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Ten Years of Experience With Porous Acetabular Components for Revision Surgery

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A prospective study was completed for 139 porous-coated revision acetabular components that were implanted with rim fit fixation and had a mean of 4.3 years' followup (range, 2–9.8 years). The Anatomic Porous Replacement component was studied. Harris Hip Scores were used for clinical evaluation, and the pain and limp components of the Harris Hip Score were assessed. Radiographic measurements were recorded as radiolucent lines by Delee and Charnley zones. Clinical results were of lesser value in this study because of the emphasis on the acetabular component. Of these components, 4.3% had revision; only 2 (1.4%) were revised for loosening. Migration occurred in 2.1% of these acetabular components. In the first 2 years postoperatively, 17.4% of components had increased radiolucent lines and 9.4% had fewer radiolucent lines. After 2 years, fixation was stable: 4% had progressively more radiolucent lines and 2% fewer radiolucent lines. The authors could not show any statistical difference in radiographic fixation of these components when adjunctive screw fixation was used or not used. Fixation of the acetabular components was better when slurry bone graft was not used to layer the acetabular surface. Fixation was similar whether the rim fit was obtained with or without protrusion of the medial dome of the cup into the pelvis. The authors did not observe osteolysis in the acetabular bone surrounding these components.

Revision hip surgery of the acetabulum done with cemented components does not have a high success rate.[1,3,12,20] Kavanagh et al[11] reported that 70% of the revisions of the acetabular component that had been done with cement in their series were associated with progressive radiolucency. Amstutz et al[1] reported that 61% of the acetabular components that had been inserted with cement were associated with progressive radiolucency, and the rate of failure was almost 10% at a mean followup of only 2 years. At a mean followup of 3 years, Pellicci et al[17,18] reported that 9% of the acetabular components which had been inserted with cement in their study had a complete radiolucent line, and the rate of acetabular revision was 3%. Revision arthroplasty using cemented acetabular components with allograft has not achieved encouraging results either.[9,10] Graft resorption and component loosening were seen in 18% to 32% of cases within 5 years.

This study reports the authors' experience with noncemented porous-coated acetabular components in revision hip arthroplasty im-

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planted without use of support bone graft. They began using the technique of fixation without cement in an attempt to achieve fixation with a reduction in progressive radiographic radiolucent lines, which would suggest better durability of fixation.

MATERIALS AND METHODS

From a local database prospectively maintained after each surgery, all revision hip surgeries done from January 1985 to July 1992 were identified. During this period, 322 revisions of hips were done. Forty patients did not have current followup, but all were known to be alive, had not had a revision, and were clinically satisfactory. Thirteen patients had died. One hundred sixty-seven hips had acetabular component revisions done with a noncemented acetabular component with or without femoral revisions. Noncemented acetabular components were used even when using bulk structural allograft. Twenty-eight hips had a bulk structural allograft and 139 hips had rim fit fixation. Rim fit fixation is defined as contact of the metal shell to the circumference of the intact peripheral rim of the acetabulum. For successful rim fit fixation, cavitary defects may be present but complete rim segmental defects are not present.[4] The authors have reported their results with noncemented porous-coated acetabular components implanted with bulk structural allograft, in which they experienced a high failure rate.[21,22] This article reports only on those 139 acetabular components with rim fit fixation.

The Anatomic Porous Replacement (Intermedics Orthopedics, Austin, TX) acetabular component was used at revision surgery. The Anatomic Porous Replacement acetabular component is a hemispherical porous-coated component of titanium alloy and a porous coating of cancellous structured titanium. The coating has an average pore size of 490 micrometers. The shell wall was 3.5 mm thick. The component could be fixed with 6.5-mm cancellous screws that were made of titanium alloy. The femoral head articulation from 1985 to 1989 was titanium. From 1989 to 1992, the femoral head articulation was cobalt chrome. Twenty–six-millimeter, 28-mm, and 32-mm femoral heads were used.

The rim fit obtained in the revision acetabulum usually was between the anterior acetabulum at the level of the anterior inferior spine and posteriorly at the ischium (Fig 1), which places the mouth of the cup approximately 1.5 cm superior to the position in primary arthroplasty. In primary arthroplasty, the cup is placed between the pubis anteriorly and the ischium posteriorly. The medial wall in some patients was reamed intentionally to enable the fit of socket size necessary for peripheral rim fit. This technique is the same as that described by Dunn and Hess[6] for acetabular preparation in congenitally dislocated hips.

