



Case report

Complete 180-Degree Dislocation of a Rotating Platform after Closed Reduction for Mobile Bearing Spinout

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ABSTRACT

Rotating-platform total knee arthroplasty was designed to help decrease backside polyethylene wear and allow maximal conformity between the femoral and tibial components, but there have been multiple reports of dislocation and spinout of these implants. There are 4 case reports in the literature of knee dislocations with 180° rotation of the platform, 3 of which occurred during relocation attempts. This is only the second case in a posterior-stabilized mobile-bearing device. We present a case of complete 180° dislocation of a rotating platform after closed reduction in a posterior-stabilized total knee arthroplasty, with subsequent conversion to hinge knee arthroplasty.

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Introduction

Rotating-platform (RP) total knee arthroplasty (TKA) was developed originally to prolong implant survival, with an aim to decrease polyethylene wear. In the posterior-stabilized RP (PSRP) design, the femur and polyethylene liner rotate together [1]. An RP is necessary to achieve maximal flexion in a TKA. The improved posterior rollback during flexion seen in the PSRP device aims to increase the contact area between femoral and tibial components, increasing the range of motion and stability [1,2]. A recent longitudinal study by Manier et al. [1] evaluated the results of PSRP knee at 10–13 years, and they found the incidence of 180° spinout using the PSRP design to be 0%; however, at least one case study has been reported in the literature thus far [3].

A spinout, or rotational dislocation of the polyethylene insert, is a rare occurrence due to external rotation or valgus/varus stress with the knee in flexion [3]. Three case reports of 180° rotatory dislocation of the polyethylene component occurred during relocation of an RP device, with only one prior case in a PSRP device [3–5]. Here, we describe an instance of platform rotation after patellar dislocation in a PSRP implant knee. A patient with posterior

dislocation and bearing spinout who underwent RP TKA failed 2 attempts at closed reduction, and during revision arthroplasty, the patient was found to have a 180° rotation of the RP. This represents an extremely rare but important cause of recurrent instability in patients with RP spinout after closed reduction.

Case history

An 82-year-old female underwent primary posterior-stabilized (PS) TKA with an RP 3 years before presentation to our institution. She had an immediate patella dislocation after her index surgery, which was treated nonoperatively by her primary surgeon. Her medical history included atrial fibrillation with warfarin anticoagulation, non-insulin-dependent diabetes mellitus, hypertension, hyperlipidemia, and obesity (body mass index, 37). The patient and her family reported significant weakness in her extensor mechanism although her knee was not painful. Since her index procedure, the patient became a household ambulator and used a wheelchair for long distances.

Before her presentation to our emergency department, the patient noted an acute onset of atraumatic left knee pain while sleeping. On evaluation in the emergency department, the patient was in significant discomfort but neurovascularly intact. Laboratory analysis was notable for elevated international normalized ratio consistent with therapeutic warfarin medication for atrial

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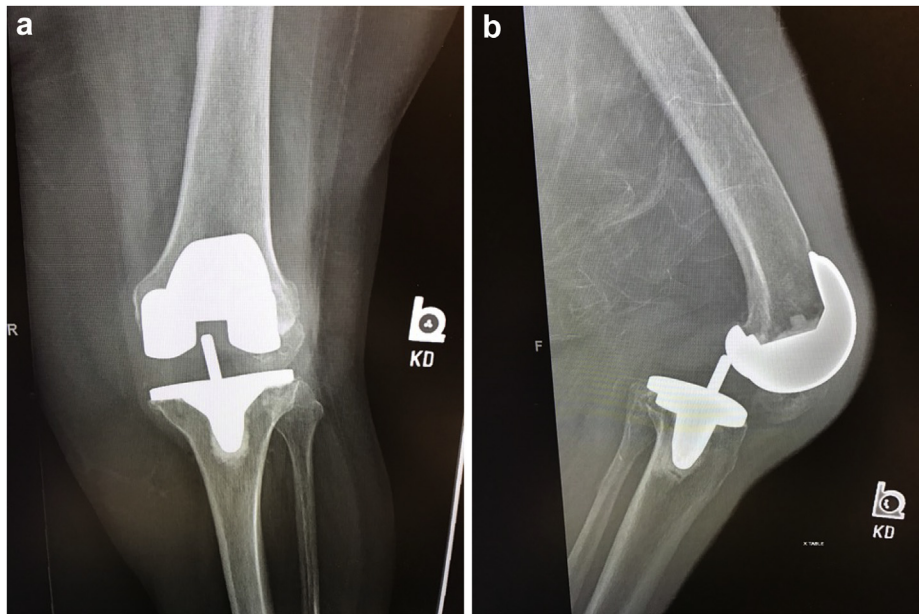


