

CASE REPORT

CASO CLINICO

The importance of the patch test (as a preventive method) before an orthopaedic prosthesis implantation: a case report

L'importanza del patch test (come prevenzione) prima dell'implantologia di protesi ortopediche: esperienza personale

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Key words

Gallium oxide • Mercury • Copper sulphate • Patch test • Orthopaedic prosthesis • Metal allergy

Parole chiave

Gallio ossido • Mercurio • Rame solfato • Patch test • Protesi ortopediche • Allergia ai metalli

Summary

We report a case of a 58 years-old woman who suffered bilateral meniscopathy and needed a knee arthroplasty. The patient had a history of contact allergic dermatitis due to costume jewellery and diffuse pruritus following the ingestion of citrus fruits. She was patch tested to metals (Metal Standard Series) and resulted positive on day 3 to gallium oxide, mercury and copper sulphate. These results indicate that patch test before implantation of metal alloys may be useful in patients with suspect allergy to metals to reduce the risk of hypersensitivity reactions against materials considered biocompatible.

Riassunto

Questo caso clinico descrive il caso di una donna di 58 anni affetta da meniscopatia bilaterale che rendeva necessario un intervento di artroplastica. La paziente aveva una storia di dermatite allergica da contatto causata da materiali di bigiotteria e prurito diffuso in seguito ad ingestione di agrumi. La paziente veniva sottoposta a patch test con esito positivo al 3° giorno per gallio, mercurio e rame solfato. Questo dato dimostra l'importanza del patch test in quei soggetti che devono essere sottoposti ad implantologia di protesi metalliche, per l'eventuale rischio di sviluppare reazioni di ipersensibilità nei confronti dei metalli considerati biocompatibili.

Introduction

Metallic alloys are largely used for osteosynthesis, restorative dentistry and long-term implants¹ and may evoke in some patients hypersensitivity responses, including severe dermatitis, urticaria, vasculitis and/or non-specific immunosuppression²⁻⁴. Such hypersensitivity reactions is usually not to the metallic implant itself but to the dissolution or degradation products (as moieties in haptenic complexes or as chemiotactic agents). A growing number of case reports provide evidence of immunogenic reactions with adverse performance of metallic cardiovascular, orthopaedic, plastic surgical and dental implants. In some cases reactions such as dermatitis, vasculitis and urticaria are associated with more general phenomena of metallosis (metallic staining of the surrounding tissue), excessive periprosthetic fibrosis and muscular necrosis; the

severity of such immunological events generally led to device removal. The extent of the immune response upon implantation of metallic devices depends on the individual reactivity and on material characteristics; in particular patients who have had an allergic reaction to a metallic device or to jewellery are more likely to have a reaction to an implanted device than are those with no such history. Furthermore, there are several reports evidencing the possibility that metal sensitivity may occur in patients bearing implants made or containing metals thought to be more biocompatible than alloys made of nickel, cobalt and chromium.

Case report

A 58 year old woman was referred from physicians of the IOMI, Istituto Ortopedico del Mezzogiorno

d'Italia "Franco Scalabrino" of Messina to our observation in the Division of Allergy and Clinical Immunology because of suffering bilateral meniscoparthy and needing knee arthroplasty.

The patient had an history of contact allergic dermatitis due to costume jewellery and of diffuse pruritus following ingestion of citrus fruits. However the patient had experienced no episode of oral pruritus, adverse drug reactions and allergic respiratory symptoms. From more than 10 years she was wearing a removable denture and bearing several dental restorations.

She was patch tested to Metals Standard Series for: i) acid tetrachlorine, ammonium molybdate, ammonium tetrachlorine platinum, colloidal silver, cadmium sulphate, cobalt chloride, cobalt; ii) sulphate, chromium; iii) chloride, chromium sulphate, iron chloride, iron sulphate, gallium oxide, indium chloride, mercury, nickel sulphate, palladium chloride, copper sulphate, ruthenium, tin chloride, tantalum, titanium; iv) oxide, zinc chloride, metallic zinc, zirconium oxide, aluminium hydroxide, vanadium chloride), which showed positivity on day 3 for mercury, copper sulphate and gallium oxide.

Besides being employed in the semiconductor industry, gallium is largely used in the medical field as diagnostic and therapeutic tool and may be also

contained in metallic alloy implants, because it is generally considered more biocompatible than other metals⁵. Biologically, gallium is able to interrupt iron metabolism and its pharmacological and toxicological profile has been well characterized. Although exposure to gallium has been shown to affect the human immune system, no data or case report are present in literature describing allergy or hypersensitivity responses to this metal.

Discussion

Currently, neither a generally accepted test for the clinical determination of metal hypersensitivity to implanted devices exists nor a standardized epicutaneous test protocol related metal implants has been established. Although acknowledging the inherently high degree of uncertainty associated with dermal patch testing, especially in the context of implant-related metal sensitivity, our results evidence that a standardized reliable patch-test battery carried out before implantation of metal alloys might be useful to identify subjects with a risk of developing hypersensitivity reactions against materials considered biocompatible and/or present only as minor components in implant devices.

References

- ¹ Morra M, Cassinelli C. *Biomaterials surface characterization and modification*. Int J Artif Organs 2006;29:824-33.
- ² Hallab N, Merritt K, Jacobs JJ. *Metal sensitivity in patients with orthopaedic implants*. J Bone Joint Surg Am 2001;83-A:428-36.

- ³ Thomas P. *Allergic reactions to implant materials*. Orthopaed 2003;32:60-4.
- ⁴ Jacobs JJ, Hallab NJ, Skipor AK, Urban RM. *Metal degradation products: a cause for concern in metal-metal bearings?* Clin Orthop Relat Res 2003;417:139-47.
- ⁵ Bernstein LR. *Mechanisms of therapeutic activity for gallium*. Pharmacol Rev 1998;50:665-82.