Early Intraprosthetic Dislocation of Dual-Mobility Total Hip Arthroplasty Implant Following Attempted Closed Reduction: A Case Report

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Introduction

Introduced in 1974 by Bousquet, the dual-mobility bearing for use in total hip arthroplasty (THA) confers increased jump distance and improved overall stability relative to conventional THA designs [1-3]. The dual-mobility bearing incorporates a relatively small (22-28mm) metal or ceramic femoral head press fit into a larger polyethylene liner which articulates with the acetabular component. Dissociation of the femoral head from the polyethylene liner (intraprosthetic dislocation) is a known late complication thought to be related to polyethylene liner wear and has been previously reported [2-7]. In a consecutive series of 384 primary THAs employing Bousquet’s original design, there were 14 intraprosthetic dislocations over 15 years (3.6%). The authors cited polyethylene wear as causative and mean time to intraprosthetic dislocation was 8.9 years [2].

A recent investigation by Hamadouche et al. reported a 2.4% rate of intraprosthetic dislocation among 168 consecutive primary THAs followed for a minimum of 5-years [5]. The dislocations occurred at a mean 5.9 years and were thought to be secondary to wear at the mobile insert. A case report from the UK describes an intraprosthetic dislocation of a dual mobility implant occurring 1.5 years after primary THA [8]. There have been no reports in North America of early intraprosthetic dislocation following use of dual mobility implants for primary THA.

Three recent case reports describe early (within 14 months) intraprosthetic dislocation of the dual mobility implants following attempted closed reduction of an ipsilateral hip dislocation [4,6-7]. The reports, however, concern patients in which the dual-mobility head was used in an off-label, mix-and-match fashion to revise an existing THA with retention of either the femoral stem [7] or acetabular cup [4,6].

We present a patient with intraprosthetic dislocation following attempted closed reduction of a primarily-implanted dual-mobility THA. To our knowledge, this is the first case of early intraprosthetic dislocation of a primary dual-mobility implant to be reported in North America. The purpose of the current report is to increase awareness of intraprosthetic dislocation and mitigate its risk by recommending that orthopaedic surgeons be involved with any attempted reduction of dual mobility implants.

Case Report

A sixty-seven-year-old man with a pertinent history of cerebral palsy (CP) presented to an outside hospital after a fall onto his left hip while attempting to rise from a chair. Prior to the fall, the patient was a community ambulator. Roentgenograms revealed a displaced, comminuted femoral neck fracture and the patient was transferred to a trauma
center for definitive management. The time of orthopaedic consult was twenty-four hours after original injury. Due to the timing and the patient’s pre-injury functional status, it was felt a total hip arthroplasty was most appropriate. Due to his history of CP, it was felt that use of a large head with dual mobility would minimize his risk of dislocation. The patient subsequently underwent primary total hip arthroplasty utilizing a posterior approach with implantation of a 56mm press-fit cobalt chrome acetabular shell in anatomic anteversion and a 28mm diameter ceramic femoral head with a 50mm polyethylene insert (Anatomic Dual-Mobility X3; Stryker, Mahwah, New Jersey) (Fig. 1). Grade 3-4 degenerative changes were found anteriorly and superiorly on femoral head. Additionally, two luque wires were placed proximal and distal to the lesser trochanter for fracture prophylaxis per surgeon’s routine for hip fracture patients undergoing arthroplasty. The polyethylene and ceramic head were assembled with implant-specific tools according to the manufacture’s specifications. The hip was noted to be stable intraoperatively with flexion to 90 degrees, adduction to 20 degrees and internal rotation to 80 degrees with no impingement or subluxation. Both the posterior capsule and short external rotators were repaired. The patient had an uneventful postoperative course and was discharged on hospital day 5.

On postoperative day 26, the patient presented to the emergency department with left hip pain and inability to bear weight subsequent to a fall out of bed onto his left hip. Imaging revealed a posterior dislocation of the left hip. On initial dislocation films the poly head can be visualized in place on the ceramic femoral head (Fig. 2). Emergency medicine physicians performed closed reduction under conscious sedation. Postreduction roentgenograms were read as normal. Retrospective review demonstrates an eccentrically located femoral head and a circular radiolucency overlying the left gluteal musculature (Fig. 3). The patient was discharged with instructions to bear weight as tolerated, limiting hip flexion to less than 70 degrees.

Six weeks after the index procedure, the patient again presented to the emergency department with left hip pain and inability to bear weight after attempting to get into a car. Plain imaging revealed a posterior hip dislocation with the prosthetic head superior and posterior to the acetabular component (Fig. 4). The patient underwent closed reduction under conscious sedation with subsequent relocation of the hip in the ER. Post-reduction films were notable for an eccentric position of the femoral head within the acetabular component in addition to a spherical lucency posterior to the acetabulum confirming an intraprosthetic dislocation (Fig. 5). The patient returned to the operating theater for revision THA. Intraoperatively, the polyethylene liner was

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Figure 1B

Figure 2: Anteroposterior pelvic film after initial dislocation. The poly head can be visualized in place on the ceramic femoral head.

Figure 3: Anteroposterior hip film after reduction. Note the eccentrically located femoral head and a circular radiolucency of poly head overlying the left gluteal musculature (identified by the arrow).

