

A Failure of the Locking System of the Acetabular Assembly in a Total Hip Replacement

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In this study, the author presents the case of one patient who had a Harris-Galante total hip replacement for pigmented villonodular synovitis of the left hip joint, the locking system failed and separation of the polyethylene liner from the acetabular metal shell occurred while the closed reduction of the posterior dislocation of the femoral prosthesis was performed. This study indicates that the design of the acetabular assembly should be modified. The gap between the rims of metal shell and polyethylene liner should be reduced or eliminated.

Key Words: Total hip replacement, dislocation of femoral prosthesis, separation of polyethylene liner.

Despite the excellent short-term results of total hip arthroplasty, there still major problem with total hip prosthesis in establishing a permanent fixation to the bone (Beckenbaugh and Ilstrup 1978; Charnley 1979; Moreland *et al.* 1980). The use of porous surfaces for biological attachment of an implant by the ingrowth of bone has been a valuable alternative method of application in alleviating the problems with the cement and the cement-bone interface (Galante *et al.* 1971; Hedley 1980; Judet *et al.* 1978; Lord *et al.* 1979).

The acetabular component of a Harris-Galante total hip system (Zimmer, Warsaw, Indiana) features a replaceable ultra-high molecular weight polyethylene articular surface backed by an outer porous-coated titanium shell. The replacement feature was introduced in this design to permit a removal of the polyethylene liner without disturbing the fixation by bony ingrowth into the porous metal shell should the polyethylene liner become distorted or worn.

In one of my patient who had a Harris-Galante total hip replacement for pigmented villonodular synovitis of the left hip joint, the locking system failed and separation of the polyethylene liner from the acetabular metal shell occurred while closed reduction of the posterior dislocation of the femoral prosthesis was being performed.

CASE REPORT

On September 8, 1986, a sixty-four-year-old man was seen for the left hip joint pain for three years' duration with no history of antecedent trauma or disease. Roentgenograms showed a complete loss of cartilaginous space of the hip joint, multiple cysts in the acetabulum and femoral head and excavating destructive lesion in the lateral aspect of the left femoral neck (Fig. 1). These findings led me to suspect pigmented villonodular synovitis, which was subsequently confirmed by a histopathological analysis. Through a postero-lateral approach, a Harris-Galante cementless total hip prosthesis was implanted in the left hip joint, using a 13mm diameter femoral stem with a medium sized femoral neck, 32mm femoral head, and an acetabular metal shell of 54mm in the outer diameter. A polyethylene liner of 32mm inner diameter was assembled. Postoperative radiograph showed the prosthesis in place (Fig. 2). The patient's recovery was uneventful. He was discharged from the hospital 8 days after the operation. At that time he was walking with bilateral crutches pain-free. Two weeks after the operation, while getting out a bed, he attempted to stand on the sound(right) limb while the left one remained on the bed. Apparently the hip was markedly flexed and then adducted as he attempted to slide the left limb from the bed to the floor. The patient felt a sudden, severe pain in the left hip and thereafter could not walk. He was immediately brought to the emergency room by an ambulance.

Physical examination revealed the left lower ex-

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Fig. 1. Radiograph of the left hip joint reveals complete loss of cartilaginous space of the hip joint, multiple cysts in the acetabulum and femoral head and excavating destructive lesion in the lateral aspect of the femoral neck.



Fig. 2. Postoperative radiograph of the left hip joint shows the prosthesis to be in place.



Fig. 3. Pre-reduction radiograph shows that the prosthetic femoral head is dislocated posteriorly while the acetabular component is embedded in the acetabulum.



Fig. 4. Post-reduction radiograph reveals failure to achieve a concentric reduction of the left hip joint.