Technique for bone preparation of the acetabular component was changed in 1989. Before 1989, fixation of the acetabular component was underreamed by 1 mm but was not always intrinsically stable, and screws commonly were used to obtain secure fixation of the acetabular component. Subsequent to 1989, the acetabulum was underreamed by 1 to 3 mm and an intrinsic press fit of the acetabular component was obtained. Intrinsic press fit stability was determined by the inability to move the socket trial manually either by tilt or rotation. If any motion was present, screws were used. Before 1989, the authors used slurry graft (ground cancellous bone) liberally to layer the sclerotic bone of the acetabulum. After 1989,

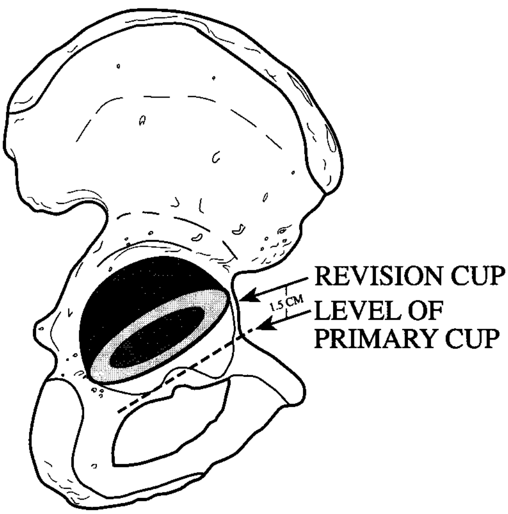

Fig 1. The rim fit acetabular component is placed between the anterior acetabulum at the level of the anterior inferior spine and posteriorly at the ischium, which places the mouth of the cup approximately 1.5 cm superior to the position in primary arthroplasty.

they used slurry graft only to fill large cavitary defects and did not layer sclerotic bone nor fill small cement stud hole defects.

All patients were seen in followup in a prospective manner. Radiographs and clinical data were obtained preoperatively, postoperatively, and then at 6 months, 1 year, and yearly thereafter. The Harris Hip Scores[8] were recorded by 1 of the authors (LDD) or his associate. The patients were graded at each visit, and these scores were stored in a computer for retrieval.

An anteroposterior radiograph of the pelvis, centered over the pubis, and lateral radiographs of the hip were obtained for all patients at each visit. No specific device was used for positioning the patient. However, the radiographs of the hip were done in a standardized fashion with an identical tube angle and distance. The immediate postoperative radiograph was considered the reference radiograph, and all subsequent radiographic measurements for evaluation of migration or radiolucent lines were compared with the measurements on this radiograph. Both anteroposterior and lateral radiographs were used to assess radiolucencies and osteolysis by Delee and Charnley[5] zones. Anteroposterior radiographs were used to measure the migration of acetabular components and polyethylene wear. One author (ZW), who was blinded to the clinical results, measured all radiographs. The determination of radiographic measurements was done twice, and when a difference occurred an average was used. The variation by the single observer was 0.1 mm for polyethylene wear measurement and 0.5 mm for migration measurement. Magnification of the radiograph was corrected by using a known femoral head size.

Migration of the acetabular component was defined as linear (direction of medial, superior, or both), or rotational (change in theta angle). Migration was determined by comparing sequential films and measuring the distances between the acetabular component and Kohler's line and the teardrop. Kohler's line and the teardrop have been shown to be reliable landmarks in the acetabulum.[7,16] The measurement of the migration of acetabular components is illustrated in Figure 2. A horizontal reference line (R R′) was drawn between the inferior margins of the teardrops on the pelvic radiograph. A perpendicular line K K′ to the horizontal reference line was drawn through the inferior margin of the teardrops. A line M M′ that was tangential to the medial edge of the sockets was drawn parallel to line K K′. Line B is constructed parallel to line R R′ at the inferior margin of the acetabulum. The distances between line K K′ and M M′, and between line B and R R′ were measured. By comparing these measurements at different followup periods, the migration of the acetabular component could be determined.

