A Resident-Authored Original Paper

Infected Uncemented Hip Arthroplasty

Preserving the Femoral Stem with a Two-Stage Revision Procedure

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ABSTRACT

Revision of an infected uncemented hip arthroplasty can be significantly complicated by the presence of extensive bony ingrowth. Although removal of the prosthesis is desirable, technical difficulties in extracting a well anchored prosthesis can be extreme. Femoral windowing or splitting may be necessary. In these cases, treatment alternatives that avoid destruction of the femoral cortex are desirable.

A 47-year-old man presented with a deep infection of a virtually fully coated porous implant two years postoperatively. Radiographs revealed extensive bony ingrowth and an arthrogram revealed no dye tracking down the femoral canal. The infecting organism was *Staphylococcus epidermis*. In order to avoid the possible complications of extraction of this fully coated stem, treatment was carried out initially with removal of the bipolar head, joint debridement, and placement of antibiotic impregnated beads. After seven weeks of intravenous antibiotic therapy with the patient in tibial pin traction, a revision was undertaken and the acetabulum was revised with a threaded uncemented acetabular component. The patient recovered and at 18 month follow-up is without evidence of infection and back to full function. Revision with a two-stage femoral stem preserving procedure is presented as an alternative in the management of infected uncemented hip arthroplasty.

Deep infection of an uncemented hip arthroplasty is a rare complication with a reported incidence from 0 to 2.8%.[1-6] In these cases, resection arthroplasty with removal of all components of the implant has been used successfully to control infection.[4,5] However, in cases where the femoral prosthesis is well anchored with solid bony ingrowth, extraction of the stem can be quite formidable. Extensive bone resec-

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tion, cortical windowing, or frank splitting or sectioning of the femoral shaft has been necessary to facilitate removal of the implant.[4]

Review of the literature pertaining to revision of infected total hip arthroplasty reveals no special attention given to the problems of dealing with satisfactorily ingrown uncemented implants. In particular, techniques that address the problem of extensive bony ingrowth complicating deep sepsis have not been described to date. We present a case of a virtually fully coated uncemented hip arthroplasty that has been successfully revised in two stages with preservation of the femoral stem. Eighteen months following his revision, the patient is now clinically well, with no clinical or radiographic evidence of recurrence. We present this technique for consideration as an alternative in the treatment of deep infections surrounding a fully ingrown femoral stem.

CASE REPORT

A healthy 45-year-old man presented with a painful hip and a diagnosis of degenerative arthritis was made. The surgeon elected to perform a bipolar hip arthroplasty utilizing a virtually fully coated AML™ femoral stem. Postoperatively the patient had persistent pain in the hip and upper thigh with a significant limp in spite of a vigorous physical therapy program. Sixteen months later, the patient presented to us with increasing pain and disability. On physical examination, the patient had a severely antalgic gait with a positive Trendelenburg test. The range of motion was diminished in all planes with pain and spasm. The wound itself was benign. There was no evidence of inflammation or retraction. Plain radiographs showed the uncemented bipolar implant in place with loss of the subchondral plate of the acetabulum, slight upward displacement of the bipolar component, and marked osteopenia. The femoral component itself appeared well fixed with apparent bony ingrowth. There was no evidence of radiolucencies, sclerosis, or shadows. Some calcar resorption was evident (Figure 1). Hematologic workup revealed a slightly elevated sedimentation rate. A bone scan showed normal activity in the femoral stem area but increased uptake in the acetabulum (Figure 2). Aspiration of the hip, done at the time of arthrogram, yielded cloudy fluid which subsequently grew *Staphylococcus epidermidis*. An arthrogram revealed no evidence of the dye extending down the femoral shaft. Dye was contained within the hip itself and did not enter the bony acetabulum (Figure 3).

Because of the probability of a well fixed, virtually fully porous coated implant, which would not be easy to remove, extensive dis-

Figure 1. *Virtually fully coated porous implant showing evidence of solid bony ingrowth, with loss of subchondral plate and roof of acetabulum.*

