

31+ Metals are Not Needed for Patch Testing in Joint Replacement Patients: Medium-Sized Health System Experience

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Introduction: The non-standardized workup methods among allergist providers over allergic contact dermatitis (ACD) due to metals leads to variable communication back to referring surgeons. The testing protocol, history taking, and size of patch testing panel vary considerably across the country, with vague directions provided by practice parameters. To optimize current practices and decrease cost, it would be useful to reduce the metals tested on the panel to reflect the most commonly identified allergens in implant patients, establish an efficient assessment-day strategy, and to refine history taking methods to best predict positive results.

Methods: We conducted a blinded retrospective chart review of 157 patients in a single outpatient allergy clinic from 7/20-7/23 referred for the evaluation of ACD due to metals. Questions used to evaluate the patient dataset revealed individual symptomatology, characteristics of historical reactions, purpose for visit, patch testing results, and the days tests turned positive. A chi-square analysis determined if a significant difference existed between population sub-group prevalences. Defined Terms: Preoperative screening joint replacement (JR) patients: patients referred to an allergist after answering yes to past metal sensitivity. Problematic JR patients: postoperative patients expressing issues with the recovery process to the allergist. Non-JR patients: patients with ACD due to metals attending the clinic for non-JR related purposes. Grid: lines drawn around patch testing wells on the skin after removing the testing kit.

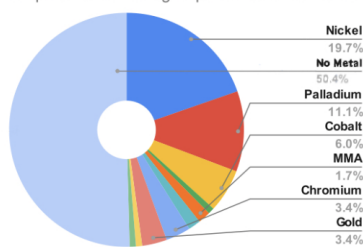
Results: 84.1% of patients referred for metal allergy concerns were joint related. 45.5% of non-JR patients, 39.0% of JR patients, and 39.5% of the total patient population were positive for any metal allergy. Population subgroups such as preoperative screening and problematic JR patients were allergic 42.2% and 23.3% of the time. Preoperative screening JR patients were more likely to test allergic to nickel, palladium, cobalt, chromium, gold, silver, and indium in order of prevalence. Problematic JR patients were more likely to test allergic to benzoyl peroxide, nickel, palladium, platinum, aluminum, and methyl methacrylate. The most prevalent allergens were nickel, cobalt, chromium, benzoyl peroxide, and methyl methacrylate. Preoperative screening JR patients were 18.9% more likely to be allergic to nickel than problematic JR patients. Of the 30 problematic JR patients, 76.7% reported pain and/or swelling, 13% tested positive to any of the 31 metals, and only 8% tested positive to a metal used in surgery. Patients were more likely to be positive if presenting with redness (p=0.0307) or lesions/blistering (p=0.0018), but not with swelling, itch, oozing, and rash (p>0.05). All positive JR patients tested positive on day 7.

Discussion: The majority of patient referrals for metal allergy concerns involved a metal implant, indicating the importance of optimizing patch testing protocol. Problematic JR patients (N=30) were less likely to test positive for a metal allergy than pre-JR patients and non-JR patients (N=22), a clinically significant observation. Statistical significance was not established (p=0.0588 and p=0.1359 respectively) due to small sample size. Preoperative screening JR patients were more likely to test allergic for nickel, palladium, cobalt, chromium, gold, and silver potentially from jewelry exposure. Problematic JR patients were just as likely to be allergic to benzoyl peroxide as nickel, which is most likely due to surgical exposure through an open wound. Problematic JR patients were also more likely to test allergic to aluminum and platinum metals potentially from surgical use. Only 12/31 metals tested positive in the total JR-related population. An abbreviated metal patch test may be sufficient in certain situations, like for patients with poor geographic access to an allergist office. All positive JR patients tested positive on day 7, reflecting the clinical insignificance of day 3 readings for JR patients. Omitting day 3 readings requires a patient's family/friend to redraw the grid on the patient's back as needed. Many problematic JR patients report pain and/or swelling, however only a small fraction test positive to any of the 31 metals included in patch testing or surgery. This observation may be linked to prosthesis-induced desensitization. The most prevalent allergens in our data set were nickel, cobalt, chromium, benzoyl peroxide, and methyl methacrylate. Titanium and aluminum may be necessary to test for despite only being in the data set once (limitation of study) because they are used in implants and during surgery. It is important to note that the nonmetal allergens methyl methacrylate (MMA) and benzoyl peroxide (BP) may test positive on day 3 but not day 7. The limitations of our findings lie in our small sample size (N=157) and the inherent selection bias seen in physician indications for testing and research analysis.

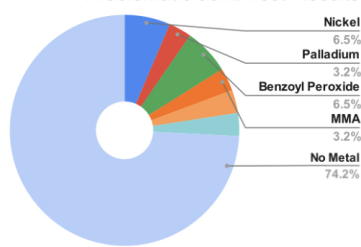
Significance/Clinical Relevance: Our findings clarify the most commonly reacted metals, optimal days to assess readings, and historical indicators for the joint replacement population. This information can be applied in clinical practice for both allergy and orthopedic offices to optimize workflow and minimize cost. A cheaper, abbreviated, and readily-available testing kit for joint replacement patients located geographically far from an allergist office could mitigate negative patient outcomes.

Images and Tables:

Preoperative Screening Replacement Test Results



Problematic Joint Test Results



of Positive Results based on Assessment Days

