Case Report

Bioball universal modular neck adapter as a salvage for failed revision total hip arthroplasty

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Abstract

Management of recurrent dislocation of total hip arthroplasty is often a challenging and daunting task. Re-revision of such a total hip prosthesis may not be easy as the removal of a well-fixed, fully coated stem is extremely difficult. We managed to salvage instability in three revision hip cases in which the fully coated stem had subsided by using a bioball universal neck adapter without changing the femoral stem or acetabular cup.

Key words: Failed arthroplasty, bioball, revision total hip

Introduction

The use of a fully coated stem is an option for revision total hip arthroplasty (THA), considering the scratch fit obtained by it in the diaphysis and later incorporation by bony in growth.[1,2] However, in the early postoperative period, this prosthesis may sometimes subside before adequate bone incorporation has taken place.[3-5] This subsidence of the femoral stem may be followed by later bone incorporation with the prosthesis in a sunken and/or rotated position. Short offset or incorrect version of the stem may lead to recurrent dislocations and failure of the revision THA. Re-revision of such a total hip prosthesis may not be easy as the removal of a well-fixed stem is extremely difficult and any vigorous attempt at its removal can lead to femoral shaft fracture. We managed to salvage three hips with subsidence of extensively porous coated cylindrical femoral stem (Solution System, Depuy International Ltd., UK) by using a modular neck extension called the bioball universal neck adapter (Merete, Germany). This alleviated the need to revise any component and the limb length and tissue tensioning were restored to normal.

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Case Reports

Case 1

A 70 year old female was operated for left femoral neck fracture with THA using metal on metal prosthesis (ASR). 1 year later she developed aseptic loosening and a peri-prosthetic fracture of the femur, which was revised with fully coated stem (Solution System, Depuy International Ltd., UK) and cerclage wires [Figure 1a]. Ten weeks after the surgery, on weight bearing, the stem subsided and the hip dislocated [Figure 1b]. Because maximum size of the femoral neck was already used in the first surgery, the acetabular liner was changed to a constrained liner. But, after 1 month of the surgery, the neck got dislodged from the stem [Figure 1c]. Version was found changed intraoperatively. This difficult hip with recurrent dislocation was salvaged using the bioball neck adapter and the version was restored. At 2 years followup, the fracture has united and the patient is pain free and mobile, with no further episode of dislocation [Figure 1d]. There was no thigh or trochanteric pain till the last followup.

Case 2

A 62 year old male had cemented THA for idiopathic avascular necrosis, but started to have progressively increasing pain and limping 3 months after the surgery. The X-rays confirmed early and severe osteolysis. This hip was revised by using a fully coated stem [Figure 2a]. The stem showed subsidence in 4 months time [Figure 2b], despite keeping the patient nonweight bearing for 2 months on crutches. It was managed successfully using the bioball adapter [Figure 2c], with no incidence of re-dislocation at

