Acetabular Prosthetic Protrusio and Sepsis

Case Report and Review of the Literature

James B. Stiehl, MD

Abstract: Acetabular prosthetic protrusio is an unusual complication of total hip arthroplasty that develops from erosion of the medial acetabular wall and intrapelvic migration of the implant. This report reviews 3 cases of severe intrapelvic prosthetic migration where acute or chronic sepsis was associated with the condition. All subjects were female and involved the left hip. In each case, debridement of the intrapelvic implant was required with an intra-abdominal approach. After successful eradication of infection, 2 patients have a well-functioning reimplanted prosthesis, and 1 was left with a Girdlestone arthroplasty. Literature review revealed that 11 of 16 similar prosthetic protrusion cases had chronic sepsis, of which, 10 were female and 9 involved the left hip. Chronic infection should be considered when intrapelvic prosthetic migration occurs after total hip arthroplasty. Key words: acetabular protrusio, sepsis, total hip, Girdlestone arthroplasty, revision total hip arthroplasty.

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Acetabular prosthetic failure in total hip arthroplasty may result from a variety of etiologies, including aseptic loosening, cup malposition with chronic implant instability, sepsis, component wear, chronic pelvic osteolysis, and traumatic injury. The incidence of intrapelvic prosthetic migration or protrusio is rare, with most series describing only isolated anecdotal events. Sepsis in failed total hip arthroplasty may result in a destructive osteolytic process, with dissolution of the interfaces and loss of bone structure. In the case of pelvic protrusion, chronic sepsis may be one of the inciting factors leading to loss of structural integrity and prosthetic migration [1,2].

The technical challenge of treating implants that have migrated into the pelvis is underscored by the anatomical impingement of vital structures inside the pelvis, such as the external iliac vessels and the femoral nerve. An intrapelvic approach is often needed to safely remove the prosthesis and may be combined with the standard lateral approach [3,4]. This report retrospectively evaluated a group of 7 patients (3%) who had been treated with intrapelvic prosthetic migration after failed total hip arthroplasty from a larger series of 225 acetabular revisions. Of this small cohort, 3 patients proved to have either acute or chronic sepsis associated with the reconstructive procedure. A literature review of similar anecdotal cases demonstrated a high frequency of infection when there is intrapelvic migration of an acetabular prosthesis [5-20].

Case Report

Patient 1

In 1993, a 63-year-old white female with chronic rheumatoid arthritis underwent revision for severe intrapelvic protrusion of a left bipolar hemiarthroplasty that was the third revision attempt after a failed total hip arthroplasty (Fig. 1). Comorbidities included aortic stenosis, mitral regurgitation, and the patient had been wheelchair-bound for the proceeding 5 years. The sedimentation rate was
22 mm/h, but both the serum albumin and total protein were slightly depressed. Preoperative aspiration of joint fluid about the prosthesis proved negative for bacterial contamination. Revision was done through an extensile triradiate lateral approach with an ilioinguinal extension [3]. The anterior column was absent for 6 to 7 cm, and there was pelvic discontinuity of the posterior column.

Microscopic analysis of frozen sections of the specimens were negative with less than 5 neutrophils per high-powered field on multiple fields, and further reconstruction was done using a large bulk acetabular allograft that was double plated into position. A 12-cm proximal femoral allograft was used for the femoral reconstruction and was press-fit distally with step-cut joint. Intraoperative cultures proved to be negative. Primary wound healing was satisfactory, but at 4.5 months after surgery, the sedimentation rate elevated to 72 mm/h, and the wound began draining a large amount of serosanguineous fluid that was culture positive for *Staphylococcus aureus* and *Pseudomonas aeruginosa*. After Girdlestone arthroplasty and appropriate adjunct antibiotic therapy, the wound healed, and sedimentation rate returned to 19 mm/h in 6 weeks. Because of the debilitated state, no further treatment was required.