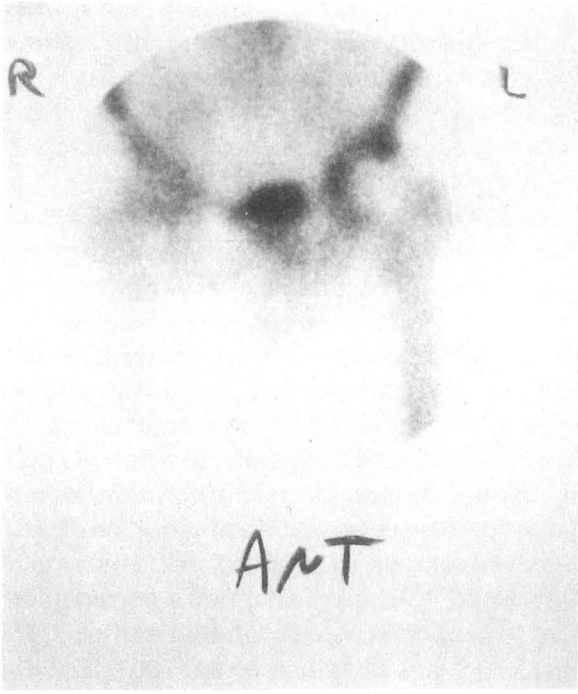

Figure 2. *Bone scan showing increased uptake in acetabular region.*

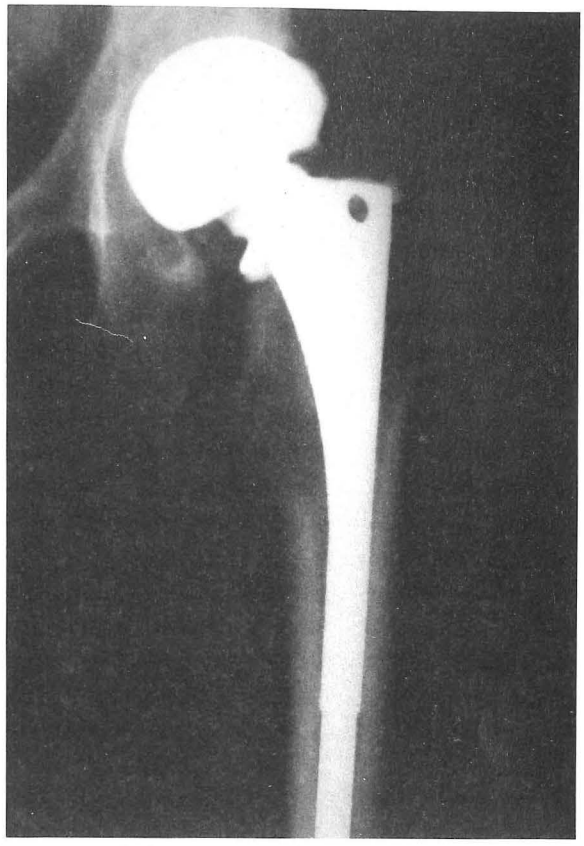

Figure 3. *Arthrogram showing dye contained within hip and no evidence of tracking into medullary canal of femur.*

cussion and thought was given to the various options in removing the femoral implant. Discussion was carried out with an experienced user of the implant, who felt that with a fully ingrown implant of this nature, extraction would be virtually impossible short of splitting the femur and dividing it into an anterior and posterior shell.[7]

Three months later the patient underwent exploration of the left hip. The hip was exposed using a direct lateral approach. When the joint was opened, a small amount of slightly cloudy fluid was encountered and was sent for culture and sensitivity. As expected, the femoral implant was rigidly fixed with no evidence of movement. The conventional measures to remove the implant without violating the femoral cortex were not successful. The bipolar component was removed and the acetabulum was inspected. There was loss of articular cartilage on the superior dome and lateral dome of the acetabulum. The acetabulum was sequentially reamed to remove all cartilaginous debris and all possibly infected tissue. Extensive debridement was carried out using sharp dissection as well as pulsating lavage.

The patient was allergic to penicillin, so vancomycin-containing methylmethacrylate beads were fashioned, strung on a wire, and placed within the acetabulum and dead space created by removal of the acetabular implant (Figure 4). The wound was closed in a routine fashion over Hemovac® drains.

Intraoperative cultures confirmed continued infection with *S. epidermidis*. The patient was placed in skeletal traction with a pin through the upper tibia. He underwent a seven-week course of intravenous vancomycin therapy and then underwent exploration of the hip again through the same approach. No significant fluid was encoun-

