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Surgical technique

Antibiotic cement spacer for isolated medial wall acetabular deficiency in the setting of infected hip arthroplasty

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Abstract

Periprosthetic joint infections remain challenging for orthopaedic surgeons. These are typically treated with 2-stage revision with an antibiotic spacer and arthroplasty reimplantation after infection eradication. We report a novel technique to create an antibiotic cement spacer construct in the setting of significant acetabular medial wall destruction due to osteolysis and infection. The medial wall of the acetabulum was reconstructed using antibiotic cement with 2 screws acting as a rebar. An acetabular liner was then cemented into place forming a cement construct similar to a reconstruction cage in function. This technique created a firm acetabular construct that allowed for the placement of a stable articulating spacer. The spacer allowed for infection eradication and was successfully converted into a revision total hip arthroplasty.

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posterolateral aspect of the acetabulum are used to add additional support. Dexler et al. [7] evaluated the outcomes of the technique proposed by Rogers et al. [6] and found good results.

Concerning the reconstruction of the medial acetabular wall, most techniques described in the literature incorporate cage and/or ring constructs. Therefore, the purpose of the current investigation is to describe a novel technique for the placement of an antibiotic spacer in the setting of a large uncontained medial wall acetabular defect secondary to acetabular osteolysis due to PJI. The proposed technique involves the use of screws and cement.

Surgical technique

After hip joint aspiration, a diagnosis of PJI was made on a 60-year-old female patient who previously underwent a left total hip arthroplasty. Based on prior records and the patient’s recollection, the index procedure was performed approximately 4 years before the patient presented to our institution. The patient had 2 prior revisions and initially underwent a head and polyethylene liner exchange shortly after the index operation due to a suspected deep periprosthetic infection followed by an acetabular component revision due to persistent hip pain and suspected aseptic loosening. Intraoperative cultures grew Corynebacterium striatum, and as a result, the patient was subsequently treated with suppressive antibiotics. The cup migrated medial to the Kohler line due to a large uncontained medial wall defect (Fig. 1a-c). Prior radiographs were unavailable for review. According to the Paprosky classification for acetabular bone loss, the wall deficiency was classified as a type 2C defect [8]. The hip aspiration demonstrated growth of Corynebacterium striatum on 2 separate samples. The patient met major Musculoskeletal Infection Society criteria for the diagnosis of PJI [9].

A 2-stage revision arthroplasty procedure was planned to most effectively eradicate this chronic PJI. An articulating antibiotic spacer was chosen due to the benefits of reduced hospitalization, enhanced function, and ease of the second-stage reimplantation [1]. The following technique describes the creation of a cement spacer construct in the setting of significant acetabular medial wall destruction.

The patient was placed in the lateral decubitus position, and a standard posterior approach was used to access the hip. The short external rotators and piriformis tendon were released off the femur, and a bone hook was used to dislocate the prosthetic joint. A bone tamp and mallet were used to remove the femoral head, and an extractor device was used to backslap the femoral stem. The polyethylene liner, acetabular screws, and cup were removed after thorough soft-tissue debridement. Adequate circumferential bone stock was noted; however, there was a large uncontained medial acetabular wall deficiency consistent with a Paprosky type 2C defect [8]. The acetabulum was reamed with a 61 size reamer. Owing to concerns of medial migration of the hip spacer, a decision was made to place 2 acetabular screws to serve as rebar to prevent medial displacement of the antibiotic spacer. One screw was placed in the pubis and the other in the ileum. Three batches of antibiotic cement with 3 g of vancomycin and 2.4 g of tobramycin were then prepared. One batch was formed into a disk and placed around the acetabular screws to recreate a medial wall. A poor cementing technique was purposely utilized to form the disk. This technique limited the interdigitation of the cement to facilitate the removal of the construct at the time of the second-stage revision. A second batch of cement was then used to cement the acetabular liner into the recreated medial wall. The third batch of cement was placed into a spacer mold to form the femoral stem. The appropriate size femoral head was placed after trialing to optimize stability. Intraoperative assessment demonstrated adequate stability of the prosthetic joint. Figure 2 shows the radiographic appearance of the spacer construct and the femoral stem.