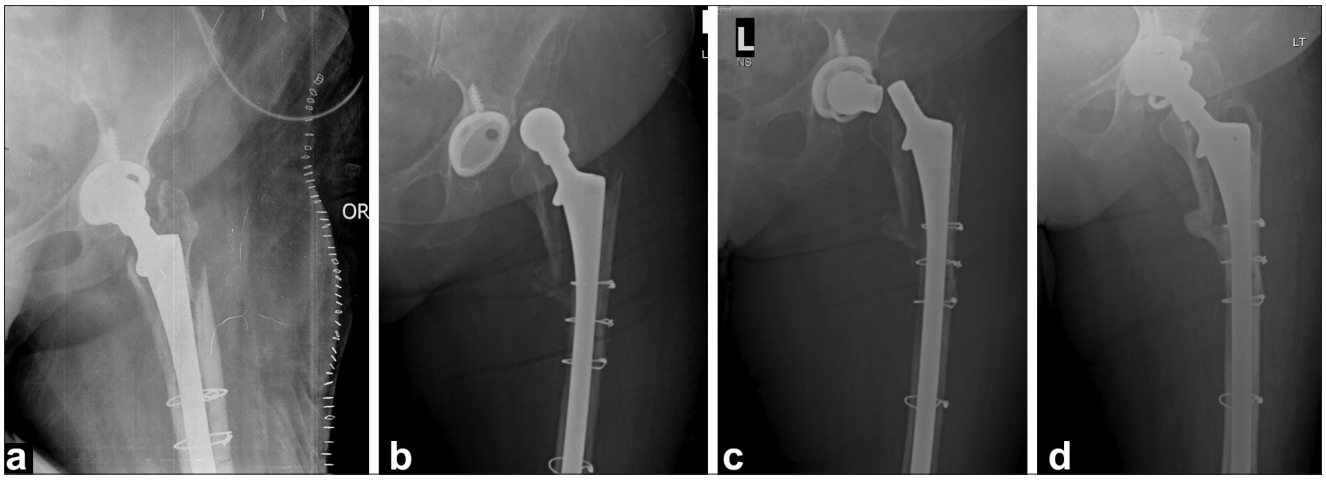

Figure 1: X-ray anteroposterior view of the left hip joint showing (a) revision total hip arthroplasty using a fully coated stem (b) stem subsidence and dislocation of hip (c) dislodgement of the neck from the stem (d) salvage using a bioball neck adapter.

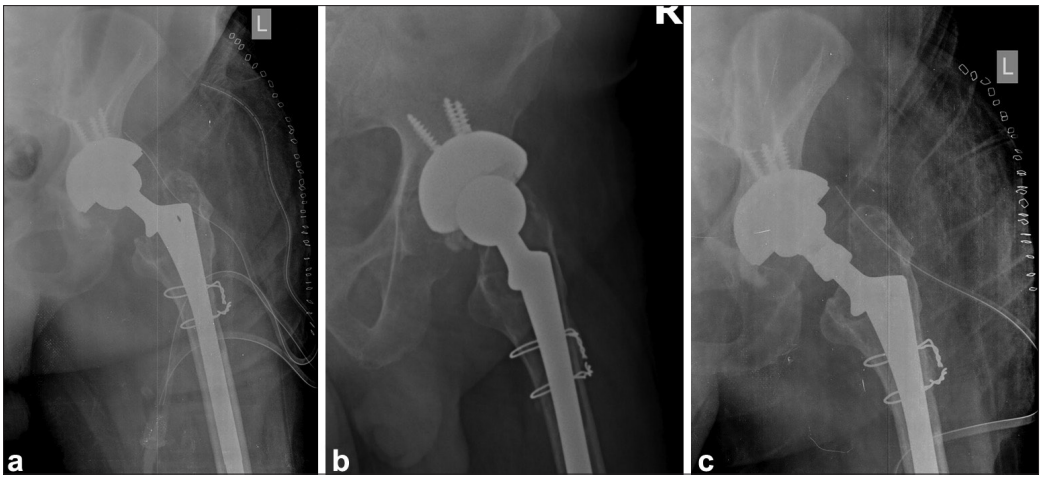

Figure 2: X-ray anteroposterior view of the left hip joint showing (a) Revision total hip arthroplasty using a fully coated femoral stem (b) Subsidence of the femoral stem (c) Re-revision with a bioball neck adapter

1.5 years followup. There was no trochanteric pain or thigh pain.

Case 3

A 35 year old male (ankylosing spondylitis) with bilateral hip involvement was operated elsewhere and had bilateral total hip replacement, but both the hips got infected. The infected implants were removed and the patient was left with a bilateral excision arthroplasty (Girdlestone's procedure). After a period of 1 year, after the infection had subsided, he was operated for left hybrid THA. While waiting for the right revision hip arthroplasty, he fractured his right femur after a trivial fall. He was operated on the right side and a revision total hip replacement was performed using the fully porous coated stem (Solution Depuy). After 3 months, when the patient was made to bear weight, the stem subsided and the patient developed a painful right hip. The pain was due to subsidence and instability as the patient could not bear weight on the affected side. The version was found to be changed intraoperatively. We managed to restore the hip biomechanics and restore the version using the bioball neck adapter. The patient has been under followup for 3 years now without any further incidence of instability.

