■ THE REVISION HIP

Osteolysis in the well-fixed socket

CUP RETENTION OR REVISION?

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Osteolysis remains a common reason for revision after total hip arthroplasty (THA). For osteolysis associated with loose cups, revision is indicated. For osteolysis around a well-fixed cup, the decision is more controversial. The data available support retention of the cup with lesional treatment, working through screw holes and access channels for debridement and grafting. The choice of graft material to fill defects, if any, remains controversial. Several studies demonstrate good survivorship with cup retention strategies. Complete revision allows more complete debridement of the lesion and better graft fill, and allows implantation of a modern cup, typically with a full line of liners and bearing surfaces available. Additionally, revision allows fine tuning of the orientation of the cup, which may be advantageous for optimising hip stability. The author prefers to retain a well-fixed cup if it meets the following criteria: it is well-fixed to intra-operative testing, it is well-positioned, it is of sufficient size to allow insertion of a new liner with a reasonable head size, new liners are available, and the hip is stable to intra-operative trialing after liner insertion.

Contemporary cross-linked polyethylene bearings have shown promise at mid-term follow up in reducing the rate of clinically problematic osteolysis, however, longer-term follow-up is important to determine any significant clinical advantage.¹⁻³ Practically speaking, osteolysis remains a common reason for revision after total hip arthroplasty (THA), therefore, having effective treatment strategies is important. The goals of treating osteolysis are to arrest the process, debride the lesions, restore bone stock for the future and provide a new bearing surface. If the acetabular component is loose or malpositioned, then revision is indicated. For example, a cup with excessive verticality that has suffered premature failure of the bearing surface due to malposition should be revised, not treated with a bearing exchange (Figs 1 and 2). For osteolysis around a well-fixed and appropriately positioned cup, the decision-making process is not as straightforward. The purpose of this article is to review the pros and cons of cup retention *versus* revision in the setting of osteolysis around a well-fixed, un cemented acetabular component.

channels for lesional debridement.^{4,5} CT scanning also provides objective measurement of both acetabular and femoral component anteversion (which can be hard to judge intra-operatively), and thus may facilitate the decision to revise or retain a well-fixed shell if malposition is identified pre-operatively. Pre-operative medical evaluation as well as an infection work-up with appropriate serologies and selective aspiration is imperative. Obtaining the operative records from the implantation procedure can help correctly identify the component manufacturer so that a full complement of liner trials, liners, and femoral heads is available. It is important to note that one should never assume the operation will be a simple “poly and head exchange”. A full complement of revision components, both acetabular and femoral, should be available to handle unexpected findings or problems. Patients should be informed that many decisions regarding component retention or revision (or possibly resection) may need to be made intra-operatively.

Cup retention

Most of the advantages of cup retention are obvious. The procedure is relatively simple, and a reasonable amount of data exist to support the concept of lesional treatment in this setting. The cups appear to survive at mid-term follow-up, and the lesions tend to decrease in size.⁶⁻¹² Less pain, lower blood loss, shorter

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Pre-operative evaluation and preparation

Plain radiographs often underestimate the severity of osteolysis. Oblique radiographs (Judet) or CT scanning can help quantify the amount of osteolysis and identify access

Fig. 1

Radiograph showing osteolysis around a well-fixed but malpositioned cup. The hip had premature failure with severe osteolysis at six years post-operatively.

Fig. 3

Radiograph showing osteolysis around a well-fixed, well-positioned cup.

Fig. 2

Radiograph of the same hip after component revision to improve cup position and address osteolytic lesions.

Fig. 4

CT scan showing osteolytic lesions.

operating times and less cost are commonly cited benefits in comparison to revision. Lesions are typically debrided through screw holes or peripheral access channels. An injectable graft is typically chosen due to ease of flow into potentially cavernous defects. The new liner is inserted after trialing, and hip stability is confirmed. The new liner is either engaged into an intact locking mechanism or a new bearing cemented into place if the prior locking mechanism is either damaged or has a poor track record.

Potential drawbacks of cup retention include an inability to fine-tune the position of the cup, which may have implications

for hip stability. Small cup size is another potential drawback. New liners of sufficient thickness to allow a reasonable head size may not be available, especially for cups with a diameter < 50 mm. Hip instability is the most common complication after liner and head exchange (discussed later in this article), therefore, occasionally, revision of a well-fixed cup may be a reasonable choice to improve hip stability.¹³

Cup revision

Proponents of cup revision cite improved access to osteolytic lesions and better graft fill as potential advantages

Fig. 5

Sagittal CT image showing large osteolytic lesions.

