Acetabular Reconstruction in Total Hip Arthroplasty

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The difficulties encountered in dealing with the bone deficient acetabulum are amongst the greatest challenges in hip surgery. Acetabular reconstruction in revision total hip arthroplasty can successfully be achieved with hemispherical components featuring a porous or roughened ingrowth surface and options for placement of multiple screws for minor acetabular defect. Acetabular component selection is mostly based on the amount of bone loss present. In the presence of combined cavitary and segmental defects without superior acetabular coverage, reconstructions with a structural acetabular allograft protected by a cage or a custom-made triflange cage have been one of preferred surgical options. The use of a cage or ring over structural allograft bone for massive uncontained defects in acetabular revision can restore host bone stock and facilitate subsequent re-revision surgery to a certain extent. But high complication rates have been reported including aseptic loosening, infection, dislocation and metal failure. On the other hand, recent literature is reporting satisfactory outcomes with the use of modular augments combined with a hemispherical shell for major acetabular defect. Highly porous metals have been introduced for clinical use in arthroplasty surgery over the last decade. Their higher porosity and surface friction are ideal for acetabular revision, optimizing biological fixation. The use of trabecular metal cups in acetabular revision has yielded excellent clinical results. This article summarizes author’s experience regarding revision acetabular reconstruction options following failed hip surgery including arthroplasty.

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cups or cemented cup fixation can be used with or without a cancellous bone graft for simple acetabular defects, either cavitary or segmental.

However, combined cavitary and segmental defects are more challenging, particularly those without superior acetabular coverage precluding the use of a conventional cementless, non-augmented socket. Combined defects may be managed with reconstruction cages or structural bone grafts. However, the reconstructive procedure is demanding in the absence of a sufficient amount of bone. Such defects have been addressed with the use of structural allograft, highly porous metal shells with or without a cage, or the use of a custom triflange cup4,5).

The long-term results of revision surgery with these reconstructive options have been suboptimal due to the lack of bony in-growth of the cage or custom-made triflange cup to the deficient iliac bone6). Furthermore, the host tissue may resorb the allograft.

Flexible reconstruction meshes can be used to convert uncontained defects into contained defects, thus providing a stable cavity for IBG reconstruction and cemented cup fixation. The use of IBG for the reconstruction of acetabular defects with and without the use of adjuvant metal meshes was described by Slooff et al1). However, this technique has been used limitedly.

Recently new porous metal cups, shells and augments such as the most commonly used Trabecular Metal (Zimmer, Warsaw, IN, USA) components have been developed. These systems provide a biologic fixation method, allow extensive bony in-growth and have a high initial frictional resistance to mechanical loosening. The goal of all of these modifications is to promote firm fixation of the acetabular component to the bony pelvis and to prevent future loosening of the acetabular component8).

This article presents our experience in acetabular revision surgery. We reviewed the indications and results of each acetabular reconstruction option in the literature. We also present our early experience with the newer Trabecular Metal (TM) cups and augments.

**PREOPERATIVE EVALUATION**

Thorough preoperative patient assessment is critical in cases requiring acetabular component revision, and patient history is a key component. The lack of a pain-free interval following primary THA may prompt questioning of the indication for surgery, or it may indicate the presence of low-grade sepsis. Deep infection must be ruled out. Serum erythrocyte sedimentation rate (ESR; normal, <20 mg/dL) and C-reactive protein (CRP; normal, <10 mg/dL) should be obtained in all revision patients.

Preoperative radiographic assessment requires projections that include the entire prosthesis. An antero-posterior (AP) pelvis radiograph, a lateral hip view and both oblique views are usually needed in small lysis or bone defect. AP radiograph is sensitive in detecting clinically significant osteolytic lesion with further increase in sensitivity with addition of oblique radiographic views and are thus effective screening tools. However, if the osteolytic volume in early computed tomography (CT) scan exceeds more than about 1,000 mm³, it should raise caution and regular monitoring of progression of lesion is required and some curtailment of patient’s activity level should be considered9,10).

CT and three-dimensional (3D) CT should be taken as an adjunct in hips with major osteolysis and pelvic bone loss. 3D CT imaging can give the operating surgeon an improved preoperative understanding of the anatomical findings in severe complicated acetabular bony defect and makes it easier to select appropriate reconstructive implant and augments.

In cases in which the acetabular component is medial to the Kohler line, retained cement may be present, and/or previous screws are present and hence Judet views and/or a 3D CT reconstruction with contrast are valuable to evaluate the pelvic vessels, ureter, and bladder and their proximity to the acetabular component.

**LABORATORY EVALUATION**

All revision candidates should be pre-operatively evaluated in the same fashion. Screening laboratory tests include a complete blood count (CBC), ESR, and CRP. If both the CRP and the ESR are elevated, the hip should be aspirated prior to surgery.

**SURGICAL EXPOSURES**

Revision of the acetabular component presents several challenges, including safe removal of existing implants and cement, stable implantation of revision prostheses and bone graft, and preservation of the soft-tissue envelope and abductor mechanism. These challenges might require special, more extensile approaches and might not be sufficiently addressed with the conventional