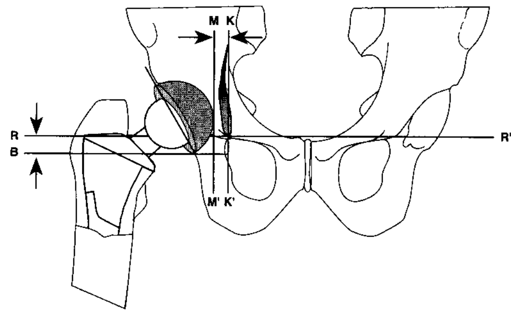

Fig 2. A horizontal reference line (R R′) was drawn between the inferior margins of the teardrops on the pelvic radiograph. A perpendicular line K K′ to the horizontal reference line was drawn through the inferior margin of the teardrops. A line M M′, which was tangential to the medial edge of the sockets, was drawn parallel to line K K′. Line B is constructed parallel to line R R′at the inferior margin of the acetabular. The distances between line K K′ and M M′, and between line B and R R′ were measured.

As shown in Figure 2, the lateral opening of the cup was measured by the method described by Callaghan et al.[3] By their criteria, a difference in the serial measurements of ≥2 mm or a change in the angle of the cup of 3° more was considered to indicate migration.

Wear of the polyethylene in the cup was measured from the anterior–posterior radiograph of the pelvis. Livermore et al[15] described a method to measure polyethylene wear. This method was designed for cemented all-polyethylene sockets. With the method of Livermore et al, the center of metal femoral head must be evident. This can be difficult for a metal acetabular component.[13] In addition, the femoral head is not always an absolute circle on radiographs. For these reasons, a different method was used. As seen in Figure 3, a line is drawn from the superior to the inferior edge of the metal acetabular component. The distances from

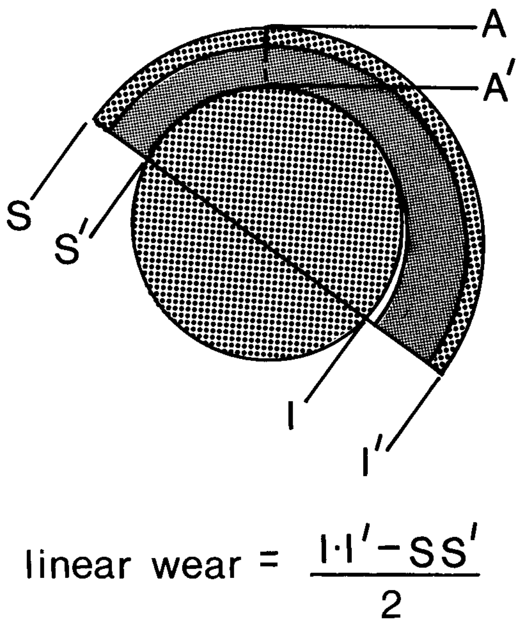

Fig 3. A line is drawn from the superior (S) to the inferior edge (I) of the metal acetabular component. The distances from the superior margin of the acetabular component to the femoral head (S S') and from the inferior margin of the acetabular component to the femoral head (I I') were measured.

the superior margin of the acetabular component to the femoral head (S S′) and from the inferior margin of the acetabular component to the femoral head (I I′) were measured. Linear wear of polyethylene was calculated by the formula: linear wear = (I I′ - S S′)/2. The linear wear measured was composed of real linear wear and creep of polyethylene so that real linear wear may be less than the value measured in the direction of A A′.

The zonal system of DeLee and Charnley[5] was used. The acetabular component was divided into Zones I, II, and III. Any radiolucent line was recorded by zone. The width of the radiolucent line at each zone was measured. Radiolucent lines were recorded as increased if on serial radiographs the number of radiolucent lines increased; if fewer radiolucent lines were observed on serial radiographs, the hip was recorded as having decreased radiolucent lines; if no change occurred, the hip was recorded as stable. If there was a complete radiolucent line around the acetabular component and the width of the radiolucent line was ≥2 mm with or without acetabular migration, the hip was classified as loose. Observation for osteolysis also was done by zone.

From the operative reports and the radiographs, the authors could record the number of screws used for each acetabular component.

Acetabular deficiencies were classified by the method of The American Academy of Orthopaedic Surgeons Committee on Hips.[4] A Type I deficiency was a defect in 1 of the major osseous columns; Type II deficiency was a cavitary defect contained within a rim of bone; Type III deficiency was a combined defect with cavitary and segmental loss of bone; Type IV deficiency was pelvic discontinuity; and Type V deficiency was associated with a previous arthrodesis.

Chi-squared test was used to analyze the consequence of protruding the dome of the cup through the medial wall for slurry bone graft and screws versus no graft fixation versus no screws for fixation. Student's t-test was used to analyze polyethylene wear. SYSTAT statistical software (SPSS Inc, Chicago, IL) was used.