The patient was treated with 6 weeks of intravenous antibiotics, followed by a 2-week antibiotic holiday at which time repeat serology and hip aspiration was performed. Cultures from the aspiration were negative with 5.3% neutrophils and a white blood cell count of 4,800. Figure 1 shows the preoperative evaluation of the patient. No additional bone stock was noted in the acetabulum. The acetabulum was reamed with a 61 size reamer. Owing to concerns of medial migration of the hip spacer, a decision was made to place 2 acetabular screws to serve as rebar to prevent medial displacement of the antibiotic spacer. One screw was placed in the pubis and the other in the ileum. Three batches of antibiotic cement with 3 g of vancomycin and 2.4 g of tobramycin were then prepared. One batch was formed into a disk and placed around the acetabular screws to recreate a medial wall. A poor cementing technique was purposely utilized to form the disk. This technique limited the interdigitation of the cement to facilitate the removal of the construct at the time of the second-stage revision. A second batch of cement was then used to cement the acetabular liner into the recreated medial wall. The third batch of cement was placed into a spacer mold to form the femoral stem. The appropriate size femoral head was placed after trialing to optimize stability. Intraoperative assessment demonstrated adequate stability of the prosthetic joint. Figure 2 shows the radiographic appearance of the spacer construct and the femoral stem.

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Figure 1. Anteroposterior view of the pelvis (a) and hip (b) in addition to a lateral hip view (c) demonstrating medial migration of the cup due to a large uncontained acetabular medial wall defect.

Figure 2. Anteroposterior view of the pelvis showing the spacer construct and the femoral stem.
cell count of 6.17 × 10^9/L. C-reactive protein was 4.2 mg/L while the erythrocyte sedimentation rate was 13 mm/h. These results were consistent with clearance of infection.

Reimplantation was performed at 10 weeks. A standard posterior approach was again utilized. The prosthetic joint was dislocated, and the antibiotic femoral stem was easily removed. The cemented acetabular component was carefully removed with an explant osteotomes may be helpful in the setting of a difficult cement disk. The limited interdigitation of the cement disk allowed osteotome and a mallet so as to prevent medial displacement of the cemented acetabular component was carefully removed with an antibiotic femoral stem was easily removed. The anterior approach was again utilized. The prosthetic joint was consistent with clearance of infection.

Discussion

The aforementioned technique illustrates a method to manage a large medial uncontained acetabular wall defect during the first stage of a 2-stage reconstruction for PJ. Using this method, we were able to recreate a medial wall to prevent protrusio and create a stable articulating antibiotic cement spacer. The construct, comprising antibiotic cement, was similar to a reconstruction cage in function as it helped restore the hip center of rotation and prevent protrusio. By forming the cement disk to recreate the medial wall purposely utilizing a poor cementing technique, the interdigitation of the cement was limited which allowed it to be easily removed during the second-stage revision. During the second stage, the surgeon should be prepared to face difficulty removing the spacer in the event that the cementing technique was better than expected. Instrumentation such as a high speed burr and explant osteotomes may be helpful in the setting of a difficult spacer removal. This procedure provided the patient with a stable construct while being successfully treated with intravenous antibiotics for 6 weeks. Furthermore, the bone stock was adequately preserved which allowed the reimplantation of a jumbo acetabular cup during the second-stage revision.

The efficacy of 2-stage revision arthroplasty for PJ is well documented in the literature [1,7,10-12]. The advantages of an antibiotic spacer are that soft-tissue management, patient function, limb length, and antibiotic delivery are all optimized to allow for infection eradication and reimplantation. Acetabular and femoral bone loss makes the creation of antibiotic spacers significantly more difficult.

Multiple techniques have been described to create antibiotic cement spacers in the setting of acetabular bone loss. Most of the published techniques discuss supplementation and support of superior and posterolateral acetabular bone loss [4-6]. The role of the screws in the current technique was to support the cement construct and to prevent medial migration. The acetabular liner was then cemented into the cement construct.

Summary

The described technique represents a unique method to create an antibiotic spacer in the setting of 2-stage revision for PJ with isolated medial acetabular wall destruction. This technique prevented the migration of the spacer through the medial wall, helped eradicate infection, and allowed for a successful total hip arthroplasty reimplantation.

References