Coexistence of dissimilar metals after conversion of intertrochanteric osteotomy to total hip arthroplasty

18 patients followed for 5–20 years after conversion

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Extraction of an internal fixation device during the conversion of a failed intertrochanteric osteotomy to a total hip arthroplasty (THR) may lead to excessive trauma of the femoral shaft. In an attempt to bypass this risk, we performed THR leaving the old osteosynthetic material (straight plates and screws) in 10 of 48 patients operated on during the last 20 years. In another 8 patients, most of the osteosynthetic material was removed, but screw fragments were left in the canal. Insertion of the cement and the stem was unexpectedly easy in all 18 cases. After a mean follow-up of 10 (5–20) years there were no clinical problems. Radiographically, there were no signs of loosening, with only an occasional slight osteoporosis of the greater trochanter. Although theoretically the coexistence of different metals in the shaft should be avoided, in practice it does not appear to create a problem for patients. This may be attributed to insulation of the dissimilar materials by the cement. In conclusion, in cases where removal of the osteosynthetic device is expected to lead to severe trauma of the femur, our findings indicate that it is no disadvantage to perform the THR leaving the internal fixation material in place.

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The conversion of failed intertrochanteric osteotomy to total hip arthroplasty (THA) presents certain problems, such as risk of fracturing the femur during dislocation, difficult preparation of the femoral canal and difficulties in removal of plates and screws (Dupont and Charnley 1972, Benke et al. 1982, Ferguson et al. 1994). Extraction of the old internal fixation device, particularly those used in some cases up until the late 1970s, may lead to excessive trauma of the femoral shaft. In an attempt to bypass these risks, we performed THA by leaving part or all of the old osteosynthetic material (straight plates and screws) in place.

Patients and methods

Between 1975 and 1991, conversions of failed intertrochanteric osteotomies to THA were performed in 48 cases. The mean age of the patients at the time of the conversion was 66 (43–81) years; there were 39 women. The mean follow-up was 10 (5–20) years.

The initial diagnosis were a dysplastic hip in 5 patients, congenital subluxation in 32 and mild to moderate arthrosis in 11. At the time of conversion, the disease had progressed to a severe arthrosis in all patients. The right hip was involved in 27 cases, and the left hip in 21. The THA was performed mean 16 (3–29) years after the osteotomy.

All patients had previously undergone internal fixation. A Wainwrigt splint had been used in 17 patients, a AO blade plate in 15 and other types of fixed or modular nail, side plate devices had been applied in the remaining cases. In 2 hips the osteosynthetic material had been removed more than 4 years before the conversion.

Various types of prostheses were used for the subsequent THR, including 12 Howse, 2 Muller (curved stem), 2 Howse-Arden, 20 Muller (straight stem), 1 Charnley, 9 SP (Link) and 2 Omnifit. There was no relationship between the type of the osteotomy and the choice of the prosthesis.

Clinical assessment was done using Charnley's modification of Merle D'Aubigne's classification (Charnley 1979).

Results

Surgical experience: Exposure was always postero-

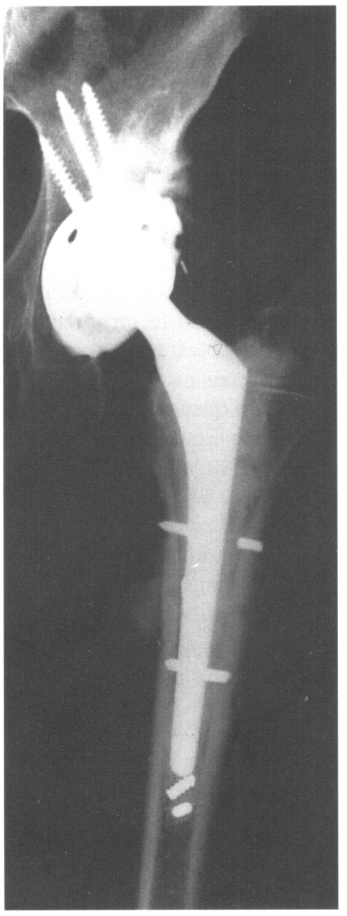


Figure 1. THR performed with incomplete removal of previous osteosynthesis material. Note the broken screws in the medullary canal.

