Massive exposition to titanium, but without sensitization

A case report of an overlooked disassembly of a modular acetabular component

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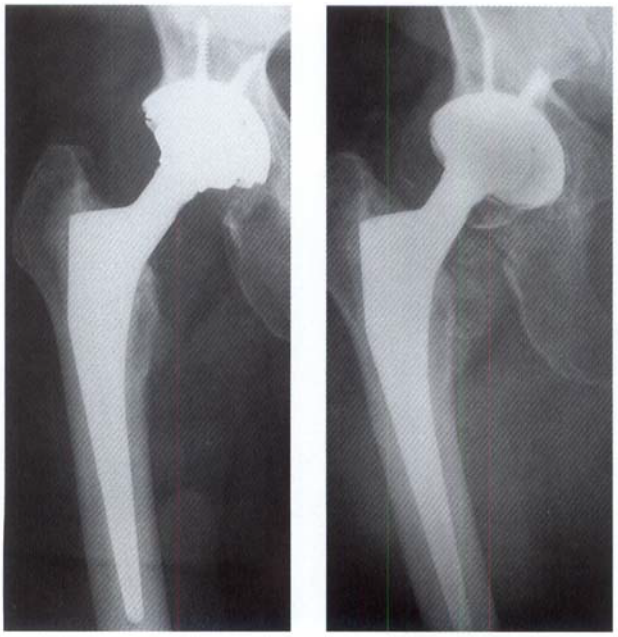
Lalor et al. (1991) have suggested the occurrence of sensitization to titanium after implant failure. We report a case of excessive and prolonged deposition of titanium and titanium alloy-debris after disassembly of a modular acetabular component in which no sensitization was found.

Case

In May 1987, a 74-year-old woman underwent a total hip replacement for primary arthrosis. The patient had no history of allergic reactions. The femoral component used was a cemented Müller titanium aluminum niobium alloy (Ti-6Al-7Nb) lateral stem with a cobolt chromium molybdenum alloy (Co-Cr-Mo) head. The acetabular component was an uncemented 50 mm Harris-Galante cup, a modular component with a metal shell fixed with 3 titanium aluminum vanadium alloy (Ti-6Al-4V) screws and an ultra-high molecular weight polyethylene (UHMW-PE) liner. The shell was made from commercially pure titanium (CPTi) and TiAlV alloy.

The patient gradually resumed her former activities. In October 1988, she suddenly heard a loud snapping noise from the joint and later a squeaking sound on flexion of the hip. Radiographs in December 1988 (Figure) showed a satisfactory position of



December 1988 (left), 5 years prior to revision, showing a satisfactory position of the prosthesis.
November 1991 (right), 19 months prior to revision, showing an eccentric position of the prosthetic head in the acetabular shell.

Sectioned soft tissue block, excised at revision, with excessive metallosis and necrotic cysts.

the prosthesis but, on clinical examination, the hip subluxated during maximal flexion. The patient gradually began to feel pain, and radiographs from November 1991 showed a cloudy mass in the hip joint (erroneously interpreted as chondromatosis). In April 1993 the patient suddenly experienced acute pain and radiographs then showed an eccentric position of the prosthetic head.

At revision, we found a 6 × 8 × 10 cm block of black, fibrous soft tissue adherent to the joint pseudocapsule and embedding the sciatic nerve. In the joint cavity, excessive amounts of black liquefied debris were found. The polyethylene liner was subluxated 90 degrees out of the metal shell. 11 g, i.e., 28 percent, of the metal shell, and approximately half the screw material had eroded away. The remaining metal shell, screw parts and femoral stem were found to be well fixed. The femoral head had 2 superficial scratches and the polyethylene liner was worn down by the femoral head. The soft tissue block was sectioned, several necrotic cysts with an approximate diameter of 1 cm and multiple metal deposits were found. The tissue was microscopically composed of hyperplastic synovial and fibroblastic tissue with calcifications and excessive deposition of black pigment lying extracellularly or within macrophages.

The patient had no eczema or allergic skin symptoms. 3 months following the revision, the patient was patch-tested with titanium oxide 2% in petrolatum, aluminum and vanadium. A standard closed test technique, as outlined by the International Contact Dermatitis Research Group (ICDRG) (Fregert 1981) was performed. The test substances were applied in a Finn chamber on Scanpore for 48 h and read at 48 and 72 h, and finally on day 7. No sensitivity to any of the applied substances was found.

Discussion

Reevaluation of the radiographs from November 1991 showed an eccentric position of the prosthetic head in the cup and a curved shadow distal to the head indicating, as pointed out by Retpen and Solgaard (1993), displacement of the polyethylene liner. Thus, for a period of at least 19 months prior to revision, metal-on-metal contact caused excessive deposition of CPTi and TiAlV debris. This metallosis explains the cloudy mass also seen on the radiographs from November. Our case emphasizes the importance of detecting radiographic signs of disassembly.

Generally, the risk of metal sensitivity after metal-on-polyethylene hip arthroplasty seems to be very small (Mjöberg 1994). However, in a study of 5 patients with failed hip implants, Lalor et al. (1991) suggested that contact sensitivity to titanium can be induced. However, titanium allergy is so rarely suspected that the experience with allergy testing is limited. Scales (1991) stated that titanium liberated by wear is believed to occur only as titanium oxide. Therefore, we chose to skin-patch test the patient with titanium oxide.

Thus, the absence of eczema or other allergic skin symptoms does not favor the development of an allergic reaction induced by titanium in this case, which is supported by the negative patch test with titanium oxide.

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