

3. Johnson TM, Headington JT, Baker SR, Lowe L. Usefulness of the staged excision for lentigo maligna and lentigo maligna melanoma: the "square" procedure. *J Am Acad Dermatol* 1997;37: 758-64.
4. Möller MG, Pappas-Politis E, Zager JS, et al. Surgical management of melanoma-in-situ using a staged marginal and central excision technique. *Ann Surg Oncol* 2009;16:1526-36.
5. Bricca GM, Brodland DG, Zitelli JA. Immunostaining melanoma frozen sections: the 1-hour protocol. *Dermatol Surg* 2004;30:403-8.

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Dermatologic Surgical Implications of Nickel Allergy

Metal allergies by and large are accountable for the greatest number of allergic contact dermatitis cases confirmed by patch testing, with nickel being the most common. Of note, the incidence of nickel allergy in the Western population is reported to be as high as 20% and more commonly seen in women than in men.¹ The implications of these allergies may have a significant impact on both wound healing and surgical outcome. A surgeon should be aware of these potential allergic reactions in a patient with known allergy, before the use of instruments and devices, such as surgical clips, needles, and cautery tips, as all have been reported in association with nickel contact allergy (Table 1).

Of interest, susceptibility to corrosion became a serious limitation on the field of surgical instrumentation in the late 1800s, worsened more so by the advent of steam sterilization. After the centennial, a significant improvement in rust prevention was associated with the nickel-plating of most steel instruments, which was later replaced by chromium plating in the early 1920s, and the eventual conversion to alloy steels (e.g., surgical-grade stainless steel), most of which contain nickel, but differ in their nickel-releasing capacities.⁵ Currently, high-grade stainless steel is used in the majority of modern surgical material because alloys with higher sulfur content are more susceptible to corrosion and oxidization, exposing metals such as

chromium and nickel, which are found in deeper layers of the metal.⁴

Notably, one of the most widely recognized surgical-associated allergic reactions has been those due to the use of surgical skin clips containing nickel.¹ Quite notably, allergic dermatitis has also been reported to occur after exposure to nickel containing acupuncture and infusion needles, such as those used in insulin infusion pumps.³ In these aforementioned cases, the cases were directly linked to a source. Of note, in some cases, the reactions ceased only on removal of the source exposure (e.g., clip or wire), and yet the culprit source proved to have less than 10 ppm of nickel release, below the lower limit for the detection of nickel by the dimethylglyoxime test.⁴ In certain instances, the reactions were first presumed to be a wound infection and later recognized as allergic.

Along these same lines, Sofen and colleagues² recently reported nickel dermatitis from a disposable electrocautery tip, in which the patient developed a pruritic erythematous rash 2 days postoperatively. Patch testing confirmed allergy to bacitracin, which had not been used by the patient, and nickel. The authors investigated for a surgical-associated nickel source and found that the hyfrecator tip reacted with

TABLE 1. Selected Cases of Nickel Allergy Attributed to Commonly Used Surgical Instruments

<i>Author</i>	<i>Study Design</i>	<i>Number of Cases</i>	<i>Source of Nickel</i>	<i>Reason for Exposure</i>	<i>Adverse Effect</i>	<i>Confirmation Test</i>	<i>History of Similar Symptoms</i>
Sofen and colleagues ²	Case report	1	Disposable hyfrecator electrocautery tip	Dermatologic surgery	Pruritic erythematous patch around her wound 2 days postoperatively	Patch test and electrocautery tip with positive dimethylglyoxime test	Not mentioned
Mehta and colleagues ³	Case series	2	Hypodermic needles	Blood draws during treatment of typhoid fever	Itchy eruption on her forearms for 2 weeks	Patch test	Artificial jewelry
			Hypodermic needles	Blood donation	Itchy hyperpigmented plaques on antecubital fossae	Patch test	Itchy, scaly plaques at site of her wrist watch, although dimethylglyoxime negative
Conde-Salazar and colleagues ⁴	Case report	1	Neuroflexotherapy with stainless steel surgical staples	Mechanical low back pain	After second intervention, pruritic erythematous lesions developed around the surgical staples	Patch test	Metal intolerance
Lhotka and colleagues ¹	Randomized controlled trial	184	18 different surgical metal clamps from 10 different manufacturers	Closing surgical wounds from orthopedic procedure	47 patients developed "a rash, eczema, blisters, or edema in the wound region"; 39 patients had "delayed wound healing with secretion, edema, and pruritus for more than 12 days after surgery"; 3 patients had a "bacterial wound inflammation"; 24 patients developed "a general allergic reaction after surgery that was defined as general pruritus with urticaria"	Patch test	Not mentioned