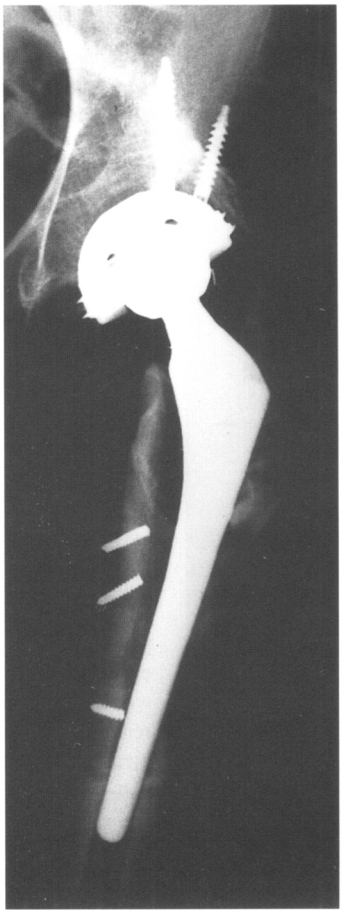
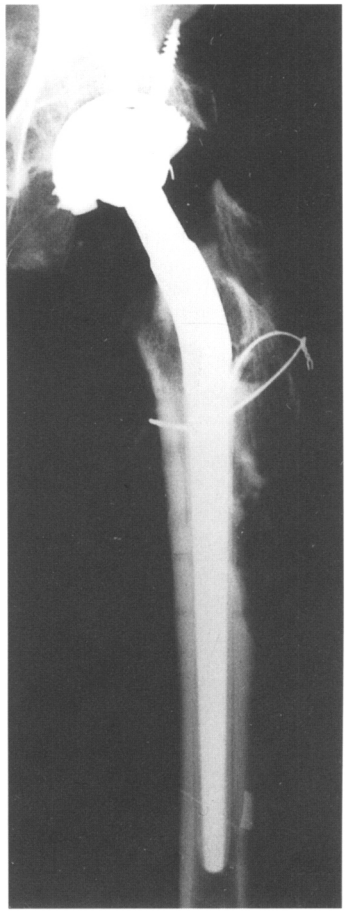


Figure 2. Extensive tramatization of the shaft after the removal of the osteosynthetic material for conversion to THR.



Revision of the THR after the poor initial result.

lateral, and once the hip joint was dislocated, an effort was made to remove the osteosynthetic material. In more than half of the cases we had difficulties in removing plates and screws, mostly the older types of internal fixation devices (Wainwright plates, vitallium screws, etc). In these cases, in addition to common standard techniques we used other available solutions, including collapse of the screw head after drilling a hole in it and subsequently lifting the plate; turning the screw in the direction of tightening before reversing; breaking off the screws in the medullary canal for an easier insertion of the stem (Figure 1).

Using these techniques we were able remove the internal fixation devices in 29 hips. In 8 cases screw fragments remained in the canal, while in 10 cases the removal of the osteosynthetic material was not feasible without a high risk of severe complications, such as excessive trauma to the femur, especially in old osteoporotic patients. In one case, the removal was so difficult that the shaft of the femur was extensively damaged, and the operation had to be terminated with a very poor result which led to a revision after 3 weeks (Figure 2). In all 18 cases in which the osteosynthetic material was left in, the insertion of the cement, as well as the prosthetic stem occurred with unexpected ease (Figure 3).

Follow-up: 31 of the 47 patients in whom an intertrochanteric osteotomy had been converted to THA underwent clinical and radiographical assessment at final follow-up. The remaining 16 patients had either died or were lost to follow-up. There were no eviclinical differences between the 20 patients in whom the osteosynthetic material had been completely removed and the 11 patients in whom part or all of the material was still in place. At final follow-up, the clinical and radiographical picture was similar to that seen for pri-

