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Fracture of an Acetabular Component Inserted without Cement: A Case Report

R T. Trousdale
D J. Berry
Joshua J. Jacobs
Jeremy L. Gilbert
Syracuse University, gilbert@syr.edu

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Fracture of an Acetabular Component  
Inserted without Cement

BY R. T. TROUSDALE, M.D.; D. J. BERRY, M.D.; J. JACOBS, M.D.; AND J. L. GILBERT, PH.D., ROCHESTER, MINNESOTA

Investigation performed at the Mayo Clinic, Rochester

The use of acetabular components without cement for total hip arthroplasty has increased dramatically in the last decade, for several reasons. With increased follow-up, fixation of sockets with cement has proved to be problematic, with as many as 48 per cent of such sockets reported to be radiographically loose at twenty years. In a study of 330 total hip replacements performed with cement, Schulte et al. noted that 23 per cent of the ninety-eight hips in the patients who were alive at a minimum of twenty years had a loose or revised acetabular component. Kavanagh et al. reviewed the results of the first 333 Charnley total hip replacement

![Radiograph of the pelvis, showing a dysplastic hip with end-stage osteoarthritis.](image)

ments performed with cement at the Mayo Clinic and found possible loosening of thirty-three (48 per cent) of sixty-nine cups in patients who were followed for twenty years.

Sockets designed to be inserted without cement are so-called user-friendly. They are technically easy to insert, and the position of the cup can be readily changed intraoperatively. Growth of bone into the sockets is reliable, as has been shown in many studies of retrieved specimens. Elevated modular polyethylene liners may improve positioning of the socket (by modifying the angle of abduction or anteversion) and can accommodate multiple sizes of the femoral head, which is useful in revision operations.

Clinical and radiographic results of total hip arthro-
plasty without cementing of the acetabular component have been quite satisfactory. However, when the results of such arthroplasties are evaluated, it should be kept in mind that loosening of cemented sockets historically has not been a major problem until at least five to ten years after the operation. Although the fixation of acetabular components inserted without cement often is stable at the time of intermediate follow-up, problems not seen with cemented implants have been reported less than ten years after insertion of sockets without cement. These problems have included dissociation of the liner from the shell, catastrophic failure of the poly-
Scanning electron micrograph of the site of the initiation of the fatigue crack. The large arrow indicates the free surface of the countersink of the screw-hole, and the curved arrow shows the intersection of the countersink with the fracture surface. On the fracture surface, there is an approximately 500-micrometer flat, fracture facet with the so-called river pattern (small arrow). These features are characteristic of a fatigue failure (magnification, × 90).

ethylene liner, impingement on the iliopsoas, possibly accelerated rates of wear of the polyethylene, and acetabular osteolysis²,³,⁶,⁷. We report a case in which the metal shell of an acetabular component that had been fixed to a large segment of autogenous graft without cement fractured after less than ten years.

Case Report

A fifty-three-year-old woman who had a history of congenital dysplasia of the left hip was first seen in our clinic in 1987. The dysplasia had been diagnosed when the patient was a child, and an open reduction had been performed at the age of four years. One year later, she had a second open reduction. She did relatively well until 1987, when she had increasing pain in the hip that limited her daily activities (Fig. 1). She was able to walk no more than one block, and she needed a cane. In 1987, a total arthroplasty of the left hip was performed with insertion of a Harris-Galante-1 porous-coated acetabular component (Zimmer, Warsaw, Indiana) and a proximally porous-coated femoral stem (Osteonics, Allendale, New Jersey) without cement (Fig. 2). A forty-eight-millimeter acetabular shell was placed superiorly, and autogenous graft from the femoral head was secured to the ilium to improve superolateral coverage. The graft was secured with four screws, and the acetabular component was secured with three screws. The patient initially did well, with a substantial decrease in pain and increase in the level of activity.

Seven years after the operation, mild so-called start-up pain (pain that occurs with the initiation of walking) developed in the thigh. At that time, it was noticed that the femoral component was loose. The acetabular component appeared to be intact. The pain in the thigh was not severe enough to warrant operative intervention. Over the next ten months, the pain in the thigh increased and discomfort developed in the groin and buttock. There was crepitation with motion of the hip, and the patient required crutches to walk. Approximately eight years after the primary total hip replacement, radiographs revealed that, although there was no history of trauma, the acetabular component had fractured (Fig. 3).

Radiograph made after the revision, which included use of a reinforcement ring. The center of the hip has been restored to a more anatomical location.
At revision, the polyethylene was noted to be intact but dissociated from the fractured shell. There was extensive abrasion, delamination, and pitting on the non-articulating surface of the liner as well as eccentric wear and foreign-body debris on the bearing surface with cracking on the superior rim. The acetabular shell was fractured along its outer third between the multiple screw-holes (Fig. 4). The fractured component was analyzed visually, and specimens were examined with a scanning electron microscope (model S120; Cambridge Instruments, Deerfield, Illinois). The morphological appearance of the fracture surface was consistent with a fatigue failure emanating from the countersink of a screw-hole. This was evident on visual examination in that an area adjacent to a posterosuperior screw-hole had a glossy, faceted appearance. The fracture surface exhibited characteristic patterns of fatigue on examination with the scanning electron microscope.

The site of the initiation of the fatigue crack (Fig. 5) consisted of a 500-micrometer flat, fracture facet with the so-called river pattern emanating from the surface of the countersink. The countersink adjacent to the site of the initiation of the crack had persistent slip bands consistent to the site of the initiation of the crack had persistent slip bands in the vicinity of the fracture. The inferior portion of the acetabular component was well fixed but easily removed. The femoral component was grossly loose. Because of the large amount of graft used in the primary total hip replacement, reconstruction was performed with a 3:201-204, 1988. Cementation of tissue growth into human porous total hip components. J. Bone and Joint Surg., 71-A: 554-571, April 1989.


