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MINI-SYMPOSIUM: REVISION HIP ARTHROPLASTY

(ii) Current techniques and new developments in acetabular revision surgery

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Summary
Revision of a failed acetabular component is one of the most challenging aspects of revision hip arthroplasty. The revision hip surgeon must have a systematic approach to preoperative, operative and post-operative management. The majority of acetabular revisions can be performed using uncemented ''jumbo'' components, however severe bone loss can make reconstruction difficult. An advanced skill set including practical knowledge of extensile exposures, special techniques in removal of components, management of bone defects, and reimplantation of revision components, is essential. The various surgical options available to the revision surgeon are discussed in this article with particular focus on new techniques, instruments, materials and prostheses which may make this challenging area less complex to manage and may improve outcomes for patients in the future.

Introduction

Acetabular revision is perhaps the most challenging facet of revision hip reconstruction for the arthroplasty surgeon. Exposure may be difficult due to obliteration of the normal tissue planes from previous surgery and distortion of the anatomy. In addition acetabular bone stock may be grossly deficient leading to difficulties both with obtaining acetabular fixation with sufficient host bone contact and reproducing the hip centre, leg length and joint stability. Fractures of the acetabulum may be present or occur intraoperatively and neurovascular structures lie within close proximity.

It is therefore necessary for the revision arthroplasty surgeon to be mindful of possible intraoperative eventualities and to be armed with the necessary techniques, skills and inventory to manage them. Meticulous preoperative planning is required to ensure a satisfactory outcome.

Preoperative planning

The surgeon must know the details of the implanted components including prosthetic sizes, femoral trunion size, acetabular locking mechanism and the available liner options. Bone defects should be estimated and bone graft (morsellised or structural) should be available. In this regard, applying a classification system of acetabular bone

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defects may aid to guide management. Inventory should include instruments for extraction of the components and prostheses to re-implant.

Intra-pelvic migration of cement or components may warrant a preoperative angiogram to diagnose involvement of vascular structures and consultation from a general or vascular surgical colleague for assistance with operative exposure may prove beneficial.

The exclusion of infection, by use of blood tests and the judicious use of joint aspiration, is mandatory in all revision surgery. While no absolute guidelines for interpretation of inflammatory markers exist, however in the absence of another cause an ESR greater than 30 mm/h or a CRP greater than 10 warrant careful consideration of preoperative hip joint aspiration.

The operative procedure can then be divided into 4 phases; exposure of the acetabulum, extraction of implanted components, assessment and management of acetabular bone defects and re-implantation of revision components.

Exposure

Surgical approach is dependant on various factors such as the surgeons preference and experience, previous surgical approach and anticipated reconstructive challenges. For instance, if a pelvic discontinuity exists, the posterior column may require plating and then a posterior approach to the hip is preferable. In most cases, the approach with which the surgeon is most adept is best, although it is imperative that the chosen approach is extensile. Some form of trochanteric osteotomy (standard, sliding or extended) is often required to enhance either femoral or acetabular exposure. If revision of the femoral component is also required and a trochanteric osteotomy or variation is used, this may also improve access to the acetabulum.

Extraction of implanted components

The surgeon must have revision instruments including osteotomes, gouges, drills and high-speed burrs. The interface between the cement and bone should be exposed circumferentially. For removal of a cemented acetabular component, the prosthesis should initially be disrupted from the cement mantle and then the cement should be carefully removed using gouges and osteotomes to disrupt the cement bone interface in a piecemeal fashion with the minimum of bone loss. For removal of an uncemented acetabular component, the polyethylene liner should be disengaged from the shell and any screws removed. A 6.5 mm screw inserted through a 4.5 mm drill hole in the polyethylene will disengaged the liner from the cup in most instances where a proprietary liner removal tool is not available. The bone prosthesis interface can be broken with a series of curved gouges or the use of more specialised instruments such as the **Explant** (Zimmer, Warsaw, Indiana). Use of the Explant device requires re-insertion of the polyethylene liner or suitable trial liner after acetabular screw removal has been performed (Fig. 1).

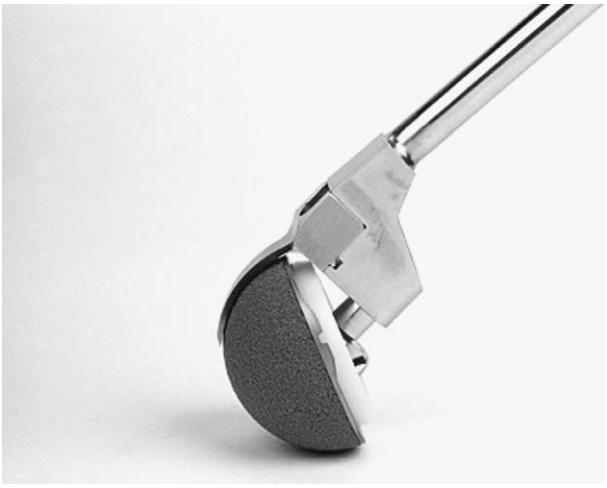

Figure 1 Explant acetabular removal system. Short followed by long blades are used to break the bone–prothesis interface with minimal bone resection. Any residual soft tissue or membrane should then be debrided to allow visualisation of the rim of the acetabulum circumferentially such that estimation of bone defect can be made.

Assessing and managing acetabular bone defects

Preoperatively plain X-ray, CT scanning and MRI scanning can be used to attempt to assess acetabular bone defects. In general the defects seen on imaging will underestimate the intraoperative status. The AAOS and Paprosky[1] classifications of acetabular deficiencies are useful in guiding further surgical management.

The remainder of this article will outline the options currently available for revision surgery of the acetabular component with a focus on new developments.

Uncemented acetabular revision

In our practice, the majority of acetabular revisions are performed using uncemented revision acetabular components when greater than 50% host bone contact is available for implantation. The use of these so called ''jumbo'' cups has become the workhorse of acetabular revision surgery. Excellent outcomes have been reported for the use of uncemented acetabular revision with 12–15-year survivorship of 81–96%.[2–4]

The complexity of acetabular revision is determined by the amount and location of acetabular bone defects present. It is not uncommon for patients to present with several years of relatively minimal discomfort with large osteolytic defects and or migration of the acetabular components. The Paprosky classification[1] of acetabular deficiency describes the amount of host bone contact for implantation of the prosthesis and takes into account the amount of rim, dome and anterior and posterior columns available.

In Paprosky type 1 defects, bone loss is minimal and can usually be treated using an uncemented acetabular component supported by multiple screws and morsellised bone