RESULTS

There were 66 men (70 hips) and 67 women (69 hips). They were studied after a mean of 4.3 years followup (range, 2–9.8 years). The average age at the time of surgery was 57 years old (range, 25–88 years). The average weight was 157.6 pounds (range, 84–288 pounds). The femoral and the acetabular components were revised in 110 hips; only the acetabular component was revised in 29 hips.

Revision surgery was done because of loosening of the acetabular component in 98 hips; a painful hip caused by hemiarthroplasty and bipolar acetabulum in 22 hips; dislocation in 8 hips; reimplantation after removal of prosthesis for infection in 3 hips; a broken acetabular insert in 3 hips; immediate reimplantation for infection in 2 hips; fracture after total hip arthroplasty in 2 hips; and malposition of the acetabular component in 1 hip.

In this study, there were 12 Type I bone deficiencies, 93 Type II bone deficiencies, 33 Type III bone deficiencies, 1 Type IV bone deficiencies, and no Type V deficiencies.

Excluding the 6 hips with a second revision, the mean Harris hip rating at last followup was 86.4 points (range, 40–100 points). Sixty-seven (50.4%) hips were graded excellent, 35 (26.3%) good, 16 (12%) fair, and 15 (11.3%) poor. The mean limp score was 8.1 points. The mean pain score was 40.4 points (range, 10–44 points). Pain was absent in 83 hips (62.6%), slight in 31 hips (23.3%), mild in 17 hips (12.7%), moderate in 1 hip (0.8%), and severe in 1 hip (0.8%). These pain scores show that the 23% fair and poor scores were mostly a result of decreased functional scores caused by factors other than the hips. However, these hip scores may be influenced by factors other than the acetabulum, including femoral component fixation and general medical conditions.

Of 139 hips, 6 (4.3%) had a second revision: Two hips (1.4%) had a second revision for loosening of the acetabular component; 2 hips (1.4%) for dislocation; 1 hip (0.7%) for malposition of the acetabular component; and 1 hip (0.7%), for acetabular fracture (osteoporosis of acetabulum). This acetabular fracture occurred while testing the stability of the acetabular component during a second revision of the femur. The acetabular component was revised at the same surgery. Three acetabular components (2.1%) had linear migration. No rotational migration occurred. Two of the migrated sockets had no radiolucent lines and 1 had a radiolucent line only in Zone 2.

At final followup, radiographic fixation of rim fit acetabular components showed 103 (74.1%) hips with no radiolucent lines (Fig 4), 12 (8.6%) hips with a radiolucent line in 1 zone, 7 (5%) hips with a radiolucent line in 2 zones, 15 (10.8%) hips with a complete radiolucent line ≤2 mm thick in any zone, and 2 (1.4%) hips had a complete radiolucent line ≥ 2 mm thick. On the immediate postoperative radiographs, 113 hips had no radiolucent lines, 11 hips had a radiolucent line in 1 zone, and 15 hips had a radiolucent line in 2 zones. In the first 2 years, there is a shifting pattern of radiographic fixation. At 2 years postoperatively, 73.2% had not changed radiographic fixation, 17.4% had an increased number of radiolucent lines, and 9.4% had fewer radiolucent lines (Table 1). Few changes occurred in radiographic fixation after 2 years postoperative.[14] Ninety-four percent of acetabular components did not change, whereas 5 hips (4%) had more radiolucent lines and 3 hips (2%) had fewer radiolucent lines (Table 2). The 2 acetabular components that were loose were revised by the time of the second followup.

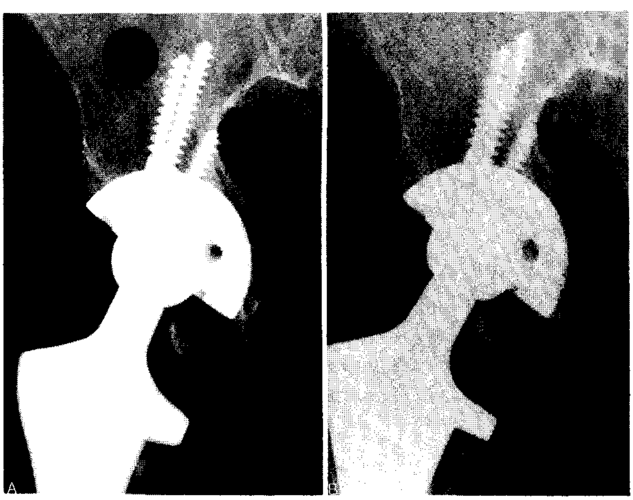

Fig 4A–B. Radiographs of acetabular components with rim fit. (A) Immediately postoperative. (B) Six years postoperatively, there was no any radiolucent line.