dimethylglyoxime, confirming the nickel content. This case points to the need for constant vigilance for new perisurgical sources of nickel and the potential for finite exposures to cause significant clinical impairment.

Nickel released from nickel-plated metals commonly induces allergic sensitization, but in stainless steel instruments containing differing nickel alloys, the effects are less well known. Given the often-unknown nickel content in stainless steel instruments, the European directive outlined the amount of bioavailable nickel released from these metals onto the skin should be no greater than 0.5 $\mu\text{g}/\text{cm}^2$ per week.⁴ The United States does not have any analogous guidelines in place at this time. With the fundamental applications of metal in modern surgery, in confirmed nickel-allergic patients, safer alloys should be used to limit adverse surgical outcomes.

Allergy can impact wound healing, result in potential bacterial superinfection, and even result in more generalized eczematous or urticarial eruptions.¹ With the developing knowledge of nickel content in medical grade instruments, clinicians should be aware of potential adverse outcomes in nickel-allergic patients and implications for wound healing and allergic dermatitis.

References

1. Lhotka CG, Szekeres T, Fritzer-Szekeres M, Schwarz G, et al. Are allergic reactions to skin clips with delayed wound healing? *Am J Surg* 1998;176:320–3.
2. Sofen BD, Hunt RD, Brancaccio RR, Cohen DE. Nickel dermatitis to a disposable electrocautery tip. Proceedings of the American Contact Dermatitis Society 26th Annual Meeting; San Francisco; March 19, 2015.
3. Mehta V, Vasanth V, Balachandran C. Nickel contact dermatitis from hypodermic needles. *Indian J Dermatol* 2011;56:237–8.
4. Conde-Salazar L, Valks R, Malfeito JE, García C, et al. Contact dermatitis from the staples of neuroreflexotherapy. *Contact Dermatitis* 2004;51:217–8.
5. Edmonson JM. American surgical instruments: the history of their manufacture and a directory of instrument makers to 1990. Norman surgery series, no. 9. San Francisco, CA: Norman Publishing; 1997.

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The Role of Preoperative Antibiotic Prophylaxis for Dermatologic Surgery in Patients With Left Ventricular Assist Devices

The role of antibiotic prophylaxis in dermatologic surgery has primarily been driven by expert guidelines. Randomized controlled studies that demonstrate efficacy of prophylaxis do not exist. The most recent Dermatologic Surgery Advisory Statement in 2008 recommends antibiotic prophylaxis for prevention of infective endocarditis (IE) and joint infection only if surgery involves an oral site or an active skin infection. The patient must also have a high-risk cardiac and/or prosthetic device as defined by the American Heart Association (AHA), American Dental Association, and

American Academy of Orthopaedic Surgeons.¹ Left ventricular assist devices (LVADs) have become more prevalent in recent years; however there is a paucity of data addressing the need for preprocedural antibiotic prophylaxis in this patient population. Recent guidelines regarding IE prevention do not specifically address patients with LVADs, and evidence to help clinicians stratify the risks and benefits is limited.

With an aging population and significant prevalence of heart disease, the use of LVADs has been increasing.