Fig. 7

Intra-operative photograph demonstrating peripheral access channels available for lesional debridement. Angled curettes can be particularly useful for debridement.

Fig. 6

Intra-operative photograph showing a well-fixed cup. The lesion was debrided through the polar hole in the cup with curettes and angled suction tips.

Fig. 8

Post-operative radiograph after bone grafting and liner exchange.

over cup retention. A new, typically larger cup is implanted. This allows fine-tuning of cup position to improve stability, and affords access to a full line of modern bearing surfaces and head sizes. The larger cup may allow upsizing of the femoral head, which has advantages for hip stability. Additionally, a brand-new locking mechanism is used for the new bearing surface.

Potential drawbacks include increased cost, and the fact that removal of a well-fixed cup with large osteolytic defects can result in loss of bone stock, and a very challenging reconstruction to manage the resulting defects. One retrospective study demonstrated better cup survivorship when component revision was performed when compared

with component retention.¹⁴ Interestingly, the major reason for failure of cup retention strategies was instability, not cup loosening. This underscores the importance of obtaining a stable construct intra-operatively when deciding whether cup retention is appropriate.

Choice of graft material

No clear data exist regarding the preferred graft material, if any, for osteolytic lesions. As previously mentioned, cup

revision allows more complete lesion “fill” on post-operative CT scans, however, the clinical significance of lesion fill remains undefined. Some data exist that the lesions seem to decrease in size even without grafting.^{6,8,15} It is the author’s preference to use some sort of osteoconductive injectable graft. Further research is needed to determine if any particular grafting strategy offers any clinical long-term advantage.

Complications

The most common complication of isolated liner and femoral head exchange is dislocation.^{6,8,13} It is possible that the dissection necessary to allow full exposure of the acetabular component for new liner insertion “loosens” the soft-tissue tension of the hip. Additionally, it is likely that a full line of head and liner options are not available for older arthroplasties, leading to challenges in tensioning the soft tissues appropriately. These patients tend not to have much post-operative pain, therefore probably regain movement quickly, which can put the hip at risk for dislocation. There is probably a tendency for surgeons to accept cups that may be slightly malpositioned in order to avoid full revision. Also, head upsizing may not be possible with older, smaller cups. It is likely, therefore, that the reasons for the surprisingly high reported dislocation rates are multifactorial. This underscores the importance of obtaining a stable hip in the operating room after thorough trialing, and having a low threshold for component revision if stability cannot be obtained.

The role of constrained liners

Generally, constrained liners should be reserved for situations with absent abductors, or grossly attenuated soft tissues from multiple dislocations. If a cup-specific constrained liner is not available, then often one can be cemented into the existing cup. It is important to position the liner to avoid impingement on the femoral neck, and also to make sure that there is good “containment” of the new liner in the cup. If the cup is too small to accommodate a constrained liner, then the cup must be revised. Multiple screws should be used to stabilise a new revision cup if it is acutely constrained due to the increased stresses on the interfaces. It is important to realize that a constrained liner will not compensate for major cup malpositions. Additionally, not all constrained liners have performed equivalently, with certain designs (notably tripolar designs) outperforming locking ring types. Further research is needed to define the role of dual mobility designs for challenging hip stability problems.

Author’s preferred treatment

The author prefers to retain well-positioned, well-fixed cups and perform lesional treatment of osteolytic cavities by debriding them through screw holes or peripheral access channels. An injectable allograft putty is used to fill the defects (Figs 3 to 8). The cup is retained if the following criteria are met:

1. The cup is actually well-fixed when stressed in the operating room. All screws are removed and the cup is mechanically tested by manipulating its rim with a rongeur.
2. The cup is of adequate size to provide a new liner with a reasonable head size.
3. The cup is well-positioned. This is defined by pre-operative radiographs, and, more importantly, by careful intra-operative trialing.
4. The new liner is stable in the cup (the locking mechanism works), or a new liner can be cemented into the cup with good liner containment.
5. When the final femoral head is inserted and the hip trialed, the hip is stable.

If all these criteria are met, the cup is retained. The author recommends the use of a hip orthosis for six weeks post-operatively to minimise the risk of dislocation. Weight bearing is allowed to tolerance, and multi-modal thromboembolic prophylaxis is used.

Conclusions

The decision to retain or revise a well-fixed cup with osteolysis is based on many factors, most importantly position of the cup and stability of the hip. The surgeon must be prepared to perform a full revision if necessary. Understanding the pros and cons of revision *versus* retention is important to appropriately individualise decision-making for the patient. Further research is needed to determine if either retention or revision strategies have any long term advantage.

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