TABLE 1. Comparison of Acetabular Component Fixation Between Immediate Postoperative Followup and 2-Year Followup (Rim Fit)

Post-operative Followup	2-Year Followup	No. of Acetabula
IB	IA	5
IC	IA	7
IC	IB	1
IA	IA	92
IB	IB	5
IC	IC	4
IA	IB	5
IA	IC	5
IA	II	8
IA	III	2
IC	II	3
IB	II	1

IA = no radiolucent line; IB = radiolucent line in 1 zone; IC = radiolucent line in 2 zones; II = a complete radiolucent line < 2 mm in any zone; III = a compete radiolucent line of > 2 mm in any zone or with migration of acetabular component.

TABLE 2. Comparison of Acetabular Component Fixation Between the 2-Year and Last Followup (Rim Fit)

2-Year Followup	Last Followup	No. of Acetabula
IC	IA	2
IC	IB	1
IA	IA	100
IB	IB	10
IC	IC	4
II	II	14
III	III	2
IA	IB	1
IA	IC	1
IB	II	1
IC	II	2

IA = no radiolucent line; IB = radiolucent line in 1 zone; IC = radiolucent line in 2 zones; II = a complete radiolucent line < 2 mm in any zone; III = a compete radiolucent line > 2 mm in any zone or with migration of acetabular component.

Of 139 hips, 26 (18.7%) had the dome of the cup through the medial wall (Fig 5). Before 1989, 8% (5 of 62) of hips were implanted in this medialized position; after 1989, 27.3% (21 of 77) of hips were placed in this position ($p = 0.011$). The acetabular components that migrated had the dome through the medial wall (3 of 26 versus 0 of 113 hips, $p = 0.01$). Migration of these 3 sockets was 3 mm, 3 mm, and 4 mm, respectively. No fracture of the acetabulum was observed at surgery during impaction of the acetabular component for rim fit fixation with or without an intact medial wall. Followup averaged 3.8 years (range, 2–6.5 years) in hips with the dome of the cup through the medial wall and 4.4 years (range, 2–9.8) in hips without the dome of the cup through the medial wall ($p = 0.12$). The overall Harris Hip Score was 87.6 points (range, 30–44 points) in hips with the dome of the cup through the medial wall and 84.8 points (range, 10–44 points) in hips without the dome of the cup through the medial wall ($p = 0.32$). Pain score was 42.2 points (range, 30–44 points) for hips with the dome of the cup through the medial wall and 39.4 points (range, 10–44 points) for hips with the dome of the cup through the medial wall ($p = 0.02$). Limp score was 8.6 points (range, 5–11 points) for hips with the dome of the cup through the medial wall and 8 points (range, 0–11 points) for hips without protrusio of the socket ($p = 0.32$).

In hips with protrusio of the dome, 17 had no radiolucent line; 6 had a radiolucent line in 1 zone; none had radiolucent lines in 2 zones; 3 had a complete radiolucent line ≤2 mm thick in all zones; and none had a complete radiolucent line ≥2 mm thick in all zones. In hips without protrusio of the dome, 84 had no radiolucent lines; 6 had a radiolucent line in 1 zone; 7 had a radiolucent line in 2 zones; 12 had a complete radiolucent line, which is ≤2 mm thick in all zones; and none had a complete radiolucent line ≥2 mm thick in all zones ($p = 0.28$).

Results were compared for those hips with ground cancellous bone graft (slurry bone graft) and those without. Before 1989, cancellous bone graft was more common and was used in 72.6% (45 of 62) of hips; from

1989, bone graft was used in 32.5% (25 of 77) of hips ($p < 0.007$). Overall, 70 hips had slurry cancellous bone graft to fill cavitary defects and 69 hips had no bone graft. Average followup was 4.8 years (range, 2–9.8 years) in the hips with slurry bone graft and 3.7 years (range, 2–7.5 years) in hips without bone graft ($p = 0.001$). The Harris Hip Score was 82 points (range, 40–100 points) in the hips with slurry bone graft and 88.7 points (range, 55–100 points) in hips without bone graft ($p = 0.02$). The Harris pain score was 39.1 points (range, 10–44) in the hips with slurry bone graft and 40.8 points (range, 30–44 points) in hips without bone graft ($p = 0.17$). The limp score was 7.7 points (range, 0–11 points) in the hips with slurry bone graft and 8.5 points (range, 0–11 points) in hips without bone graft ($p = 0.05$).