Figure 4: Anteroposterior hip film after reduction. Note the eccentrically located femoral head and a circular radiolucency of poly head overlying the left gluteal musculature (identified by the arrow).
identified within the gluteal musculature, completely dis-
sociated from the femoral head. A trial was done with ex-
isting components and the hip was found to be stable with
flexion to 90 degrees, adduction to 20 degrees, internal ro-
tation to 70 degrees, with no obvious component failure.
Due to concern for damage to the cobalt chrome acetabular
shell and ceramic head from articulation over the previous
weeks both the femoral head and acetabular components
were revised using a 58mm press-fit cobalt chrome acetab-
ular shell and 28mm outer diameter ceramic femoral head
with a 52mm polyethylene insert (Anatomic Dual-Mobili-
ity X3; Stryker, Mahwah, New Jersey). The CoCr shell was
placed with an additional 10 degrees of anteversion and
patient had a stable intraoperative exam. He tolerated the
procedure well but his postoperative course was compi-
lated by sigmoid volvulus. This resulted in an emergent
exploratory laparotomy, a prolonged course in the SICU
from which the patient did not recover, and ultimately the
death of the patient on post operative day 79 from the in-
dex procedure.

Discussion

This is the first case of early intraprosthetic dislocation
of a primary dual-mobility implant to be reported in North
America. Previous literature has suggested restricting the
use of dual-mobility components in primary THA only to
patients at increased risk for dislocation (i.e. patients >75
years of age, those with neuromuscular or cognitive dis-
orders, and patients having an ASA score ≥3) [9]. A dual
mobility implant was therefore chosen for this patient with
cerebral palsy who is at higher risk for dislocation. Our in-
stitution has flat cap pricing contracts and we occasionally
use this device in patients felt to have an increased risk of
instability.

The patient’s diagnosis of cerebral palsy is material to
the current discussion, as the risk of THA dislocation is
higher in patients with CP [10]. While there have been no
large case series analyzing the incidence of dual-mobility
THA dislocation in patients with cerebral palsy, a retro-
spective cohort of eight patients (10 hips) treated with du-
al-mobility designs reported no dislocations at an average

The posterior approach was utilized in this patient ac-
cording to the preference of the primary surgeon. An anteri-
or or anterior lateral approach can be considered in patients
with increased dislocation risk. However, in a retrospec-
tive review of 228 THA revisions in the Swedish Hip Ar-
throplasty Register using dual mobility implants 56% were
preformed through a posterior approach and there was no
increased incidence of dislocation in this cohort relative to
other approaches [12].

Philippot et al. recently postulated three mechanisms
of intraprosthetic dislocation after analysis of 81 such cas-
es from a series of 1960 primary dual-mobility THAs im-
planted between 1985 and 1998 [13]. Type I “pure” dislo-
cation results from wear of the polyethylene retentive rim
in an otherwise functional prosthesis; this accounted for
32% of cases. Type II was secondary to extrinsic blocking
of the polyethylene liner, for example, by arthrofibrosis or
heterotopic ossification; 51% of dislocations were classi-
fied as Type II. Finally, Type III was characterized by cup
loosening and accounted for 17% of intraprosthetic dislo-
cations. Notably, each of these mechanisms is a late comp-
lication with mean onset of 11, 8, and 9 years, respec-
tively.

In North America there are no randomized controlled
trials comparing the rate of dislocation among dual-mobili-
ty and conventional THA implants. A single non-random-
ized, retrospective study compared the rate of dislocation
of conventional THA and dual-mobility THAs implant-
ed primarily following femoral neck fracture. Among 98
primary THAs at one year there were no dislocations reported in the dual-mobility group compared with 8 of 56 (14%) of the conventional THAs [11]. Moreover, in a recent retrospective comparison of bipolar hemiarthroplasty and dual-mobility THA the authors reported a significantly increased incidence of dislocation among patients treated with bipolar hemiarthroplasty (14.6% vs. 4.5%) [15].

Analogous to the current case, intraprosthetic dislocation of bipolar hemiarthroplasty implants after attempted closed reduction has been described in the French literature [16]. In both cases bipolar hemiarthroplasty was utilized in treating displaced femoral neck fractures. The authors of this report postulate a “bottle-opener” effect where the cup engages the posterior acetabular rim and subsequent limb traction results in dislocation of the intraprosthetic joint. It is reasonable to conclude, although no biomechanical studies have been conducted to address this claim, that the “bottle-opener” effect would only be aggerated when the relatively smooth posterior acetabular rim is replaced with a metal acetabular component.

In contradistinction to postulated mechanisms of late intraprosthetic dislocation, the current case was likely a direct result of attempted closed reduction with subsequent impingement of the polyethylene head on the acetabular component. The aforementioned case report by Banzhof et al. describes this impingement mechanism leading to early intraprosthetic dislocation following attempted closed reduction [4].

We advise caution with any attempt at closed reduction of dual-mobility implants. In many communities emergency room physicians routinely perform closed reduction of dislocated total hips under sedation without consulting orthopaedics. For patients with a dual-mobility implant and THA dislocation, an orthopaedic surgeon should perform the reduction attempt under general anesthesia with complete muscle relaxation using fluoroscopy. Although an intraprosthetic dislocation could still occur in this setting the risk would be reduced, recognition of the complication immediate, and it would allow for an open reduction under the same anesthetic if required. We recommend advising patients with dual mobility implants that orthopaedic surgeons be involved with any attempted reduction in the event their total hip dislocates to mitigate the risk on an intraprosthetic dislocation. If similar case reports follow in the literature consideration should be made for advising patients with dual-mobility implants to have dislocations addressed in the manner described above.

References