Early Intraprosthetic Dislocation of A Dual Mobility Acetabular Construct

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Abstract

The concept of a dual mobility cup has been in existence for more than 40 years, and was initially popularized in Europe. Only recently has it started to garner attention in the United States. Its design, consisting of a small femoral head articulating within a larger polyethylene insert which articulates with an outer shell, has found increasing use in patients at risk for post-operative dislocations. This case report describes a case of recurrent total hip arthroplasty dislocation managed with the implantation of a dual mobility cup with an acute intraprosthetic dislocation of the dual mobility construct.

Keywords: Dislocation; Total; Hip; Arthroplasty; Retentive failure; Intraprosthetic dislocation

Abbreviations: DM: Dual Mobility; THA: Total Hip Arthroplasty; ADM: Anatomic Dual Mobility; MDM: Modular Dual Mobility; CT: Computed Tomography; PE: Polyethylene

Introduction

Dislocations represent one of the more common postoperative complications seen after total hip arthroplasty (THA) with estimates ranging from 0.2 to 7% in primary cases and as high as 25% in revision surgeries [1]. In the early 1970s, Giles Bousquet developed a dual mobility (DM) acetabular cup with the goal of reducing dislocation rates. The dual mobility (DM) design consists of two articulations: a large diameter polyethylene articulation with a metal cup and a smaller articulation between a modular femoral head and the polyethylene liner [2]. In a dual mobility (DM) construct, when impingement of the smaller articulation occurs, additional range of motion is available through the articulation of the polyethylene liner within the metal cup. Thus, DM constructs increase the head-neck ratio, and also increase the jump distance; this effectively decreases the dislocation rate of total hip arthroplasty with this construct [3].

While introduced over 40 years ago in Europe, only recently has the dual mobility construct been introduced in the United States market. There are currently several different dual mobility constructs available in the United States to include the Anatomic Dual Mobility (ADM) (Stryker Orthopaedics, Mahwah, New Jersey) and Modular Dual Mobility (MDM) (Stryker Orthopaedics, Mahwah, New Jersey), the POLARCUP (Smith & Nephew, Memphis, Tennessee), and the Active Articulation (Biomet Orthopaedics, Warsaw, Indiana). Although the goal of these constructs is to reduce dislocation, there are a few reports in the literature which detail a unique complication - intraprosthetic dislocation. Intraprosthetic dislocation, also known as retentive failure, is a form of dislocation that occurs when the femoral head has dissociated from the mobile-bearing polyethylene liner often times causing the large polyethylene liner to be lodged in soft tissue. This is typically a medium to long term complication [3,4].

Case Report

A 52-year old woman underwent an uneventful left total hip arthroplasty through a posterior approach. This was complicated by four dislocations, managed with closed reductions, within six weeks of her surgery. She underwent an open revision of
her acetabular component with conversion to a dual mobility construct (Stryker, Mahwah, New Jersey). Five weeks after her revision procedure, her left leg was noted to be shorter than the contralateral leg four days after admission to an outside hospital for altered mental status. Radiographs confirmed a dislocation. A closed reduction was attempted in the operating room with resultant eccentric location of the femoral head in the acetabular component (Figure 1). She was transferred to our facility for definitive treatment. Computed tomography (CT) confirmed intraprosthetic dislocation with the polyethylene liner lodged in the gluteal tissue (Figures 2A & 2B).

Anteversion of the acetabular component was measured to be about 15 degrees. She was taken to the operating room with plan to revise her acetabular component to another Stryker dual mobility construct, but with an increase in the anteversion despite initial anteversion being “appropriate” on computed tomography imaging. Intraoperatively, the polyethylene (PE) liner was embedded in gluteal tissue as depicted on the CT. The abductors were intact. There was no impingement in extension and maximal external rotation (after implantation of new acetabular component in increased anteversion) when trialed with a conventional head/liner construct. A new DM construct was then implanted (Figures 3A & 3B) and recovery was uneventful.

**Discussion**

Intraprosthetic dislocation is usually a medium to late-term complication (3, 4). In these cases, it is thought to be secondary to wear at the liner/head interface decreasing the retaining power of the polyethylene liner and resulting in dislocation of the prosthetic head/polyethylene liner (4). There are only a few reports of early intraprosthetic dislocations in the literature. Banka et al reported one case of an early dislocation in a 70-year-old woman who underwent revision with a dual mobility cup after having recurrent dislocations. She suffered dislocation of her dual mobility (DM) cup, and radiographs showed eccentric placement of the femoral head within the cup. She ultimately underwent repeat revision surgery for implantation of a constrained liner [3]. Samona et al. [5] reported dislocation of a DM cup less than one year after implantation. The patient required closed reduction and subsequently underwent revision surgery for persistent pain and clicking symptoms. The polyethylene liner was found to be fragmented intraoperatively. These are the only two reported cases of dislocation within one year of surgery in the literature. Guyen et al. [6] reported two dislocations out of 54 patients with DM cups at a minimum follow-up of 2.2 years. This case could very well represent the earliest case of intraprosthetic dislocation in literature.

Indications for use of DM cups in the United States are evolving, but it is agreeable that they significantly decrease dislocation.
rates in patients at risk for increased dislocations. Tarasevicius et al. [7] reported dislocation rates in patients who underwent total hip arthroplasty (THA) for femoral neck fractures with conventional cups compared to DM cups. Conventional cups saw dislocations in 14.3% of patients, compared to no dislocations in the DM cup group. Adam et al reported three dislocations out of 214 patients who underwent total hip arthroplasty (THA) with a DM cup after sustaining a displaced femoral neck fracture [8]. In patients who underwent THA after resection of a hip tumor, the use of a DM cup led to lower rates of dislocation than reported in the literature [4]. In patients with cerebral palsy and resulting spasticity who underwent THA for osteoarthritis, Sanders et al. [9,10] reported a dislocation rate of zero percent at mean follow-up of 39 months, which was significantly lower than rates reported in the literature for similar patient populations.

Our patient’s initial revision was with a DM construct with acetabular component positioning within the so called “safe zone” of Lewinnek with anteversion of 15 +/- 10 degrees and inclination of 40 +/- 10 degrees [11]. However, it is now being accepted that majority of THA dislocations occur within the Lewinnek safe zone, and the ideal cup position for some patients may lie outside the safe zone [12]. Thus, at the time of re-revision, the decision was made to increase her anteversion out of the “safe zone.” This increase in the anteversion did not cause any intraoperative impingement with a conventional head/liner construct prior to implanting a DM construct.

Conclusion

Intraprosthetic dislocation is a rare occurrence and unique complication to DM constructs. It very rarely occurs in the acute post-operative period to our knowledge; this case report represents the earliest report of intraprosthetic dislocation in the literature. Care should be taken in reducing dislocated DM constructs so as not to cause intraprosthetic dislocations. Open revisions can be managed with revisions to another DM construct or to a constrained liner construct to maximize stability.

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