In hips with slurry bone graft, 43 had no radiolucent line; 8 had a radiolucent line in 1 zone; 7 had a radiolucent line in 2 zones; 10 had a complete radiolucent line, which was ≤2 mm thick in all zones; and 2 had a complete radiolucent line ≥2 mm thick in all zones. In hips without slurry bone graft, 60 had no radiolucent line; 4 had a radiolucent line in 1 zone; none had a radiolucent line in 2 zones; 5 had a complete radiolucent line, which was ≤2 mm thick in all zones; and none had a complete radiolucent line ≥2 mm thick in all zones ($p < 0.05$).

The clinical and radiographic data of acetabular components fixed with or without screws were compared. Before 1989, 82.3% (51 of 62) of acetabular components had screw fixation; after 1989, 31.2% (24 of 77) had screw fixation ($p < 0.0005$). Overall, 75 acetabular components had adjunctive screw fixation with an average of 2.9 screws (range, 1–5 screws). No screw was broken. Average followup was 4.8 years (range, 2–9.8 years) for 75 hips with screws and 3.7 years (range, 2–9 years) for 64 hips without screws ($p = 0.0004$). The Harris Hip Score was 82.7 points (range, 40–100 points) for the hips with screws and 88.1 points (range, 48–100 points) for hips without screws ($p = 0.05$). The Harris pain score was 39.3 points (range, 10–44 points) for the hips with screws and 40.8 points (range, 20–44 points) for hips without screws ($p = 0.28$). The limp score was 7.6 points (range, 0–11 points) for the hips with screws and 8.7 points (range, 5–11) for hips without screws ($p = 0.045$).

In hips with screws, 52 had no radiolucent line; 7 had a radiolucent line in 1 zone; 4 had a radiolucent line in 2 zones; 10 had a complete radiolucent line, which was ≤2 mm thick in all zones; and 2 had a complete radi-

Fig 5A–B. Radiographs of acetabular components with rim fit that had the dome of the cup through the medial wall. (A) Immediately postoperative. (B) Four years postoperatively, fixation of acetabular component was Type IA.

olucent line ≥2 mm thick in all zones. In hips without screws, 48 had no radiolucent line; 5 had a radiolucent line in 1 zone; 7 had a radiolucent line in 2 zones; 5 had a complete radiolucent line, which was <2 mm thick in all zones; and none had a complete radiolucent line >2 mm thick in all zones ($p = 0.5$).

In this study, the average polyethylene linear wear was 0.18 mm per year. Femoral head size was 26 mm in 11 hips, 28 mm in 48 hips, and 32 mm in 80 hips. If divided by head size, a mean of polyethylene wear was 0.33 mm per year in 26-mm heads, 0.16 mm per year in 28-mm heads, and 0.17 mm per year in 32-mm heads. Twenty–six-millimeter heads had higher polyethylene wear as compared with 28- and 32-mm heads ($p = 0.04$, $p = 0.05$). There was no statistical difference between 28- and 32-mm heads ($p = 0.6$).

DISCUSSION

Fixation of the acetabular component in revision surgery using a porous-coated acetabular component without structural allograft support is satisfactory. The results of studies by Lachiewicz et al[14] and by Padgett et al[16] support the conclusions reported in this article. The authors were able to assess the effect on radiographic fixation of the acetabular component for use of screws for immediate adjunctive stability, the addition of slurry bone graft to the acetabular surface at the time of implantation, and the protrusion of the dome of the cup through the medial pelvic wall to obtain a rim fit.

