Novel Use of a Trabecular Metal Augment in a Severe Acetabular Defect

1Daniel J Scott MD, MBA, 2Jason M Jennings MD, DPT, 3Michael P Bolognesi MD

ABSTRACT

Many total hip arthroplasties are complicated by severe acetabular bone loss, limiting reconstruction options. This case report details the use of a 54-mm trabecular metal straight buttress and press-fit jumbo cup to reconstruct an especially large superior and medial defect (Paprosky type IIIB). Specifically, the large defect was reconstructed by placing the augment superior-medially in the acetabular defect instead of simply superiorly and attached to the iliac wing as it is more commonly employed. To our knowledge, there has been no reported use of a similar augment to fill such a defect in this way. This technique represents a promising potential option for reconstruction of especially large superior and medial acetabular defects.

Keywords: Acetabular bone loss, Arthroplasty revision, Total hip arthroplasty, Total hip arthroplasty revision.

INTRODUCTION

Total hip arthroplasties (THAs) are one of the most commonly performed orthopaedic procedures in the United States. With 572,000 primary THAs projected to be performed per year by 2030, there is a corresponding projected increase in revisions of THAs to 96,700 by 2030. Many of these revisions may be complicated by severe osteolytic induced acetabular bone loss, which is problematic as it makes reconstruction difficult. Possible options for management of these defects include jumbo-sized cups, cup-cage constructs, and trabecular metal augments. Unfortunately, studies have shown revision THAs in the setting of severe acetabular bone loss have high rates of failure. With reported failure rates ranging from 12.5 to 24%, there is a clear and present need for better reconstruction methods. Current reconstruction methods present a number of challenges. Jumbo cups are frequently undersized to reconstruct these large defects. Given the often extensive osteolysis, it is also quite difficult to attain adequate fixation for the cup superiorly. In this case report, we describe the unique use of a trabecular metal buttress augment to fill a large superior and medial defect, along with a press-fit hemispherical component in the native position. To our knowledge, there have been no reported cases of using this augment in this capacity to reconstruct such a defect. The patient was informed that data concerning this case would be submitted for publication, and he provided consent.

CASE REPORT

A 65-year-old healthy male was status post left hip hemiarthroplasty in 1999 secondary to a fall from a height where he sustained a displaced femoral neck fracture. His postoperative course was complicated by protrusio requiring revision surgery at an outside hospital with acetabular bone grafting and subsequent conversion to a THA in August 2009. He presented to our clinic in November 2010 for evaluation of his painful left hip. Physical examination demonstrated groin pain with active and passive range of motion, with his left leg noted to be significantly shorter than his right. Radiographs (Fig. 1) demonstrated cup loosening and migration. Previous serial comparative imaging was unavailable. Inflammatory markers were elevated...
significantly above our institution’s normal reference range (C-reactive protein of 13.7, sedimentation rate of 83). The patient returned several weeks after our initial evaluation with an increase in his baseline groin pain with femoral head uncovering noted on his follow-up radiographs (Fig. 2).

The patient was taken to the operative theater, where intraoperative frozen samples were positive for acute inflammation. The acetabular component was grossly loose and had migrated proximally. The anterior and posterior walls were intact, but there was a large superior and medial wall defect noted. The femoral component was well fixed; an extended trochanteric osteotomy was utilized to explant and place an articulating antibiotic spacer (Fig. 3). Intraoperative cultures grew coagulase-negative Staphylococcus species, which was sensitive to vancomycin. Accordingly, he was treated with 6 weeks intravenous vancomycin. No complications were noted postoperatively; his inflammatory labs returned to within reference range.

Ten weeks after his index procedure at our institution, the patient was taken back to the operative theater for a presumed left hip reimplantation. Intraoperative frozen samples were negative for acute inflammation and his nucleated cell count was 689. His acetabular combined superior and medial defects were not suitable for traditional acetabular augmentation secondary to the size. Therefore, we used a 54-mm trabecular metal buttress superiorly with a press-fit hemispherical component in the native position to fill the void (Figs 4 and 5). The cup itself was cemented over the trabecular metal buttress and bone allograft was used to fill the remaining medial portion of the defect. We utilized intraoperative imaging to document the appropriate placement of the acetabular components. A distal tapered femoral stem component with a modular proximal cone body was used for the femoral revision. His postoperative course has remained uncomplicated. At his 1-year and 1.5-year follow-up, he remains pain free.
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DISCUSSION