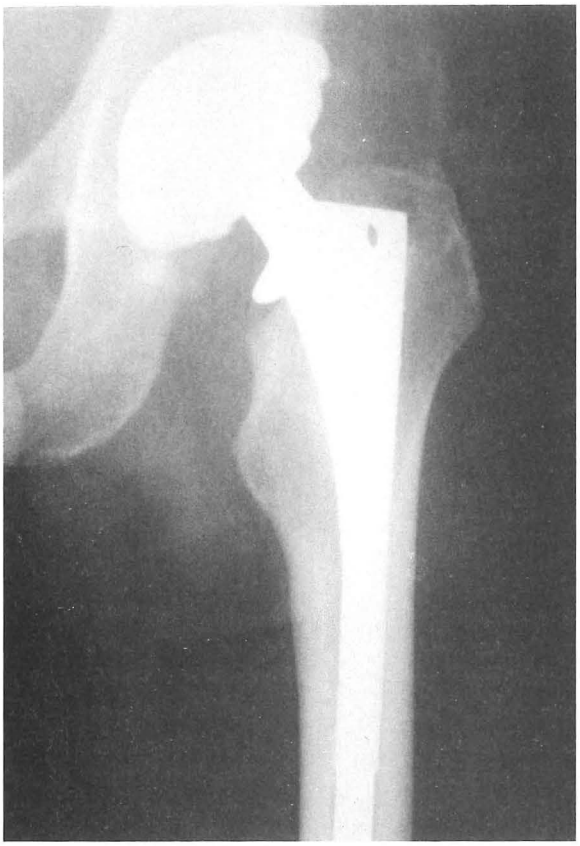

Figure 4. *Radiograph following first stage revision surgery, with antibiotic loaded cement beads in place.*

tered. The antibiotic impregnated beads were removed and the acetabulum was inspected. There was no evidence of active infection. Subsequent cultures taken at the time of second stage revision revealed no evidence of infection. The acetabulum was revised with a matching STAR® uncemented threaded acetabular cup. The wound was again closed over Hemovac drains and the patient was placed on intravenous antibiotics for 48 hours.

He subsequently underwent oral antibiotic therapy for six months. The wound healed uneventfully. At 18 month follow-up examination, the patient was pain-free, with a full range of motion, no limp and a Harris hip score of 92. He had returned to work on a full time basis. Radiographic examination at that time revealed the femoral stem to be unchanged in appearance with no evidence of lucency, infection, or loosening. The acetabular component remains in satisfactory position (Figure 5).

DISCUSSION

Successful treatment for an established deep infection of a cemented total hip arthroplasty involves surgical debridement and control of the infection with local and intravenous antibiotics. Most authors advocate complete removal of all methylmethacrylate and surrounding necrotic bone.[8-11] Residual fragments of methylmethacrylate and adjacent devascularized bone are inaccessible to antibiotics and are believed to act as a nidus for continued infection.[10,11] Once infection is controlled and a well vascularized bed has been re-

Figure 5. *Eighteen month postoperative radiograph showing no evidence of recurrence.*

established, reimplantation can proceed in either a one- or two-stage fashion.[6,12-14] The use of antibiotic impregnated cement for revision surgery has been successful in maintaining control of infection.[6,8] Temporary replacement of antibiotic impregnated methylmethacrylate beads in two-stage procedures has likewise been successful in eradicating local infection.

Infection of an uncemented prosthesis that is well anchored with extensive bony ingrowth presents a different and complex clinical problem. As with infection of a cemented implant, removal of the prosthesis is desirable. However technical difficulties in extracting a well anchored prosthesis, as pointed out by Lord,[4] may be considerable and fraught with complications. This is particularly true when the prosthesis is virtually fully porous coated as in our case. Extraction in some cases may be accomplished only at the expense of splitting a large segment of femoral cortex to allow removal. This places the patient at risk for further complications during revision and in the postoperative period.

In planning treatment for this patient, preservation of the femoral stem was considered in order to avoid the anticipated problems of extracting the prosthesis. Both the preoperative radiographs and the arthrogram suggested extensive bony ingrowth and tight circumferential apposition of the prosthesis and bone. Frank infection of the femoral canal appeared unlikely in view of these studies. Also influencing the decision to preserve the stem was the fact that the infecting organism, *S. epidermidis,* was a pathogen of relatively low virulence and sensitive to several antibiotics, including vancomycin. Infection with a more resistant organism might have led to a more radical approach, possibly necessitating the removal of the femoral stem even in the face of possible complications. The bone scan revealed no increased uptake about the acetabular region. Findings at surgery confirmed the preoperative studies, and treatment with both local and intravenous antibiotics was successful in clearing the infection. The absence of methylmethacrylate and devascularized bone surrounding the prosthesis likely allowed improved antibiotic penetration into the area surrounding the femoral stem. Most of the current models of porous coated implants now have the coating in the upper third of the prosthesis only, making extraction easier should it be necessary.

Radical debridement and removal of components remains the preferred method of treatment for infected porous coated implants. However, the presence of extensive bony ingrowth may considerably complicate efforts to extract the prosthesis even with newer implant design. One can anticipate these problems by careful preoperative assessment. In cases where extraction of a well anchored prosthesis is likely to be met with considerable difficulty, preservation of the stem should be considered. In our case we were successful in controlling infection and avoiding the complications of femoral stem removal by using both local and intravenous antibiotics prior to, during and after reimplantation. This alternative should be considered in similar cases.

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