Interestingly, this study did find that 0.9% of patients in the bacitracin group developed a contact allergy to the medication, whereas no patients in the white petrolatum group developed such a reaction. Of note, there was no significant difference in healing rates between the 2 groups. In contrast to closed wounds, the use of topical antimicrobial agents in open wounds is effective in reducing bacterial counts without compromising wound healing. It has been suggested by Jacob et al³ that white petrolatum be used postsurgically and mupirocin if there is a high risk of infection.

Topical Steroids

Although contact dermatitis to topical corticosteroids was initially thought to be rare, it has been widely recognized for the past 20 years with a prevalence between 0.55% and 5.98%.^{3,78} Topical steroids are not classically used in postoperative wound care; however, if there is suspicion for evolving ACD, a topical steroid will often be indicated. If contact sensitization to topical steroids transpires, it can potentially exacerbate the dermatitis. Currently, the most common allergen in the group of topical corticosteroids to cause a positive patch test result is tixocortol-21-pivalate with a prevalence of 2%, followed by triamcinolone acetonide (0.8%), hydrocortisone-17-butyrate (0.7%), and clobetasol-17-propionate (0.3%), with desoximethasone producing the lowest likelihood of ACD at a prevalence of 0.2%.¹⁹ Cross-reactions occur more frequently within a corticosteroid class (A–D). However, cross-reactions can occur between classes, most commonly between classes B and D.

More commonly, ACD from topical steroids is due to sensitization to other preparation components such as the vehicle (eg, lanolin, propylene glycol), preservatives (eg, quaternium-15,

isothiazolinones, parabens), or stabilizers (eg, ethylenediamine). Common vehicle allergens reported in the literature include propylene glycol, which has a prevalence of 3.2%.¹⁹

Surgeons and Medical Staff

Exposure to a potential allergen and risk of developing ACD are risks shared among the patients, medical staff, and surgeons. Dermatologic surgeons and medical staff have repetitive exposures to all the aforementioned contact allergens, heightening their risk for contact sensitization.

DIAGNOSIS AND TREATMENT

To accurately diagnose ACD, it is important to combine a detailed history with clinical morphology and patch testing. Identification of the cause of ACD should prompt avoidance of the offending agent. Following avoidance, topical corticosteroids are the mainstay of therapy; however, ACD to topical medicaments such as corticosteroids has increased in prevalence as mentioned above.

Accurate patch testing is crucial in evaluating and managing suspected ACD and remains the criterion standard for diagnosing ACD. The ACDS Core Allergen Series contains 65 allergens, many of which are present in other international series. Of importance to ACD in dermatologic surgery, the NACDG standard series thoroughly screens for commonly used metals (nickel, cobalt chloride), antimicrobials (neomycin, bacitracin, tea tree oil), steroids (tixocortol-21-pivalate, hydrocortisone-17-butyrate, triamcinolone acetonide, desoximethasone, clobetasol-17-propionate), vehicles (lanolin, propylene glycol), adhesives (colophony, ethyl acrylate, methyl methacrylate), dyes (disperse blue 106), anesthetics (benzocaine, lidocaine, dibucaine), formaldehyde, and formaldehyde releasers.

In contrast, the TRUE (Thin-layer Rapid-Use Epicutaneous) test (Allerderm, Phoenix, Ariz) tests to only 35 allergens. Of note, antiseptics and propylene glycol are not included in this series, and a single caine mix is used that consists of both esters (benzocaine, dibucaine) and amides (lidocaine); therefore, the interpreting physician cannot classify the type of anesthetic allergy. Screening with the TRUE test allergen series alone has been suggested to miss 27.2% of the relevant positive reactions identified in the 2007–2008 series.¹⁹

Currently, neither patch test series screens for allergy to suture material or 2-octyl cyanoacrylate (Dermabond). If suture ACD is suspected, it has been suggested to consider testing with suture sewn through the skin, as opposed to placing against the skin, as a method of discerning the etiology of suture line ACD. Similarly, if allergy to Dermabond, or any other allergen not on the standard series, is suspected, a stand-alone epicutaneous test can be helpful.

CONCLUSIONS

The prevalence of contact allergy is rising worldwide.² This results in high costs for health care systems and the economy, as well as in an impairment of quality of life for patients. With the growing

number of dermatologic surgeries performed each year comes an increased potential for exposure and sensitization in patients, surgeons, and medical staff. The dermatologic surgeon must be aware of the many allergens patients are exposed to in the pre-operative, intraoperative, and postoperative periods such that early recognition, diagnosis, and treatment are possible. Although a specific standard screening panel for surgery-related allergens is not well established, we propose that the previously mentioned allergens be tested in an attempt to reveal pertinent allergens and prevent future exposures.

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