Figure 1. AP (a) and lateral (b) radiographs demonstrating a cemented left total knee arthroplasty posterior-stabilized rotating platform device, with both posterior and patellar dislocation.

fibrillation. Radiographs at that time demonstrated a posterior dislocation of her total knee with presumed bearing spinout (Fig. 1).

She was taken immediately to the operating room for closed reduction under conscious sedation pending medical optimization. Manual traction and manipulation of the RP was used to reduce the knee under fluoroscopy, and she was placed in a knee immobilizer. Postreduction radiographs demonstrated recurrent posterior dislocation (Fig. 2). She was admitted to a hospitalist service for medical management, and both services planned for a repeat attempt at closed reduction in the operating room with a plan to convert to a hinged prosthesis if needed to prevent recurrent instability. The following day, a second attempt at closed reduction

was made in the operating room under fluoroscopy at which point the knee was again noted to be unstable. The decision was made to convert to an open reduction.

A recreation of her midline medial parapatellar arthrotomy was performed, and open evaluation revealed the mobile polyethylene was in good condition but had rotated 180° on the tibial tray (Fig. 3). The patient's extensor mechanism was intact and able to be balanced with a lateral release. After open reduction of the knee, it was felt that the patient did not have adequate valgus/varus constraint even with a larger polyethylene, and with her chronic patella dislocation, it was felt this would best be addressed with revision to a hinged arthroplasty. She was successfully treated with

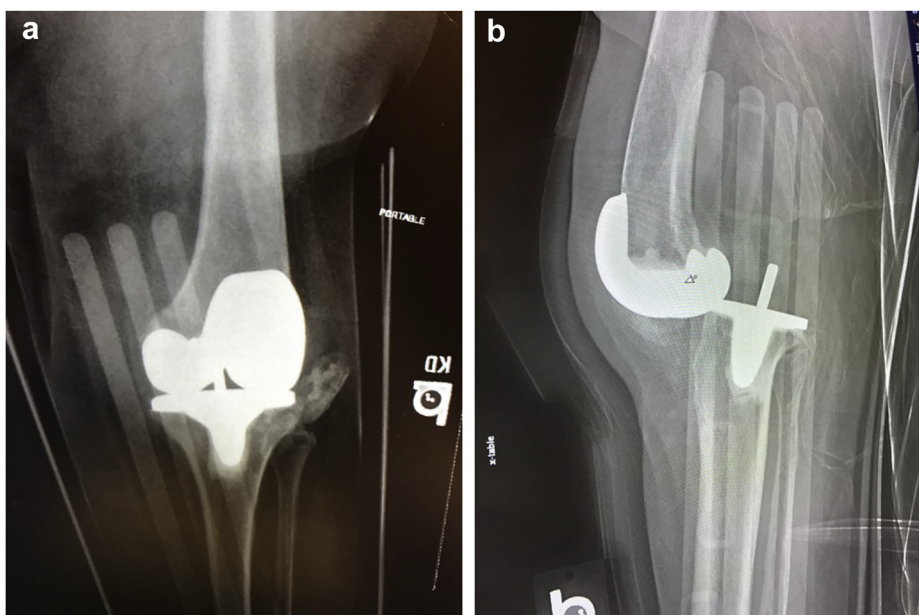


Figure 2. AP (a) and lateral (b) radiographs of left total knee arthroplasty after attempted closed reduction using manual traction and manipulation of the rotating platform under fluoroscopy. She was placed in a knee immobilizer. Postreduction radiographs demonstrating recurrent posterior dislocation.

