

The development of metal hypersensitivity in patients with metal-to-plastic hip arthroplasties

J. P. NATER¹, R. G. BRIAN², R. DEUTMAN² AND TH. J. MULDER³

¹ Department of Dermatology, State University Hospital, Groningen, the Netherlands

² Roman Catholic Hospital, Groningen, the Netherlands

³ Diaconessen Hospital, Groningen, the Netherlands

Sixty-six patients who had to undergo total hip replacement by means of a metal-to-plastic Stanmore prosthesis, were patch-tested prior to and 6 to 12 months after surgery with the standard ICDRG allergens series and with acrylic monomer 5 % in acetone.

In 62 patients the history of metal allergy as well as the patch tests to all tested allergens were negative. One patient with a history of metal allergy reacted negatively before surgery; about 6 months after surgery the patch test to nickel sulphate was positive (2 plus).

Three other patients developed positive patch test reactions after surgery: two reacted positively to nickel sulphate (2 plus) and one to cobalt chloride (2 plus). In none of the 66 patients have local side effects of the prostheses been found to date.

Key words: Cobalt chloride – metal-to-plastic prosthesis – nickel sulphate.

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Metal implants are used regularly in orthopaedic surgery. The most commonly used alloys consist of nickel, chromium, and cobalt, in various percentages.

Recently, cases of loosening of joint prostheses have been attributed to the development of a state of immunologic sensitivity to the metallic components of the joint prostheses (Munro-Ashman & Miller 1976). Metal-to-metal bearings particularly generate metallic wear products. A high incidence of hypersensitivity to nickel, cobalt, and chromium in patients with metal-to-metal (McKee-Farrar) hip prostheses was reported by several authors (Benson et al. 1975, Evans et al. 1974, Elves et al. 1975). These findings seem to indicate that metal-to-metal bearings may sensitize some patients to the

metals of the prostheses, which may cause loosening of the joint. In contrast, according to Benson et al. (1975) patients with metal-to-plastic prostheses had no greater incidence of metal sensitivity than a control group.

The exact incidence of metal sensitivity in a group of patients before and after joint replacement still remains in doubt. In an attempt to solve this question, the present study was carried out in a group of patients with implanted metal-to-plastic total joint prostheses.

Materials and Methods

Sixty-six patients who had to undergo total hip replacement were examined prior to and

after surgery. Osteoarthritis was the usual reason for the replacement arthroplasty. In all cases metal-to-plastic Stanmore prostheses were implanted, consisting of metal and high density polyethylene joints, in combination with acrylic bone cement.

The patient group was composed of 55 women and 11 men, with an average age of 69.5 years. Special attention was given to symptoms in the history of the patients which might indicate possible skin reactions to metal. All persons were patch-tested prior to surgery and during a period of 6 months to 1 year afterwards.

The patch tests were performed on the skin of the back with the standard series of allergens recommended by the International Contact Dermatitis Research Group. The series of standard allergens includes potassium dichromate 0.5 %, nickel sulphate 2.5 %, and cobalt chloride 1 %, all dispersed in petrolatum. To this battery was added acrylic monomer 5 % in acetone. The tests were done according to the methods recommended by the ICDRG. Reactions were read after 48 hours and scored according to the method of the latter group.

Results

In 62 patients the history of metal allergy as well as the patch tests to all tested allergens were negative before and after surgery. One patient with a history of metal allergy reacted negatively to all tests before the surgical operation. About 6 months afterwards the patch test reaction to nickel sulphate was positive (2 plus). Three other patients with a negative history and negative patch tests before surgery developed positive patch test reactions: two reacted positively to nickel sulphate (2 plus) and one to cobalt chloride (2 plus). Thus far in none of the 66 patients could side effects (such as pain, loosening of the prosthesis or skin symptoms) be noted.

Discussion

Four out of 66 patients probably developed a sensitization to nickel or cobalt as a direct consequence of the implantation of a metal-to-plastic prosthesis. In one of these patients a history of possible metal allergy was noted, but patch tests before surgery were negative. In this case boosting of a previously existing but subliminal sensitization might have taken place. Sensitization to acrylic monomer of the bone cement, a well-known hazard in prosthetic dentistry, could not be demonstrated in any patient.

None of our patients experienced pain, loosening of the prosthesis or skin eruptions. The possibility clearly exists, however, that some of these patients may run into trouble in later years.

Conclusion

Patients in the general population may be sensitive to nickel, cobalt, or chromium. In our opinion, in order to prevent rejection reactions, it is necessary to take a careful history concerning metal allergy, as well as to patch test each patient for whom metal implant surgery is considered. One must be aware of the fact, however, that sensitization may develop in patients with metal-to-metal implants. Our own investigation indicates that this sensitization may even develop in patients with metal-to-plastic implants.

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Address:

J. P. Nater

Department of Dermatology

State University Hospital

Groningen

The Netherlands

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