Revision THAs can be very challenging, especially if the reconstruction is complicated by severe osteolysis. Multiple classification schemes have been developed to further differentiate the degree of existing bone loss. One especially useful classification system was developed by Paprosky et al.9 This system for classifying large defects is based on four radiographic parameters: Superior migration of the hip center, ischial lysis (indicative of posterior column insufficiency), destruction of the teardrop (medial wall), and disruption of Kohler’s line.9 The superior and medial portions of the acetabular cup are of particular importance (Paprosky type 3B lesions) as erosions of these portions of the cup are particularly difficult to manage in revision THAs.10 Erosion of superior and medial walls of the acetabulum have been reported as complications of failed THAs, most commonly due to aseptic loosening of a primary THA.11

Historically, acetabular revisions in the setting of severe bone loss were treated with bone allograft, jumbo cups, or in severe cases cup-cage constructs. Jumbo cups alone are limited in that there may be further bone loss during reaming. Also, placing a correctly sized jumbo cup can be extremely difficult due to the extremely large size of many of these defects. These difficulties may be compounded given the frequently poor acetabular column bone stock that complicates the task of getting adequate superior fixations for these cups.10

In contrast, the structural bone allograft is used to fill existing boney defects and buttress the acetabular components. Of note, survival rates in the literature have varied from 75% to 86%.12 Cup-cage constructs have proven useful, especially in the most severe cases of acetabular bone loss. Schneider et al13 looked at 96 patients revised with cup-cage constructs after a mean of 41 months. They found that 95% of the constructs were still in place. All but one of the failures were due to hardware failure.

Tantalum metal acetabular augments have also been used previously in the treatment of large acetabular lesions. Weeden and Schmidt14 reported on one group of 43 acetabular revision patients with large (Paprosky type 3A and 3B) defects treated with porous metal implants. Of these, 26 also required porous metal augments to support the acetabular shell. Only one of these patients went on to require another revision procedure after an average of 2.8 years of follow-up. Similarly, Del Gaizo et al10 looked at a cohort of 37 revisions in 36 patients (one patient with bilateral revisions), all with Paprosky type 3A lesions and treated with tantalum metal acetabular components and augments. Of these, only one went on to require another revision for aseptic loosening, though additional surgery was required for two patients with periprosthetic fractures, three with acute postoperative infections, and two recurrent dislocations at a mean of 60 months follow-up. Of these, 35 of the 37 hips had no or occasional pain at last follow-up. Additionally, Harris hip scores were improved from an average of 33.0 preoperatively to 81.5 postoperatively. These studies seem to indicate that tantalum metal acetabular implants provide a viable solution over traditional implants. However, these augments can only be used in defects whose shape and size is amenable to the use of these augments.

Here, we describe the novel use of a 54 mm straight buttress augment and a press-fit jumbo cup to reconstruct an especially large superior and medial defect (Paprosky type IIIb). To our knowledge, there has been no reported use of a similar augment to fill such a defect in this way. This patient had a large defect both superiorly and medially. The superior portion of the defect was an especially challenging aspect of the reconstruction, as it left us with little posterior column bone stock to use for fixation of a jumbo cup (Fig. 6). The large size and shape of the defect also precluded the typical use of any existing trabecular metal acetabular augments. We wanted to avoid the use of a cup-cage construct in this patient because as previously stated, these reconstructions have a high rate of failure. Therefore, we elected to reconstruct the defect using a 54 mm straight buttress augment placed superior-medially in the acetabular defect, instead of simply superiorly and attached to the iliac wing as it is more commonly employed. This reduced the size of the defect such that it could be further reconstructed with a cemented jumbo cup as well as bone allograft to fill the rest of the medial portion of the defect (Figs 7 and 8). This is a novel use of the implant to reconstruct a defect.

FIG. 6: Re constitution of the defect


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in this way, as this technique offers a unique approach to defects that would otherwise require a cup-cage construct. Although this is a solitary case with relatively short follow-up, given the difficult size and location of the defect, our experience indicates that our unique use of a straight buttress augment can allow for the creation of a stable hip construct.

Based on our management of this patient, we recommend the use of the straight buttress augment in selective cases to fill very large superior and medial defects that could only otherwise be managed with a cage construct, allograft, or a jumbo cup alone.

REFERENCES

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