

Ten-year results of the Charnley hip in arthrosis

BJörn Wejkner¹, Jan Stenport¹ and Mika Wiege²

After exclusion of 15 infected cases, 165 consecutive primary Charnley hip replacements for arthrosis were examined 5 and 10–13 years postoperatively. The failure rates during the first 5 years and between the 5- and 10-year follow-ups were 6 and 5 percent, respectively. Failures were more common in men. Among the hips followed for at least 10 years, 43 and 50 percent of the stems were radiographically loose at the 5- and 10-year follow-ups, respectively; the corresponding figures for the socket were 8 and 12 percent. No hips with radiographically intact components at 5 years were clinical failures at the 10-year follow-up.

We have studied the clinical results of primary Charnley hip replacement for arthrosis.

Patients and methods

The study comprised 165 consecutive primary Charnley total hip replacements without deep infection, and were done on patients with arthrosis (99 in women, 66 in men) between February 1968 and January 1972. The mean age at operation was 64 (52–85) years. Fifteen hips with deep infection were excluded. A Charnley "flat-back" femoral stem and an ultra high-density polyethylene cup were used in all the cases. When these operations were done, the great importance of the cementing technique was not fully appreciated; the medullary canal was usually prepared only enough to allow a moderate amount of cement to be inserted by finger and thumb; no distal plug was used.

Pain, walking ability, and range of mobility were recorded as advocated by Charnley (1979). The result was graded as *excellent* for hips rated 6 for pain, 6 or 5 for walking ability, and 6 or 5 for range of mobility, but with only one of the two last-named scores rated 5; as *good* for hips rated at least 5, 5, 4; and as *fair* for hips rated at least 4, 4, 3. All the others were graded as *failures*. When walking ability was limited owing to factors

other than the relevant hip, this score was disregarded.

The radiographic examination at follow-up included a projection centered on the symphysis pubis, embracing both hips, and anteroposterior and lateral projections of the operated on hip. The criteria for loosening of the femoral component were as follows: any radiolucent line between the metal and the cement of at least 1 mm in width, any discernible change in position of the stem within the cement mantle, or any change in position of the whole implant (cement and stem). The radiographic criteria for acetabular loosening were a radiolucent line between the cement and bone of more than 1 mm in width around the whole circumference on the AP-film or any change in position.

The hips were examined 5 and 10–13 years postoperatively. At the 5-year follow-up, 27 hips were excluded (death 19, supervening disease 3, not traceable 5), leaving 138 hips for assessment. Totally, 130 hips were fair or better and constituted the basic series for the 10-year follow-up. At the 10-year follow-up, a further 38 hips were excluded (death 35, supervening disease 2, not traceable 1). One hip not assessed at 5 years was nevertheless examined at the 10-year follow-up. Thus, 93 total hip replacements were assessed 10–13 years postoperatively. Complete series of radiographs from the 5- and the 10-year follow-up were available in 86 cases.

The chi-square test was used; $P < 0.05$ was considered significant.

Karolinska Institute and Departments of ¹Orthopedics and ²Diagnostic Radiology, Södersjukhuset, S-100 64 Stockholm, Sweden

Results

At the 5-year follow-up, 94 percent of the hips were graded as acceptable (excellent 93, good 30, fair 7). The eight failures between operation and the 5-year follow-up were due to fracture of the femoral stem (four), loosening of the stem (three), and loosening of the socket (one).

At the 10-year follow-up, 95 percent of the hips graded as acceptable at 5 years were still acceptable (excellent 56, good 26, fair 6). The five failures between the 5-year and the 10-year follow-ups were due to fracture of the femoral stem (two), loosening of the socket (two), and loosening of the stem (one).

The probability for an acceptable result 10-13 years after operation was thus 89 percent in noninfected cases. Clinical failures were noted in 11 of 66 male hips and in two of 99 female hips ($P < 0.01$).

Radiographic observations. Among the hips assessed at the 10-year follow-up, 37 stems and seven sockets had been loose at 5 years. At the 10-year follow-up, another six stems and three sockets were loose. Between the two follow-ups, progression of loosening of the stems occurred in 22 of 37 hips. This progression of loosening was usually slow, however. At the 5-year follow-up, 28 of 37 stems had migrated 4 mm or less; at the 10-year follow-up, the rate was 30 of 43.

At the 5-year follow-up, two of the loose sockets were defined as loose because of migration, whereas at the 10-year follow-up, the corresponding figure was 5. At the 10-year follow-up, the rate of stem loosening in men was 26 of 29 and in women 17 of 57 ($P < 0.001$). No hips that had had radiographically intact components at the 5-year follow-up were clinical failures at 10 years.

Discussion

The relatively low rate of clinical failure in our series despite the high rate of femoral stem loosening compared with some other studies

(Johnston and Crowninshield 1983, Gudmundsson et al. 1985, Stauffer 1982) could be explained on the basis that the degree of radiographic stem loosening was usually not severe enough to cause clinical failure. Before reoperation of 32 failed total hip replacements that were due to stem loosening, Carlsson et al. (1983) found a radiolucent zone at the proximal lateral edge measuring not less than 6.5 ± 3.6 mm, and in 17 cases subsidence averaging 9.2 ± 4.6 mm.

During the early days of total hip replacement, it was customary to prepare the medullary canal only enough to admit a moderate amount of cement. No femoral plug and no cement gun were used. It is now obvious that according to today's standards few hips had been satisfactorily cemented. The rate of radiographic stem loosening in hips operated on with present cement techniques is believed to be far lower (Beckenbaugh and Ilstrup 1978, Carlsson and Gentz 1980, Tappadiya et al. 1984, Wroblewski 1986). A lower rate of stem loosening must influence the overall long-term result positively, because no hips in the present series in which the components were radiographically intact at the 5-year follow-up were clinical failures at the 10-year follow-up.

Our clinical failures occurred more often in men than in women, which tallies with the findings of Johnsson et al. (1987), who found that men run a four to five times greater risk of surgical revision owing to loosening of components. Most clinical failures in our series resulted from failed fixation of the stem. Radiographic stem loosening occurs more in men than in women (Carlsson and Gentz 1980, Gudmundsson et al. 1985, Stauffer 1982). Femoral stem loosening is more common in hips with a wide medullary canal (Beckenbaugh and Ilstrup 1978, Sutherland et al. 1982), which may partly explain the sex pattern of loosening.

Because the result of total hip replacement differs greatly between men and women, the proportion of men at follow-up examinations greatly influences the overall result of a single series. Therefore, long-term results of total hip replacement should be analyzed separately for men and women.

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