Hip socket wear due to component mismatch

A case report

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A total hip replacement with loosening of the femoral component was revised. The original femoral component with a 35-mm head was exchanged for one with a 32-mm head. The mismatch caused extensive wear of the acetabular component. The importance of preoperative planning in revision surgery is stressed.

Case report

In 1975, a 57-year-old man with rheumatoid arthritis had a total McKee-Arden arthroplasty of his left hip, initially with an excellent result. In 1981, there were obvious radiographic signs of loosening of the femoral component (Figure 1). At revision the loose McKee-Arden femoral component was exchanged for a Richards femoral component with a long stem. The acetabular component was not exchanged because there were no signs of loosening or wear on radiographs or during the operation.

In 1986, the patient was admitted to our hospital because of severe pain in his left hip when walking. Radiographic examination revealed loosening and extensive wear with fragmentation of the acetabular component. Furthermore, there was an incongruency between the head of the femoral component and the acetabular component as seen on radiographs ever since the femoral component was exchanged in 1981 (Figure 1b). Measurements showed that the outer diameter of the head of the primary femoral component was 35 mm and the outer diameter of the head of the exchange femoral component was 32 mm. At second revision a very rough and abundant polyethylene synovitis was found. The acetabular component was loose and extensively worn. The upper part of the socket wall, with an original thickness of 6 mm, was completely absent, with only fragmented parts of the rim remaining. It was exchanged for a standard acetabular component with an inner diameter of 32 mm.

Discussion

Wear of the high-molecular weight polyethylene socket is seldom a cause of failure in total hip replacements (Cupic 1979, Dunn and Hamilton 1986, van der Schaaf et al. 1988). The average rate of wear is about 0.1 mm per year (Charnley and Halley 1975, Griffith et al. 1978). In our case, there was a rapid progress of wear of the socket from 1981 to 1986, an average of at least 1 mm per year. This could be explained by the fact that the contact area between the two prosthetic components was much smaller than normal due to the incongruency. Consequently, the contact stress of the socket was increased. Under normal loading conditions of the hip joint up to four times body weight, contact stress, as estimated in this particular situation, reaches values well over yield stress (Timoschenko and Goodier 1951). The resulting plastic deformation of the inner surface of the socket increases the wear many times over, explaining the rapid wearing down of the socket in our case.

This case stresses the importance of preoperative planning, especially in revision surgery. When documentation is absent, the size of the prosthetic components can easily be measured from radiographs if the magnification is considered.

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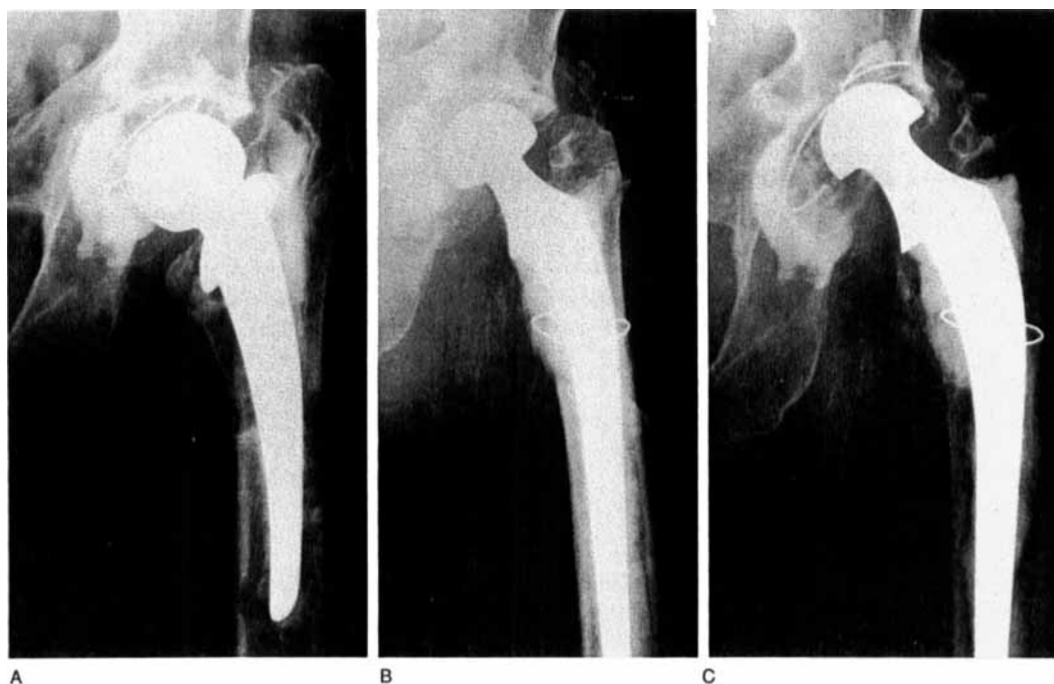

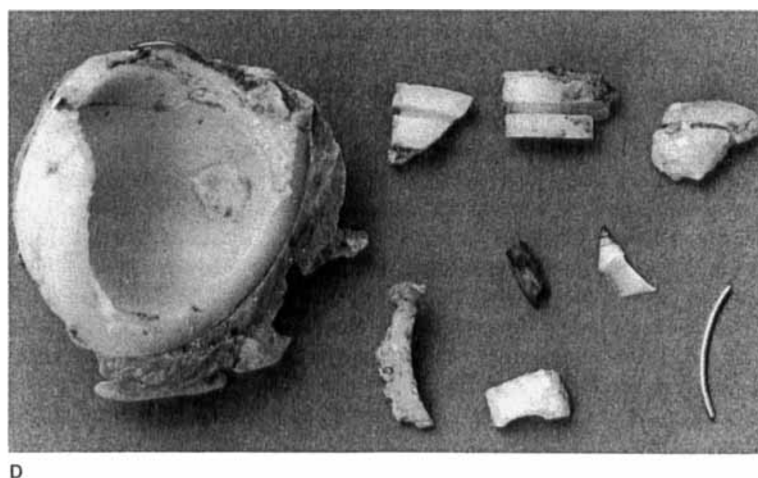

Figure 1. Mismatch of components at revision of total hip prosthesis.
A. 1981. Before first revision.
B. 1981. After first revision. Note the excentric position of the head in relation to the socket.
C. Before second revision. Note wear in the upper part of the socket.
D. Acetabular component. Note the complete wearing down of the upper part of the socket and the fragmented parts of the rim.

References

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