Discussion

Extensively coated stems in revision arthroplasty have shown excellent mid-term results. Chung *et al*. in their study on Paprosky femoral type III defects in 96 femoral revisions achieved stable bony in-growth in 92 cases.[1] Jaya Kumar followed 56 revision arthroplasty cases using extensively porous coated femoral stem for 6 years. All implants demonstrated evidence of bony in-growth and stable fixation, with no cases of loosening, instability, deep infection, stress shielding, subsidence or osteolysis at last followup.[2] Moon *et al*. also showed similar results in 35 patients followed up for 77.5 months.[6] Kim *et al*. used fully porous coated stems with strut allografts in 54 hips followed for 10 years. Only

two hips showed aseptic loosening and had to be revised.[7] Similar results have been shown by Whiteside and Engh *et al*.[8,9] These authors have thus recommended the use of extensive coated stems in revision arthroplasty.

However, failure of adequate bone in-growth, fibrous in-growth or unstable implant may lead to subsidence. Weeden *et al*. followed 170 patients for a mean of 14.2 years and reported bone in-growth in 82% of the hips, stable fibrous fixation in 14% of the hips and 4% unstable hips. They concluded that failure of fixation correlated highly with extent of bone loss at the time of surgery.[3] Porous coated stems however have shown good mid-term results, but may have certain limitations. Zhao *et al*. reported prosthesis subsidence of 5 mm in one case and 7 mm in another case of 20 cases operated with fully porous coated stem and followed for 36 months.[4] The mean time to subsidence was 3.1 months in our cases. This raises a question on the optimal time to weight bearing after fixation with these fully coated cementless stems. We made our patients to weight bear not before 2 months, but still all three stems showed subsidence. The exact time to bear weight is not certain as there are no clinical or radiological parameters to guide the surgeon regarding bone in-growth in this initial period. Bone in-growth in the stem is also often not visible on plain X-rays. Fretting caused by micro-motion between the modular components may lead to particle and ion release to the surrounding tissues. Trunionosis may lead to peri-prosthetic bone loss and third body wear.[5] Only long-term studies can show the effect of the titanium ions released into the surrounding tissues. These coated stems cannot be used in femora with Paprosky type IIIB defects with diameter >19 mm or in type IV defects,[10] and intraoperative fractures are common with large diameter femoral stems.[11]

Although we found the modular neck stem system of bioball to be a great salvage procedure for difficult recurrent dislocation of THA, we believe that the long term outcomes of modular neck–stem connection still needs to be proven in more clinical studies as no previously published reports are available in the literature. The Bioball Adapter System (designed by Merete, a German Company and is distributed by WG Healthcare, UK) seems to be a safe, effective and least traumatic way to salvage instability in revision THA. It allows various alterations to neck length and offset [Figure 3] to enable a stable, simple and quick revision without the need for complicated and costly removal of the existing components. Thus, it allows a surgeon to manage unexpected surgical situations with a high degree of flexibility and precision. This innovative hip endo-prosthetic modular head system appears to be the only such available system at present that helps the surgeon to intraoperatively correct femoral stem malpositioning to minimize the risk

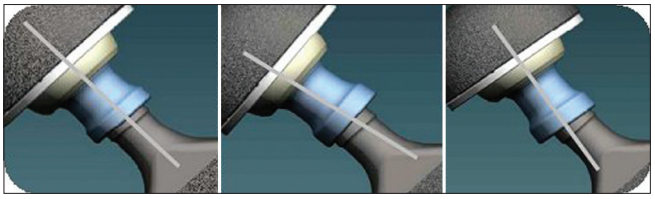

Figure 3: Bioball neck adapter system showing variable neck lengths and offsets

of dislocation. It is indicated for neck length equalization and antetorsion correction of the femoral hip stem during revision hip surgery. The main advantages of the bioball system are allowing precise adjustment of neck length, anteversion and offset of the well-fixed femoral component, with a simple instrumentation. The bioball adapters are made from TiAl6V4 according to ISO 5832-3. Regarding the risk of fracture, the bioball adapters are tested with merete hip stems according to ISO 7206-6, the testing standard for testing hip stem necks. All testings were successful. Bioball heads are available in 28 mm, 32 mm and 36 mm metal (vivium) and ceramic (zirconium oxide and Delta Ceramic) and it can give up to 21 mm extra neck length and has 7.5 degrees dialable offset. These can be used on an existing stem to switch to or from a ceramic head with the simple use of a single adapter, thereby avoiding full femoral revision and any unwanted cross-material contamination. A bioball adapter can fit a variety of tapers, including 12/14 and 14/16. The bioball universal neck adapter is perhaps one of the least traumatic ways to deal with the situation as there is no need to change any other component of the total hip system.

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