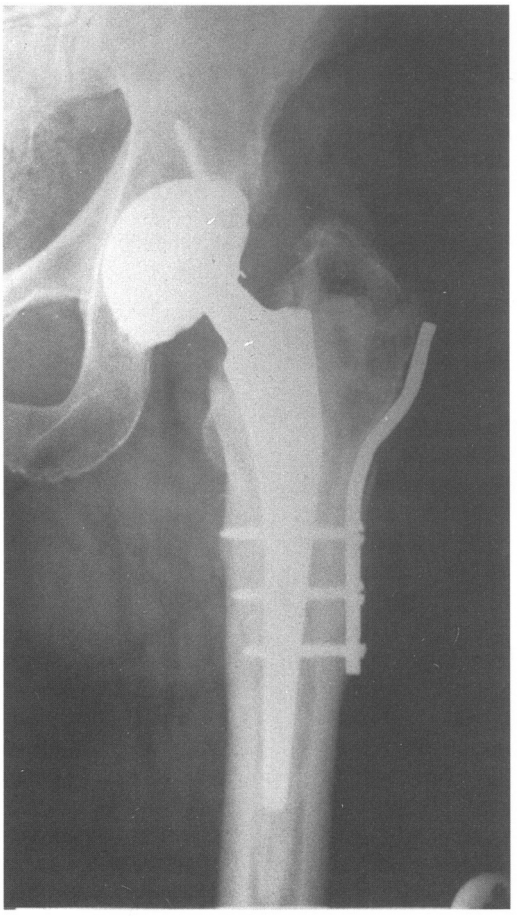


Figure 3. THR performed without removing the previous osteosynthetic material.

mary THA in comparable patients. In those patients in whom the internal fixation device had been removed, the expected loosening of the stem which occurred after 10–15 years did not appear to be related to the areas with cortical defects produced by the removal of screws. Serial radiographic examinations showed no signs of loosening and a good clinical outcome in those patients with the original osteosynthetic material in place. Slight osteoporosis of the greater trochanter was detected in 2 patients, 3 years after the conversion. The osteoporosis did not progress in either patient and did not produce any clinical symptoms.

Discussion

Intertrochanteric osteotomy is a successful operation for the treatment of mild or moderate arthrosis, especially in young patients with dysplastic hips or subluxed femoral heads. Even in this properly selected group, intertrochanteric osteotomy usually offers only a transient surgical alternative. Since the disease usually progresses to severe arthrosis of the hip joint, the majority of these operations which are performed in rather young patients finally fail. The mean time of conversion to THA has been reported to be between 5 and 9 years (Benke et al. 1982, Ferguson et al.1994, Miegel and Harris 1992). Although some studies show that at 10 years 70–80% of intertrochanteric osteotomies continued to have satisfactory outcome (Langlais et al.1979, Watillon et al. 1978). In our series, the mean time of conversion was 16 years after the osteotomy. This may be explained, in part, by the fact that the patients in our series were operated on in earlier stages, and thus, they still had a long way to go until the end-stage of the disease was reached.

The conversion of failed intertrochanteric osteotomy to THA does not seem to prejudice the final outcome (Benke et al. 1982, Dupont and Charnley 1972, Ferguson et al. 1994). Nevertheless it presents some problems, such as compromised incision and difficult exposure, risk of fracture of the femur due to the weakening from screw extraction, and difficulties in reaming the femoral canal because of the displacement of the upper femur. In our series, the most difficult problem was the occasional inability to extract the osteotomy fixation device, particularly the osseointegrated chromium and cobalt threaded screws. This effort, in some cases, would have caused excessive damage of the femoral shaft, as well as other complications, including penetration of the femoral cortex in osteoporotic parts, blood loss and prolonged operative. Because of the probability of these complications some authors (Dupont and Charnley 1972) no longer attempt to remove screws, while others recommend that screws and plates should be routinely removed after union of the osteotomy (Ferguson et al. 1994).

The insertion of the femoral stem in cases where part or all of the old internal fixation device was not removed raises some practical problems and theoretical considerations. The former has to do with the expected difficulty in inserting the stem with the screws in place. This anticipated difficulty proved not to exist in the our series, since in the 10 cases with all of the old osteosynthetic material left, the insertion was very easy. In other 8 patients with some material left in, the screws were easily broken in the canal with a blunt instrument. We preferred this technique rather than damaging the shaft of the femur with holes through the shaft at each screw site. This technique was first reported by Dupont and Charnley (1972) who found that breakage of the vittalium screws into the medul-

lary canal using a long screwdriver was quite easy.

The theoretical considerations raised by leaving the internal fixation device in place is related to the coexistence of dissimilar metals in the femoral canal. Many screws are of cobalt-chrome alloy, while some femoral prosthesis contain stainless steel or titanium. When dissimilar metals are present, one tends to become an anode and the other a cathode. In the presence of oxygen, a battery effect or galvanic corrosion will take place. In practice, however, this theoretical disadvantage did not appear be a problem. This may be due to the insulation of the dissimilar materials by the cement (Dupont and Charnley 1972).

In conclusion, the findings of the present study indicate that whenever the removal of an internal fixation device during the conversion of intertrochanteric osteotomy to THA is difficult and potentially dangerous, it is best to leave it in place.

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