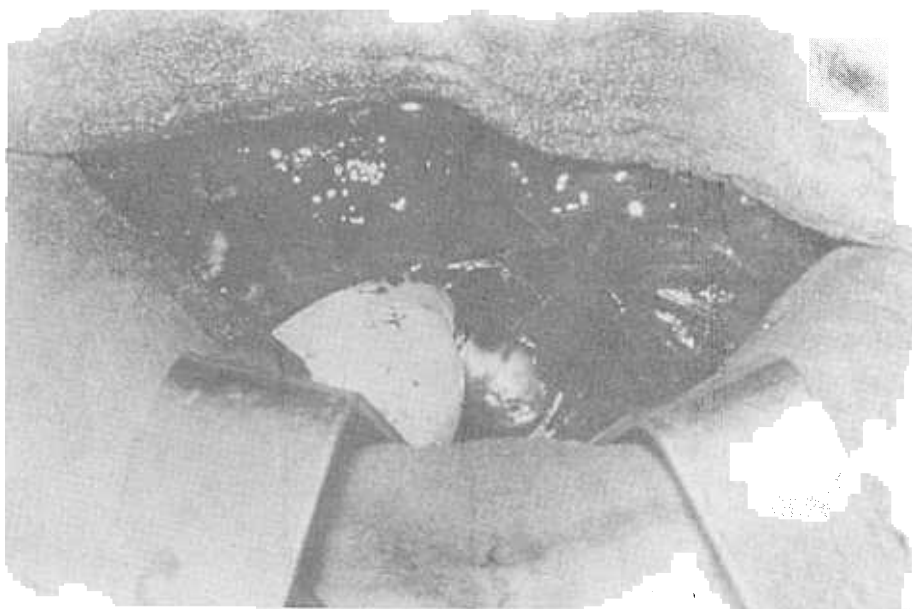


Fig. 5. The operative photograph demonstrates that the polyethylene liner has been completely separated from the acetabular metal shell and is found inferior to the acetabulum while the femoral head is contained in the acetabular metal shell.



Fig. 6. Post-revision radiograph shows that prosthesis is intact and in place.

tremity was held in a slight flexion and adduction and also slightly rotated internally. The patient had a painful restriction of movement of the joint. Radiographs showed that the prosthetic femoral head was dislocated posteriorly while the acetabular component was embedded in the acetabulum (Fig. 3). Although closed reduction was achieved in the emergency room, a severe crepitus was audible when the hip joint was ranged. Post-reduction radiographs revealed failure in the attempt at a concentric reduction (Fig. 4). It was suspected that the interposing loose body between the femoral and acetabular components might have prevented the concentric reduction of the hip joint.

On September 26, 1986, the patient was brought to the operating room for his hip to be explored. The operative findings demonstrated that the polyethylene liner had been completely separated from the acetabular metal shell and was found inferior to the acetabulum while the femoral head was contained in the acetabular metal shell (Fig. 5). The separated polyethylene liner was found deformed. The femoral head and the acetabular metal shell were intact.

A new polyethylene liner was assembled on the metal shell and the femoral component was reduced into the acetabular component. The patient was then placed in Thomas splint for 2 days and thereafter he was gradually allowed to walk, first with a walker

and then with bilateral crutches. When he was last seen, four weeks postoperatively, the hip was stable and painless and he was walking with bilateral crutches. Radiographs showed that prosthesis was intact and in place (Fig. 6).

DISCUSSION

The replacement feature in the Harris-Galante acetabular assembly is useful for easy removal of the polyethylene liner without disturbing the metal shell fixation. This beneficial feature satisfies the common need to easily replace the liner when it is distorted or worn. However, this same feature can cause a problem when there is a dislocation.

The Harris-Galante acetabular assembly has a gap between the rims of the metal shell and the polyethylene liner, which is approximately 5 millimeters. It appears that the failure of the locking mechanism in this patient probably has been the result of the impingement of the polyethylene liner by the inferior-medial portion of the femoral head. What seems to have been the case is that while traction was applied on the left lower extremity, the dislocated femoral head was compressed over the acetabular rim by hip muscles and an inferior-medial portion of the femoral head was caught in the gap between the rims of the metal shell and the polyethylene liner. And then a further traction seems to have caused an impingement by the femoral head on the rim of the polyethylene liner and in result the separation of the polyethylene liner occurred. In this case, a simple closed reduction of the dislocated femoral head could have been possible without requiring the second operation, had the femoral head not been caught in the gap between the liner and metal shell, resulting in the separation of the assembly.

Consequently, I believe that the design of the acetabular assembly should be modified and the gap between the rims of the metal shell and the polyethylene liner should be either reduced to minimal or possibly eliminated all together.

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REFERENCES

- Beckenbaugh R D, Ilstrup D M: Total hip arthroplasty. A review of three hundred and thirty-three cases with long follow-up. *J Bone and Joint Surg* 60-A:306-313, April 1978
- Charnley John: *Low friction arthroplasty of the hip*. Theory and practice. New York, Springer, 1979, pp 25-133
- Galante J O, Rostoker William, Lueck Roger, Ray R D: Sintered fiber metal composites as a basis for attachment of implants to bone. *J Bone and Joint Surg* 53-A:101-114, Jan. 1971
- Hedley A K: *Present stage, problems and future implications of porous coated implants*. In *The Hip*. St. Louis, C.V. Mosby, 1980, pp 329-342
- Judet Robert, Siguier Marc, Brumpt Bertrand, Judet Thierry: A non-cemented total hip prosthesis. *Clin Orthop* 137:76-84, 1978
- Lord G A, Hardy J R, Kummer F J: An uncemented total hip replacement. Experimental study and review of 300 Madrepourique arthroplasties. *Clin Orthop* 141:2-16, 1979
- Moreland J R, Gruen T A, Mai L, Amstutz H C: *Aseptic loosening of total hip replacement*. Incidence and significance. In *The Hip*. St. Louis, C.V. Mosby, 1980, pp 281-291