Cement-in-cement Acetabular Revision With a Constrained Tripolar Component

ANDREAS LEONIDOU, MRCS, MSC; JOSEPH PAGKALOS, MRCS, MSC; JONATHAN LUSCOMBE, FRCS

abstract

Full article available online at ORTHOSuperSite.com. Search: 20120123-25

Dislocation of a total hip replacement (THR) is common following total hip arthroplasty (THA). When nonoperative management fails to maintain reduction, revision surgery is considered. The use of constrained acetabular liners has been extensively described. Complete removal of the old cement mantle during revision THA can be challenging and is associated with significant complications. Cement-in-cement revision is an established technique. However, the available clinical and experimental studies focus on femoral stem revision. The purpose of this study was to present a case of cement-in-cement acetabular revision with a constrained component for recurrent dislocations and to investigate the current best evidence for this technique.

This article describes the case of a 74-year-old woman who underwent revision of a Charnley THR for recurrent low-energy dislocations. A tripolar constrained acetabular component was cemented over the primary cement mantle following removal of the original liner by reaming, roughening the surface, and thoroughly irrigating and drying the primary cement. Clinical and radiological results were good, with the Oxford Hip Score improving from 11 preoperatively to 24 at 6 months postoperatively.

The good short-term results of this case and the current clinical and biomechanical data encourage the use of the cement-in-cement technique for acetabular revision. Careful irrigation, drying, and roughening of the primary surface are necessary.
Dislocation of a total hip replacement (THR) is common. In primary total hip arthroplasty (THA), the incidence of dislocation ranges between 0.6% and 9.9%. In refractory cases and cases with component malposition, revision surgery may be necessary. It has been estimated that the rate of hip revision surgery in the United States will increase by 137% compared with the current ratio by 2030.

The predominant purpose of acetabular revision is to restore the anatomy and form a stable, long-lasting construct. Instability is a challenge of acetabular revision surgery because it has a multifactorial etiology, including underlying soft tissue destruction and muscle insufficiency. Inadequate soft tissue and bone stock contributes to dislocation in 15% to 30% of cases. Constrained acetabular liners achieve stability by holding the femoral head via a secure locking mechanism and have been extensively used for the revision of the acetabulum for recurrent dislocations.

During revision of a cemented THR, the complete removal of the old cement mantle can be considerably challenging and time consuming and can cause several complications, such as substantial blood loss, bone loss, and intraoperative fractures. Evidence from clinical and biomechanical studies supports the cement-in-cement revision technique. However, these studies focused on the femoral stem.

This article describes a case of cement-in-cement acetabular revision with a constrained component for recurrent dislocations and to review the evidence base for this technique.

**CASE REPORT**

A 74-year-old woman had bilateral Charnley THRs with cemented acetabular components. The right prosthesis was inserted with the Hardinge approach 20 years previously, and the left one 30 years previously. She had a history of well-controlled chronic obstructive pulmonary disease, ulcerative colitis, and psoriasis. The patient was not taking steroids or immunomodulating drugs. She lived alone and mobilized with 2 canes.

Twenty years after the primary procedure, the first anterolateral dislocation of the right THR occurred while the patient was walking. This was reduced under general anesthetic, and an abduction brace was fitted for 3 months. Four months following the first dislocation, the right THR further dislocated 3 times with low-energy activities. The last dislocation occurred in a hospital bed 3 days after manipulation and reduction of the THR.

Inflammatory markers were normal, no signs of sepsis existed, and the hip was unstable in multiple directions and dislocated in extension and 30° of external rotation during manipulation under anesthesia. Anteroposterior radiographs and image intensifier images and screening revealed that the acetabular component was severely worn eccentrically. No radiolucenties were noted in the Gruen zones of the bone–cement interface in the acetabular or femoral components (Figure 1).

To treat the multidirectional instability, we revised the acetabulum with a constrained cemented component. The hip joint was accessed through the posterior approach. The abductor muscles were significantly atrophic, and bare bone was seen at the attachment of the muscles on the greater trochanter.

Intraoperatively, we maintained the femoral stem because it was well fixed and positioned. Good access to the acetabulum was achieved. The cemented polyethylene acetabular insert was reamed, and the pieces were removed. The acetabular cement was further reamed and noted to be congruent. It was carefully washed and dried, and its surface was roughened. A Trident Constrained Acetabular Component (Stryker, Mahwah, New Jersey) was cemented onto the prepared cement mantle. The cement was mixed with gentamicin and applied at an early phase following mixing. The hip was stable to the extremes of movement after reduction. Routine closure was performed without drains.

Postoperatively, the patient underwent blood transfusion and received 3 units of blood. She made a good recovery and was discharged mobilizing full weight bearing with a walking frame.

At 6-month follow-up, the patient was fully weight bearing with 2 canes and almost pain free. Clinical and radiological results at 6 months were good, and radiographs were...
Cementing a constrained component onto a well-fixed preexisting mantle is an option when revising an acetabulum for recurrent dislocation. In our case, this produced good short-term clinical and radiological results. The possibility of retaining an intact cement mantle and performing a cement-in-cement revision was first identified by Greenwald et al. The authors tested the cement-in-cement interface with the application of shearing forces, and it was suggested that recementing over an old cement mantle is advisable if the surgeon removes all blood from the surface, roughens the primary cement, and applies the fresh cement at an early point after mixing.

The early application of low-viscosity cement was thought to promote integration between the old and fresh cement. Furthermore, Weinrauch et al suggested that the application and diffusion of fresh cement onto the old cement mantle could form new polymer chains at the new cement-in-cement interface.

Further biomechanical studies by Li et al have shown that the presence of even a thin layer of blood and marrow debris at the cement-in-cement interface decreased the strength of the bond up to 85% when tensile and shearing forces were applied. The authors challenged the value of cement-in-cement revision because a spotlessly clean drying of the primary surface are necessary, and it is a technically challenging procedure. Furthermore, surgeons need to confirm the suitability of the existing cement mantle to be retained preoperatively using imaging and intraoperatively.

Six clinical studies presenting case series of cement-in-cement femoral revision were published that showed satisfactory results. However, the mean follow-up in 5 series ranged from 2 to 5 years. The biggest case series was presented by Duncan et al and included 136 femoral revisions with a mean follow-up of 8 years. The authors reported good outcomes of this technique because none of the stems required a second revision for aseptic loosening.

No outcomes exist in the published literature for cement-in-cement acetabular revision. At the British Orthopaedic Association conference, Brogan et al presented their results of a series of 60 acetabular revisions with a minimum follow-up of 2 years. The majority of the revisions (80%) were performed for recurrent dislocations. One re-revision was performed for aseptic cup loosening, and the authors concluded that this technique could also be applied for acetabular revisions with good functional and radiological results.

CONCLUSION
To our knowledge, this is the first described case of a cement-in-cement acetabular revision with a constrained insert. The good short-term results of this case and the
current clinical and biomechanical data encourage the use of the cement-in-cement technique for acetabular revision. Careful irrigation, drying, and roughening of the primary surface are necessary. This technique requires the presence of a senior hip surgeon during the procedure. Further clinical and biomechanical studies focusing on the application of the cement-in-cement technique for acetabular revision are needed.

References