**Patient 2**

A 70-year-old white female had undergone bilateral total hip arthroplasty with the original left total hip performed in 1988. By 1995, the left prosthesis had migrated into the pelvis, but the patient could walk 3 blocks and pain was defined as moderate continuous. The proximal femur had stabilized against the lateral surface of the ischium, preventing further migration. By 2002, there was a change with the acetabular component, now becoming free floating in the pelvis (Fig. 2). The sedimentation rate was elevated to 107 mm/h, and the C-reactive protein was 48.8 mg/dL. Aspiration of the hip joint produced a negative culture. A revision of the failed acetabular component was done, leaving the failed cup protruded inside the pelvis. This was done because of the marked medial position of the implant, now clearly floating inside the pelvis, and the inability to safely reach the medial surface that appeared to be adherent to soft tissues. Intraoperative specimens obtained about the prosthetic articulation were negative by frozen section analysis with less than 5 white blood cells per high-powered field leading to an attempt at cup revision. The femoral component was not revised as fully porous stem had solidly ingrown over time, making the implant virtually impossible to remove. Permanent microscopic sections of additional tissue revealed inflammation of greater than 10 white blood cells per high-powered field.
<table>
<thead>
<tr>
<th>Reference</th>
<th>Age (y)</th>
<th>Sex</th>
<th>Diagnosis</th>
<th>Side</th>
<th>Described Condition</th>
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<th>Outcome</th>
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<tr>
<td>[6]</td>
<td>54</td>
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<td>Left</td>
<td>Rectal fistula into hip joint</td>
<td><em>Escherichia coli</em>, <em>Salmonella</em>, <em>Streptococcus</em></td>
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<td>Femoral artery aneurysm</td>
<td><em>Proteus mirabilis</em></td>
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<td>[8]</td>
<td>61</td>
<td>Female</td>
<td>Intrapelvic migration of acetabular component</td>
<td>Left</td>
<td>False aneurysm of external iliac artery, rheumatoid arthritis</td>
<td><em>Staphylococcus aureus</em></td>
<td>Girdlestone arthroplasty</td>
</tr>
<tr>
<td>[8]</td>
<td>57</td>
<td>Female</td>
<td>Intrapelvic migration of acetabular component</td>
<td>Left</td>
<td>False aneurysm of external iliac artery, rheumatoid arthritis</td>
<td><em>Staphylococcus aureus</em></td>
<td>Girdlestone arthroplasty</td>
</tr>
<tr>
<td>[9]</td>
<td>76</td>
<td>Female</td>
<td>Intrapelvic migration of acetabular component</td>
<td>Left</td>
<td>False aneurysm of external iliac artery, abdominal-hip joint fistula Protruded cement mass</td>
<td><em>Enterobacter agglomerans</em>, <em>Staphylococcus aureus</em></td>
<td>Girdlestone arthroplasty</td>
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<td>73</td>
<td>Female</td>
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<td>Left</td>
<td>Myotic aneurysm of external iliac artery</td>
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<td>Revision arthroplasty</td>
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<td>58</td>
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<td>Intrapelvic migration of cement and cup</td>
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<td>Osteogenesis imperfecta</td>
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<td>Yes, ?</td>
<td>Girdlestone arthroplasty</td>
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<tr>
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<td>Bladder perforation</td>
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<td>Revision arthroplasty</td>
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<tr>
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<td>Remove of offending cement spicule</td>
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<td>False aneurysm of external iliac artery</td>
<td>None</td>
<td>Closure of fistula and revision arthroplasty</td>
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<tr>
<td>[19]</td>
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<td>Left</td>
<td>Arteriovenous fistula of external iliac</td>
<td><em>Enterococcus</em></td>
<td>Revision arthroplasty</td>
</tr>
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</table>

118 cultures from deep in the wound inside the pelvis recovered *S. aureus*. The patient declined removal of 119 implants if a debridement of the intrapelvic prosthesis was possible. This was subsequently done 120 through a rectus retroperitoneal approach followed 121 by several months of adjunct antibiotic therapy [4]. 122 Recovery was uneventful, and the patient is now 123 pain-free and ambulatory at 2 years follow-up.

126 **Patient 3**

127 A 60-year-old white female was seen in 2003 128 with a failed left cementless acetabular component of a total hip arthroplasty that was initially placed 129 in 1986 for avascular necrosis that followed adjunct chemotherapy therapy for treatment of Hodgkin disease in 1979. The acetabular component had migrated into the pelvis (Fig. 3). However, the anterior ilioinguinal line was intact on radiographs, and pelvic discontinuity was not suspected. The preoperative sedimentation rate was 98 mm/h, and the serum C-reactive protein level was 11.2 mg/dL. Because of the severe pain and strong suspicion of chronic sepsis, a hip joint aspiration was not done. The acetabular component was recovered through an anterior rectus retroperitoneal approach. Intra-
operative frozen sections of periprosthetic tissues revealed inflammation with greater than 10 white blood cells per high-powered field on multiple specimens. Wound debridement was done through an additional lateral approach with removal of the femoral component and placement of a large “tennis ball”-sized antibiotic spacer that could not migrate through the pelvic medial wall defect. After subsequent adjunct antibiotic therapy, the patient underwent a successful reimplantation 3 months later and remained symptom-free at 12 months follow-up.

Discussion

Acetabular prosthesis protrusion can be a difficult surgical problem, especially if the device migrates into the pelvis. Adjacent structures such as the external iliac artery and the femoral nerve lie adjacent to the anterior column and often are displaced and become scarred to the protruded implant. When coupled with low-grade chronic sepsis, the condition becomes recalcitrant to standard revision methods. Cameron et al [21] were able to make a direct correlation of infection with 10 cases of protruded bipolar hemiarthroplasties. Although other conditions, such as pelvic radiation therapy, aplastic anemia, sickle cell disease, metstatic carcinoma, and osteolytic bone destruction from polyethylene debris, have been implicated in causing protrusion, these conditions are rare and have identifiable clinical hallmarks [22-25].