The medial wall of the acetabulum often is absent at the time of revision surgery. The medial wall sometimes was reamed purposefully to obtain a rim fit of the socket as had been described by Dunn and Hess[6] for technical preparation of hips with congenital dislocation. There was no difference in the followup time between hips with the medial cup through the dome of the wall and those without protrusion. Although the pain score was statistically better for hips with the cup protruded through the medial wall, this finding does not mean that this technique gives a better clinical result. In this study of the acetabular components, the effect of the femoral component was not measured and pain could have been influenced by the fixation of the femoral component. The medical condition of the patient also was not judged as to its influence on the pain result reported by the patient. The technique of medial protrusio of the cup permits improved stability of the socket at the time of surgery and improved contact of the porous-coated surface to host acetabular bone. The fixation scores as judged by radiolucent lines were not different among cups that were implanted with or without an intact medial wall. There were 3 of 139 acetabular components with migration and protrusio of the medial wall. The magnitude of the migration was small: 3 mm in 2 components and 4 mm in 1 component. The authors conclude from the clinical condition of the patients and the radiographic fixation of the acetabular components that protrusion of the medial wall of the cup is a good technique to facilitate rim fixation of the cup.

In the revision surgery done with these acetabular components, use of ground cancellous bone graft (slurry bone graft) did not seem to be beneficial. The average followup was 1 year longer for hips with cancellous bone graft. The clinical results favored not layering the surface of the acetabular bone with slurry graft before implantation of the acetabular component. These clinical results also have the same criticisms as were discussed with the technique of protrusio of the medial acetabular wall with the acetabular component. The hips without bone graft did have statistically better radiographic fixation. The authors believe that this occurred because in the absence of the slurry bone graft the porous coating could contact the host bone of the acetabulum directly. They recommend that ground cancellous bone graft be used only to fill cavitary defects. Padgett et al[16] have reported that cancellous bone graft used to fill cavitary defects heals. The authors would agree with these conclusions.

The comparison of the techniques of obtaining immediate stability of the acetabular component at the time of implantation with or without screws did not show that 1 of these techniques was better than the other. The hips fixed with screws had followup that was 1 year longer than those hips initially implanted without screws. The clinical results would favor the technique of impaction of the acetabular component without adjunctive screw fixation. Again, the clinical results cannot be compared accurately because of the absence of data regarding femoral component fixation and medical condition of the patient. In addition, the hips with screws had a longer followup. The clinical results would indicate that either technique of immediate stability could be done with confidence that the clinical results can be similar. There are many hips in which initial stability of the acetabular component at revision surgery cannot be obtained without using screws. This study would suggest that using screws in every hip at revision surgery could be expected to give satisfactory clinical and radiographic results. This would agree with the results of using screws for initial implant stability in revision surgery as previously reported by Padgett et al[16] and Lachiewicz et al.[14] Neither in their studies nor in this study were any broken screws reported. The authors had no fracture of the acetabulum observed at the time of surgery with impaction of the cup either when screws were used or when screws were not used.

The polyethylene linear wear in these hips was similar to that previously reported for using modular polyethylene inserts in porous-coated cups. Bankston et al[2] reported an average annual wear rate of 0.22 mm, and in these hips the average annual linear wear was 0.18 mm. In these hips, the polyethylene wear was greatest when a 26-mm articulation femoral head was used. This is not consistent with the previous reports of modular inserts with porous-coated cups (Harris–Galante Prosthesis, Zimmer, Warsaw, IN) as in primary hips as reported by Schmalzried and Harris.[19] The authors cannot explain this difference accurately. Because this finding in their revision hips is the same as they have found in their primary hips, the authors suspect that the modular insert used in these Anatomic Porous Replacement sockets was the cause. The polyethylene component used in the Anatomic Porous Replacement metal shell during the years 1985 to 1989 had observable motion between the polyethylene and metal at the time of implantation and had poor congruence of the plastic to the metal. The 26-mm heads were used with these inserts and were not used after 1989.

Progressive change of radiographic fixation with rim fit fixation with or without screws seems to stabilize after the second postoperative year. In these hips, the overall rate of a progressive increase in the number of radiolucent lines was 20.2%. This is nearly the same as the incidence of 18.2% that was reported by Lachiewicz et al[14] using the Harris–Galante porous-coated socket. The study by Lachiewicz et al[14] does not determine if their results are stable after 2 years postoperative. In these hips, only 4% showed any increase in the number of radiolucent lines between 2 and 10 years. Two percent showed fewer radiolucent lines. In addition, no osteolysis was observed in the acetabular bone surrounding the acetabular component in either the study of Lachiewicz et al or in these hips. This similarity in results between these 2 studies and that of Padgett et al[16] suggests that consistent results can be obtained in revision acetabular surgery with the use of a porous-coated hemispheric cup fixed with or without screws combined with rim fit implantation.

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