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Management strategies for allergic reaction following implantation of nickel-containing devices



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Over the last thirty years, nickel-containing devices have been widely implemented. These include inferior vena cava (IVC) filters, amplatzer occluders, vascular and non-vascular stents, and other endovascular and implantable devices. Hypersensitivity to these nickel-containing devices has been well documented in the literature and has been reported to cause a major burden to the patients who have received nickel-containing device implants. Therefore, efforts for prevention, diagnosis, and management of hypersensitivity to nickel-containing devices are strongly encouraged.

Nickel is the most common occupational and contact allergen, affecting approximately 8.6% of the population.^{1,6} Additionally, the incidence of hypersensitivity to nickel has been reported to be as high as 15%.⁷ Therefore, manufacturers warn that use of a nickel-containing device can potentially cause allergic reactions, although the incidence of such allergic reactions with these devices is extremely rare.²

Reactions reported at the site of metal implants include type IV hypersensitivity reactions but are probably complex in nature. Peri-implant reactions seem to be Th1-dominant. Increased levels of interferon (IFN)- γ and interleukin (IL)-6 have been found in metal-allergic patients with joint arthroplasties.^{8,9} Analysis of tissues adjacent to implanted metals in patients with metal hypersensitivity have demonstrated elevated levels of immune cells/markers, including CD3 β T lymphocytes, CD4 β cells, CD11c β macrophages/dendritic cells, and cells with abundant major histocompatibility complex class II (human leukocyte antigen-DR) expression (dendritic cells).¹⁰ However, the mechanism of nickel allergy remains unknown.⁵

“Nickel itch” is an early symptom of nickel hypersensitivity and is often followed by severe dermatitis, which can continue for as long as the allergen is present.⁴ The nickel skin patch test can be used to confirm the source of the hypersensitivity reaction.⁵ Stent explantation and reconstruction with a vein graft has been reported in a patient who developed a systemic allergic reaction following placement of a nitinol stent in the superficial femoral artery.¹¹

What can we do to counter the hypersensitivity to nickel-containing device? The following recommendations should be considered: (1) An occupation history, such as prior exposure to nickel, and history of allergies should be provided before implantation of a nickel-containing device, and in patients with a known history of nickel

hypersensitivity, nickel-containing devices should be avoided. However, nickel-containing devices, such as IVC filters, may be difficult to avoid as almost all filter manufacturers use alloys that contain nickel. In such cases, a retrievable filter may be considered over a permanent one, as the filter can be removed if an adverse reaction occurs. (2) Laboratory tests including white blood cell count, eosinophil count, and nickel skin patch test should be performed for patients who are suspected of hypersensitivity to nickel-containing device.³ If an allergic reaction to a nickel-containing device occurs, treatment with steroids and antihistamine agents may be initiated in the patients who need surgery to remove the device, and device removal may be initiated in the patients with retrievable filters.

Conflicts of interest

None.

Ethical approval

This article does not contain any studies with human participants or animals performed by any of the authors.

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