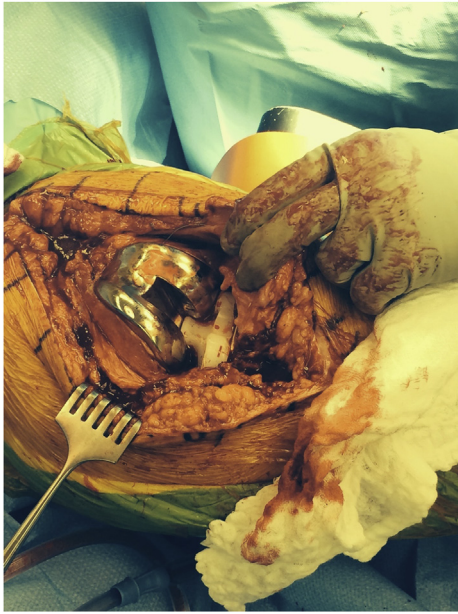


Figure 3. Intraoperative photograph of left total knee arthroplasty with the posterior aspect of the liner (white) facing anteriorly, indicating 180° rotation.

conversion to a hinge knee arthroplasty with medial retinaculum repair (Fig. 4).

The patient tolerated the procedure well and was discharged to skilled nursing on postoperative day 4. She was allowed to fully weight-bear with a straight leg brace during ambulation only and use of a walker for the first 6 weeks until she demonstrated her quadriceps were strong enough to prevent a fall using bilateral upper extremity support. She was transitioned to home at 6 weeks and began outpatient therapy, regaining her ability to ambulate with a walker without bracing. She completed 8 weeks of outpatient therapy and was then transitioned to a home maintenance program. The patient did well with no further falls or episodes, maintaining this ambulatory status for 1.5 years before dying from unrelated causes.

Discussion

The RP TKA was designed to help decrease backside polyethylene wear and allow maximal conformity between the femoral and tibial component [1,2]. There have been multiple reports of dislocation and spinout of these implants at various time intervals after the index procedure [3–6]. Spinout of RPs is most commonly due to flexion gap asymmetry or a tight posterior cruciate ligament [2]. Spinout can occur in high flexion as the posterior condyle of the femur moves posterior and the lateral portion of the RP dislocates anteriorly [2]. Currently, there are 4 case reports in the literature of knee dislocations with 180° rotation of the platform, with 3 occurring during relocation after spinout. The first report described in 2011 by Turki and Trick [4] occurred with a cruciate-retaining mobile-bearing device. The second case described in 2014 by Lee et al. [3] occurred with a PS mobile-bearing device. Two subsequent cases involving cruciate-retaining mobile-bearing devices have also been reported, one in which the initial event of dislocation may have occurred 6 years previously at the index procedure [5,6].

Thompson et al. previously identified various risk factors for dislocation of the RP, such as increased age, prior valgus malalignment, and patellectomy [7]. Prior patellectomy potentially increases the risk for spinout risk because of violation of the extensor mechanism incited by patella removal, compromising the anterior-posterior (AP) stability of the joint [7]. Our patient had experienced a prior patella dislocation immediately after her index surgery and was treated nonoperatively. This was reported by the surgeon who performed the index procedure to be from disruption of the arthrotomy such that the extensor mechanism was felt to be intact. The patient did, however, report significant extensor mechanism weakness since the incident. Technical considerations that could have led to this event in the index surgery would have included internal rotation of the femoral or tibial component, closing the retinaculum from the arthrotomy in extension, or excessive valgus alignment of the femur. The implants and alignment appeared to be in good position, suggesting the primary cause of this patella dislocation was a combination of retinaculum closure failure and excessive lateral tightness. The patient's chronic patella dislocation allowed for increased unchecked anterior translation, and we