The surgical approach to prosthetic protrusion requires several important considerations. If one cannot easily gain access to soft tissues about the inner surface of the implant from the lateral approach, an alternate anterior approach is needed. A general surgeon skilled in vascular and abdominal surgery can easily make the routine anterior rectus approach for safe implant removal. Stiehl et al [3] have shown that the protruded implant will displace vital structures such as the external iliac vessels and the femoral nerve, and traction injury is likely if they are entrapped in scar tissue. From my initial experience with earlier similar cases, a comprehensive preoperative evaluation was done including a femoral arteriogram, barium enema, and cystrogram to assess these structures. Without exception, significant prosthetic protrusion beyond the ilioinguinal line demonstrated predictable displacement of the vessels. An arteriogram of the external iliac is recommended as the literature review has demonstrated 1 case of false aneurysm that, if present, could pose a substantial challenge for the reconstructive surgeon. Removal of the prosthesis from the lateral external approach must be done very carefully if neurovascular involvement is demonstrated.

An adequate preoperative workup for cases of acetabular periprosthetic protrusion should include standard measures to discover chronic sepsis, such as complete blood count, serum C-reactive protein levels, sedimentation rate, and preoperative fluid aspiration of the hip joint. From the recommendation of Feldman et al [27], multiple intraoperative frozen sections of nonperivascular tissue from representative areas about the prosthesis should be obtained with a threshold for inflammation at greater than 5 neutrophils per high-powered field [26]. Because of the wound complexity and soft tissues involved, a 2-stage reconstruction would be recommended for infected acetabular prosthetic protrusion. After the initial wound debridement, an antibiotic spacer is placed, and 6 weeks of adjunct antibiotics are administered guided by intraoperative bacterial cultures. In this case report, an antibiotic spacer was used only in patient 3, as the defect was treated with a permanent Girdlestone arthroplasty in patient 1, and patient 2 was treated with only intrapelvic prosthetic removal. Reimplantation is done only after subsequent inflammatory indices have returned to normal [27-29].

This case report focuses on the rare occurrence of sepsis that is associated with intrapelvic protrusion of acetabular components in total hip arthroplasty. As intrapelvic protrusion of implants is not infrequent, the standard case without infection will not be reported upon. From a review of the literature using the National Library of Medicine Pubmedline database, 218 articles were identified from 1956 to 2005 under the search heading of acetabular protrusion or protrusion. Further review of these articles revealed 16 anecdotal cases of severe intrapelvic prosthetic migration, similar to cases identified in this report (Table 1). Of this group, there were 11 cases where another clinical entity had been described, such as false aneurysm of the external iliac artery or an enteric fistula into the hip joint, but chronic sepsis of the total joint was present and provided an equally challenging problem. Another observation is that 10 of the 11 infected cases were female and 9 had involvement of the left side. There is no apparent explanation for this finding, but prior studies have identified an easy access of the retroperitoneal space and bursae with the hip joint [30]. Finally, 10 of 11 infected cases were left with a permanent Girdlestone arthroplasty or death in 1 case, demon-
strating the severity of the condition. In the present report, all were female and involved the left side.

From my own clinical experience, roughly one half of the cases with severe intrapelvic prosthetic protrusion were found to have infection. This possibility should come as no surprise as osteolysis and bone resorption have proven to be common radiographic features of chronic infectious processes [31]. Two of the cases in this report were not straightforward in identifying the infectious etiology. In the first case, low-grade chronic sepsis was probably present all along but took a couple months to manifest. In the second case, the elevated sedimentation rate and C-reactive protein level were the only preoperative findings pointing to chronic sepsis. Nonetheless, chronic infection was eventually proven. An interesting feature of the bulk allograft acetabulum placed in the first patient was that it had completely incorporated by 4.5 months and required osteotomy of significant effort to break up the union site. The infection apparently did not hinder the healing process and 271 allograft incorporation.

Two recommendations emerge from this clinical experience. There should be a high suspicion for chronic sepsis in this scenario. Secondly, the reconstructive surgeon should perform or perhaps choose a general surgeon better qualified to perform an abdominal approach such as the rectus retroperitoneal or the anterior ilioinguinal to safely extract and debride an infected implant that may have migrated into the pelvis. The surgeon may be obligated to choose a staged procedure, should soft tissue microscopic evaluation or other clinical findings point to infection.

References


25. Marco RAW, Thethy DS, Boland PJ, et al. Functional and oncological outcome of acetabular reconstruc-