

A case of severe metal hypersensitivity post tibial plating

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Citation

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Abstract

INTRODUCTION

Metal hypersensitivity is a well-recognised phenomenon post implantation of orthopaedic devices, though rarely tested for or considered prior to implantation of said devices. Our report outlines a case of severe metal hypersensitivity to stainless steel, and raises the issue of a need for pre-operative screening of patients for metal sensitivity prior to implantation. Studies would suggest a baseline incidence of nickel sensitivity in the general population to be in the order of 10-15%₁₂, with the rates doubling in those with chronic nickel exposure. The role such hypersensitivity plays in hardware failure, pain, and cutaneous reactions remains unproven in clinical studies, though many cases, such as this one, suggest a direct causal relationship.

HISTORY

The patient in question (Mr AR), a male aged 45 years, presented initially to the ED post a crush injury where he sustained an oblique fracture of the distal shaft of his right tibia (4.2.3.2). This was initially treated without immediate peri-op complications by a tibial nail. At review 5 months post an X-ray confirmed no callus formation at the fracture site, with signs of loosening around the tip of the nail. Overall alignment remained acceptable. It was decided to monitor the patient monthly for signs of union, but at 6 month review he was no complaining of pain around the fracture site and difficulty mobilising. Secondary to this painful non-union, Mr AR was taken back to theatre for removal of the nail and plating + bone grafting of his distal tibia. Again this had an uncomplicated peri-op recovery, and the patient was discharged home NWB. At 2-week follow-up his wound was noted to be erythematous and warm, with mild haemo-serous ooze. This was interpreted as a superficial wound infection and the patient commenced on oral antibiotics.

Subsequent review revealed progression of the erythema

with formation of an area of ulceration over the distal tibia (see pic 1). This failed to respond to multiple courses of antibiotics over a number of weeks. Mr AR was taken back to theatre 2 months post ORIF for wound debridement and washout (see pic 2). CRP was 3 at this time, and remained low throughout. Repeat washout was performed at 3 months post ORIF, and he was treated with IV antibiotics and a VAC dressing with mild improvement in his signs, but a persisting area of ulceration and marked pain. Treatment was continued with regular dressings and antibiotics until readmission for pain management and plastics review regarding grafting for closure. A passing comment was made about the patients' expensive 'titanium' watch under which he wore a piece of Velcro on one ward round, at which point it became clear that the patient had a marked sensitivity to metals. He reported erythema, itching and blistering with any topical contact to metal jewellery. Patch testing was undertaken with a markedly positive reaction to nickel (see pic 3), with his current tibial implant being a stainless steel distal tibial locking plate. This hardware was removed once there was radiological evidence of fracture union (6 months post implantation), with rapid resolution of the ulceration and his pain.

Figure 1

Picture 1: ulcerated lesion right distal tibia



Figure 2

Picture 2: tibial plate below ulcerated lesion at wound washout



Figure 3

Picture 3: positive reaction to nickel on patch testing



DISCUSSION

Metal allergy and its clinical relevance remains a poorly understood area for many practicing surgeons. The background incidence of metal sensitivity in the community is remarkably high at 10-15%, and up to 30% still in patients chronically exposed to metals (including women with jewellery piercing)¹²⁵. The unanswered question remains how significant clinically is a positive sensitivity to metal allergens? This question remains difficult to answer, but available evidence would suggest it might have a role in aseptic loosening of components and ongoing pain in otherwise well functioning implants.

How metal allergens induce their allergic response has been well documented. The predominant response to metal allergens is a type IV delayed hypersensitivity response⁶, though the more spectacular bullous dermatitis reactions are due to type I and/or type III responses⁷. These more severe reactions involving marked pain, erythema, swelling, and often bullous eruptions and skin loss, are quite rare⁴, with a few reported in previous case reports. Warmuth et al³ examined 794 patients undergoing insertion of metal implants and found only 1 developed a dermatitis reaction to allergen testing post-operatively. An interesting finding supported by a number of researchers has been an increased incidence of sensitivity in patients post-operatively as compared to pre-operatively, with rates as much as double⁹. The rates of metal sensitivity in patients with well functioning implants has been reported from 6% to as high as 33%^{9,10}. Lending support to the idea of a causal relationship between sensitivity to metal allergen and implant failure, studies have shown rates of sensitivity in

patients with poorly functioning implants from 13-69%₉₁₀.

Metal sensitivity may exist as an extreme complication in only a small percentage of cases, or alternately may be a subtler contributor to pain and implant failure₁₁. Further research is required in this field to determine the exact relationship of the development of metal sensitivity and clinical conditions such as persisting pain or hardware failure. The question then will be that considering the high incidence of allergy to common components of stainless steel, should we be routinely testing patients pre-operatively for sensitivity to metal allergens, or routinely using titanium products with a lower allergic response rate? As these decisions have huge financial and treatment implications, further evidence is required to make an informed decision.

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