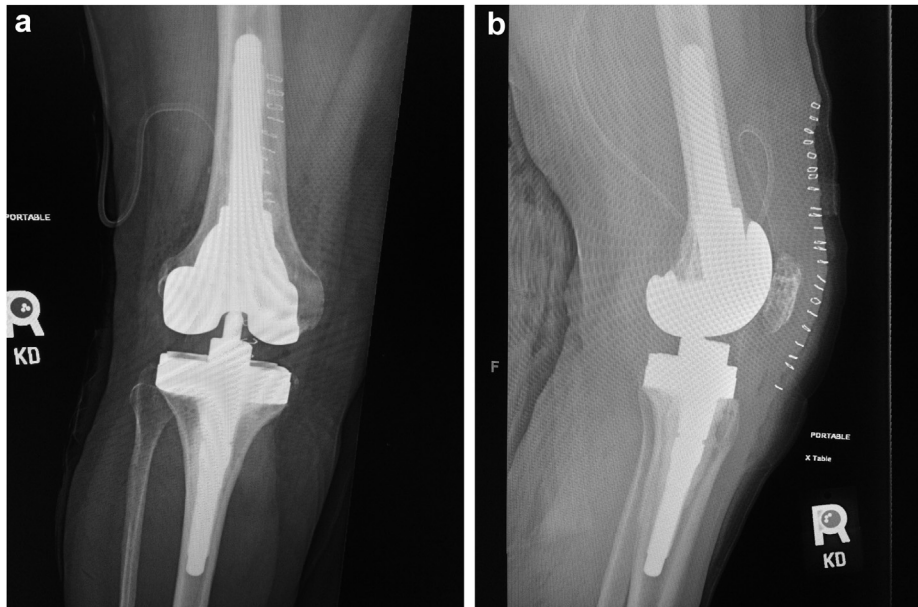


Figure 4. AP (a) and lateral (b) radiographs of the left knee after conversion to a hinge knee arthroplasty with medial retinaculum repair.

believe that the lack of a quadriceps moment arm through the patellofemoral joint contributed to the dissociation. This leads to the discussion of whether surgeons should treat patella dislocations that remain laterally subluxed operatively to prevent this occurrence.

Treatment of RP spinout with associated dislocation may initially consist of a trial of closed reduction, although we advise caution must be taken to ensure return of the polyethylene to its native position. Lee et al. [3] described an incidence of 180° rotation after an unsuccessful closed attempt at relocation and were able to achieve varus/valgus/AP stability and a full range of motion by increasing the size of the polyethylene component. During surgery, Lee et al. [3] recreated the rotation of the polyethylene insert by applying posterior force to the tibia while in valgus stress. This highlights the proposed mechanism of action: external rotation or valgus/varus stress with the knee flexed. The posterior dislocation in the case was attributed to a small widening of the flexion gap and valgus laxity [3]. We were not able to correct the malfunction surgically, as we found recurrent instability intraoperatively, and instead converted the patient to a hinged TKA with medial retinacular repair.

These cases of RP spinout all emphasize the need to pay particular attention to the AP and lateral knee radiographs to ensure proper relocation of the RP. Lee et al. used not only radiographs but also intraoperative arthrography to increase their visualization of the radiolucent polyethylene component [3]. Welborn and Friedman also point out that although patients typically present with acute pain and swelling after RP dislocation, it should not be ruled out as a cause of unexplained postoperative pain after TKA [6]. Patients may present with gradually increasing pain and a decreasing range of motion, once again enforcing the need for intense scrutiny of radiographs to evaluate for the position of the polyethylene component [6].

At the time of submission, the patient had unfortunately passed because of natural causes. The patient had consented for her unique case to be published in the medical literature and was proud to add to the body of knowledge surrounding TKA.

Summary

A patient who underwent PSRP TKA experienced a posterior dislocation of the knee and failed 2 attempts at closed reduction. The patient was found to have a 180° rotation of the RP, causing recurrent instability. This is a rare complication of the RP TKA, and there are only 2 case reports in the literature of 180° rotatory dislocation of RPs after reduction in PS devices. The displacement is thought to occur in high flexion as the posterior condyle of the femur, and the lateral portion of the RPs move in opposite directions, allowing the polyethylene platform to dislocate. Treatment may consist of a trial of closed reduction, but attention must be paid to postreduction radiographs to ensure the polyethylene is returned to its proper position. Consent was obtained from the family to publish on behalf of their mother.

Conflict of interest

The authors declare there are no conflicts of interest.

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