



Short communication

Prospective analysis of the incidence of metal allergy in patients listed for total replacement of the temporomandibular joint

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Abstract

We prospectively analysed the incidence of metal allergies in patients listed for total replacement of the temporomandibular joint (TMJ) and the efficacy of patch testing to prevent rejection phenomena. All patients ($n = 101$) that required a prosthetic TMJ between March 2004 and August 2012 were tested preoperatively. A total of 39% had an allergy to one or more metals and they were given all-titanium prostheses. Following the introduction of this protocol no patients have shown signs of an allergic rejection within 6 months of operation. We suggest that all patients listed for total TMJ replacement should have patch tests for metal allergies and that all-titanium prostheses are used when allergy is detected.

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Keywords: TMJ replacement; Metal allergy; Patch testing; Prosthetic joint replacement

Introduction

Current TMJ replacements have developed since the 1960s for the management of end-stage TMJ diseases including inflammatory and degenerative arthritis, trauma, and complications of surgery.¹

In the UK during the 1990s most prostheses placed were one of two variants of the Christensen system (TMJ Implants, Golden, USA), an acrylic condyle on a cobalt–chromium fossa, or subsequently a metal-on-metal cobalt–chrome condyle and fossa system. In a UK-based study of 3 centres where 29 acrylic-on-metal prostheses and 77 metal-on-metal prostheses were placed, a foreign body-type giant cell reaction developed within months of placement in 2 of the

acrylic-on-metal and 7 of the metal-on-metal prostheses.² Patch testing for metals which was done in some of these cases showed an underlying metal allergy, and routine pre-operative patch testing was suggested. After this, routine patch testing and custom-made prostheses (TMJ Concepts, Ventura, USA) were introduced to eliminate 3 possible causes of failure: allergy to metal components; debris from early metal-on-metal wear; and micromotion of the prosthesis, which is reduced when a custom-made joint is used.

On a standard TMJ concepts prosthesis the condylar head is made from cobalt–chromium–molybdenum attached to a titanium alloy body, which is secured to the mandibular body by titanium screws. The fossa component, which is made from ultra-high-molecular-weight polyethylene attached to a commercially pure titanium backing, is secured to the glenoid fossa with titanium screws. The alternative design (for use in patients allergic to metal) uses an all-titanium condylar head with a plasma spray coating.

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Table 1

Incidence of metal allergy. Data are number (%).

Metal allergen	No. (%) of patients (n = 39)
Chromium	2 (5)
Nickel	28 (72)
Cobalt	5 (13)
Molybdenum	1 (3)
Nickel and cobalt	3 (8)

Method

Patients who have TMJ replacement are routinely advised to give their consent to lifelong assessment of the outcome of their prosthesis according to US Food and Drug Administration (FDA) requirements. Patients were not listed for joint replacement until they had patch tests for nickel, cobalt, chromium, and molybdenum – the components of cobalt–chromium alloy. Allergy to medical titanium is rare³ and there is no alternative replacement so tests for titanium or vanadium (included in the alloy) were not routinely done and were not available in some centres. All data were placed on a secure prospective database. Data regarding metal allergy were analysed from March 2004 for all patients who had total TMJ replacement.

Results

From March 2004 to August 2012, 101 patients had a total TMJ replacement with follow-up of at least 6 months. All of them had patch tests for the components of cobalt–chromium alloy before operation. Of those treated, 62 had no allergies and were given standard TMJ replacements (except one who had an all-titanium prosthesis because the patch test was delaying treatment); 39 with an allergy to metal were given an all-titanium condylar head (Table 1).

To date no patient has shown any symptoms of allergic reaction within 6 months of operation.

Discussion

The most common sensitivity was to nickel which correlates with general data on the population.⁴ Importantly, patch tests showed that 39% of patients listed for TMJ replacement had an allergy to metal, but it cannot be assumed that all who showed sensitivity to metal would have developed an allergic reaction. In the absence of preoperative testing, between 1999 and 2006 Speculand found that the failure rate caused by proven sensitivity was 0.33%.⁵

The efficacy of patch testing for allergies to metal in orthopaedic patients has been debated.^{6,7} In a review, Thyssen

et al.⁸ concluded that clinicians refrain from wholesale patch testing. One of the key points in their argument was that of cost–benefit. Patch testing costs £270 in our centre (including components, and medical and nursing time). The cost of a TMJ replacement is around £8000 for the prosthesis and roughly £5000 for the treatment. Revision causes considerably more morbidity than primary replacement with respect to the facial nerve. In the context of TMJ replacement, testing is justified financially if rejection caused by allergy is around 9%, which was the rate found in the multicentre study before practice was changed.²

These results confirm that patch testing seems adequately to prevent allergic reactions to the prosthetic components used in total TMJ replacements. However, with no long term data on wear in all-titanium joints, current evidence still supports a cobalt–chrome–molybdenum (containing nickel) prosthesis over an all-titanium head. Titanium is considered to be hypoallergenic, but although rare, sensitivity has been seen to this metal too.⁶

We recommend that all patients listed for total TMJ replacement should have routine patch tests to prevent early rejection caused by allergic phenomena.

Conflict of interest

The authors have no conflicts of interest.

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