

Nickel allergy in a patient after nitinol stent placement

Meryem Sassi * and Alexandre Lecis

Department of vascular surgery, Troyes Hospital Center, France.

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Abstract

We report a case involving a patient who developed a polymorphic rash and prurigo lesions on the limbs and anterior thorax, accompanied by an urticarial reaction on the back, following the endovascular placement of a femoral and iliac nitinol stent for critical limb ischemia. Patch testing identified a nickel allergy. The patient responded well to corticosteroid therapy, showing significant clinical improvement. This report discusses the epidemiology, pathophysiology, and clinical implications of nickel allergy, particularly in the context of using nickel-alloy stents.

Keywords: Dermatitis; Contact allergy; Nitinol; Stent

1. Introduction

Nitinol stents are increasingly being placed in arteries to treat peripheral and coronary vascular disease.

Nickel is a common allergen in patients suffering from contact dermatitis, and is the predominant component of nitinol.

Allergic reaction to nitinol stents can be difficult to diagnose and has only recently been recognized in the literature.

2. Case report

We report the case of a 69-year-old patient with a history of left heart failure, COPD, chronic kidney disease, and Launois-Bensaude lipomatosis.

He underwent surgery in 2020 for a 70% right carotid stenosis, benefiting from a transluminal angioplasty with a nitinol stent.

He was admitted in 2022 for the management of critical ischemia of the left lower limb.

A lower limb angiography revealed stenosis at the level of the external iliac artery, lesions at the femoral trifurcation, and stenosis at the femoropopliteal junction.

The patient underwent endarterectomy of the left femoral artery with the placement of a self-expanding stent in the iliac and femoral arteries.

Three months later, the patient presented for consultation with a polymorphic rash and prurigo lesions on the limbs and anterior thorax, with an urticarial appearance on the back.

* Corresponding author: Meryem Sassi

2.1. 3mm skin biopsy

Slight cellular infiltrate around the small vessels of the superficial dermis. The infiltrate consisted mainly of small lymphoid cells with a few activated lymphoid elements and some histiocytes. A few lymphocytes were seen in exocytosis at the basal epidermal layer. Non-specific appearance.

Patch tests revealed contact dermatitis due to the nickel contained in the nitinol stents.

Therapy with corticosteroids (30 mg orally, progressively tapering over 4 weeks) was initiated with good clinical improvement.

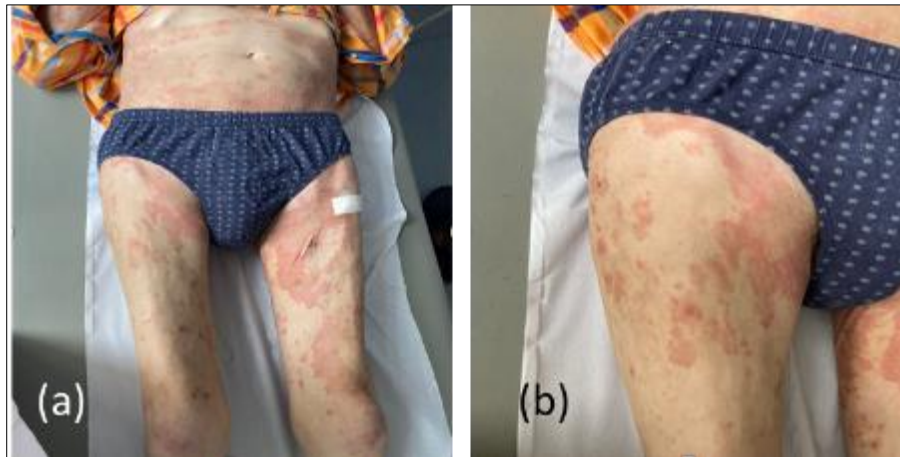


Figure (a)(b) Pruritic and an eczematous dermatitis worse on the thighs and trunk

3. Discussion

Advancements in endovascular techniques have led to the increasing use of self-expandable nitinol alloy stents in patients with claudication and critical limb ischemia.

Nickel, which constitutes 54.5%-57% by weight of nitinol, is a predominant component (1). Nickel allergy is among the most common allergies and causes of dermatitis globally, with an incidence rate reported to be between 8% and 15% in the general population (2-3).

Allergic contact dermatitis has two phases: the induction phase, with initial sensitization to the allergen, and the elicitation phase, where re-exposure to the allergen causes cutaneous inflammation. The induction phase is usually triggered by commercial products containing nickel, while the elicitation phase in some patients may be related to internal metallic implants(4). In the United States, the most commonly used stents are made of 316L stainless steel, containing chromium (20%), nickel (8.3%-35%), and molybdenum (2%-3%); these stents are available as bare metal or drug-eluting (5) . Nitinol stents (55% titanium, 45% nickel) and those made of cobalt, chromium (27%-30%), molybdenum (5%-7%), and nickel (<0.5%) are also common. Although nitinol stents release the least amount of nickel compared to stents made of cobalt, chromium, and nickel alloys, or 316L stainless steel, they are more commonly used in peripheral vascular disease (6-7).

Gimenez-Arnau et al(8) . documented a case of a nickel-allergic patient who developed generalized eczematous dermatitis three weeks after undergoing abdominal aortic aneurysm repair with a nitinol Vanguard endograft (Boston Scientific Corp, Marlborough, Mass). More recently, two case reports have described patients experiencing localized rashes with pruritus on the ipsilateral lower extremity following the placement of a nitinol stent in the femoral artery.

According to Jetty et al. (9), they suggest that the small amount of free nickel allergen released from nitinol stents is unlikely to cause a clinically significant reaction, and the nickel exposure being intravascular might lessen the severity of any reaction. However, in susceptible patients, even low-level exposure could lead to a systemic allergic reaction, as observed in the current patient.

A conclusive link between nickel allergy and in-stent restenosis has not been established. Coronary stents are typically made from smaller amounts of stainless steel or cobalt chromium alloy, resulting in a much lower proportion of nickel and overall nickel burden (5%-10% versus 55%, respectively), compared to self-expandable nitinol stents used in peripheral vascular disease(10-11)

4. Conclusion

In summary, this report underscores the potential for a systemic allergic reaction in patients with nickel allergy receiving nitinol stents for peripheral vascular disease. While the clinical impact of nickel allergy on stent restenosis remains unclear, it may be influenced by nickel bioavailability, particularly in cases of stent fracture.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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