Case Report

90° Spinning of Polyethylene Inserts in Mobile Bearing Unicompartmental Knee Arthroplasty

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Keywords

Unicompartmental knee arthroplasty · Mobile bearing

Abstract

Background

The objective of this article is to describe for the first time a case of 90° spin out of a mobile bearing unicompartmental knee arthroplasty (UKA) polyethylene insert. In this report, we present a 57-year-old gentleman with a medial compartment UKA for osteoarthritis in 2017 who developed dislodgement and 90° rotation subsequent to traumatic injury when he was involved in a bus crash and impacted the anterolateral knee sustaining a valgus type injury 1 week postoperatively. Following the injury, he reported medial knee pain and a sensation of something moving within the joint. He was initially managed conservatively and progressed to full weight bearing; however, he experienced intermittent symptoms of catching and blocking of the joint, as well as medial knee swelling, that inhibited his ability to perform activities involving walking, kneeling, or pivoting. Imaging taken in 2018 show a 90° rotation of the polyethylene insert. These images showed the longitudinal metallic marker on the insert facing in an anteroposterior direction as opposed to the normal medial-lateral orientation. Failing conservative management, he presented to our clinic in 2019 and proceeded for revision of his UKA. Intraoperatively, his insert was reviewed and seen to easily spin on axis. The liner was therefore removed and upsized from a size 5 medium to a size 7 medium insert which provided excellent stability and stopped any further spinning. He has done tremendously well since the operation and reports full range of motion and no concerns. In patients with a history of pain, swelling, or locking following a UKA, it would be prudent to consider insert spinning, as well as the more common dislocation, through confirming the orientation of the metallic insert marker. Revision surgery to correct the spinning defect has proven effective with good resolution of symptoms and return to full range of motion.

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Introduction

Unicompartmental knee arthroplasty (UKA) has been a commonly performed knee surgery for arthritis since 1982 [1]. Implants can be either a fixed bearing polyethylene insert or a mobile bearing polyethylene insert with both having excellent survival at the 10-year mark [2–4]. Despite the similarity in survival statistics, there are important differences in complications that need to be considered which relate to the biomechanics of the prosthetic design.

A mobile insert acts to mimic the congruency afforded by the native meniscus throughout the entire range of motion. The rationale is to decrease friction through the inset leading to less polyethylene stress and therefore less wear of the insert overtime [1, 3]. This added design complexity leads to greater difficulty in prosthesis insertion and possibility of dislocation or spinning if the alignment is askew. Reported incidence of insert dislocation ranges from 0.6% to 4% and is typically either anterior, medial, or lateral within the joint capsule. Posterior dislocation is rare given the anterior lipping of the insert [5].

The fixed bearing model conveys a flatter tibial articular surface. This simpler design has the advantage of being technically easier to insert and no chance of dislocation. However, without the congruity of the mobile insert, there is greater point loading generated creating a problem with aseptic insert loosening and more wear and tear over time [6]. Despite these differences in design and complications, current research does not show any superiority with long-term functionality and patient satisfaction [2–4]. This case report reflects on our experience of a male with an Oxford medial mobile bearing UKA in which his polyethylene insert rotated 90° to face an anteroposterior (AP) direction, which to the best of our understanding is the first case described in the literature.

Case

A 57-year-old Caucasian male living in London with medial compartment osteoarthritis of the left knee underwent an Oxford medial compartment UKA in June 2017. His operation was performed through a medial patellar approach, and the implants inserted were an Oxford phase 3 medium femoral component, size E tibial component, and a size 5 tibial insert. He made an unremarkable postoperative recovery and was deemed to have made excellent progress with good mobility and stability.

About 1 week after discharge, our patient was standing on a bus when the brakes were slammed on, and his left knee was thrown into the front wall of the bus with an anterolateral force of impact. The bus was travelling at approximately 25–30 miles per hour at the time. He subsequently developed medial side left knee pain and the sensation of feeling something move within his knee. He experienced fluctuant knee swelling that was worst after prolonged periods of standing and a blocking sensation but no true locking. He presented to A&E where he was reassured that there was no bony injury on X-ray and the implants were still well positioned. He was reassured by a specialist on 2 separate occasions and was managed conservatively. He was able to partial weight bear initially and then progressed to full weight bearing; however, he was still limited in the range of activities he was able to perform – such as heavy labour, prolonged walking, and twisting motions – due to pain and swelling. In 2018, he moved back to New Zealand and presented to A&E here due to his ongoing symptoms. X-ray imaging completed at this time was reported as normal, however in fact shows a 90° rotation of the polyethylene liner (Fig. 1). He was subsequently discharged with the plan of continued conservative management.

Fig. 1. a, b AP and lateral imaging preoperatively showing 90° rotation of the polyethylene liner, note the anteroposterior direction of the metallic marker.

Fig. 2. a, b AP and lateral imaging preoperatively showing the polyethylene liner has rotated back into the correct position, note the mediolateral direction of the metallic marker.

He presented to our clinic for the first time in 2019 due to failure of his symptoms to improve with conservative management. On examination, he was tender to palpation along the medial joint line with a moderate effusion. He has mild posteromedial corner laxity, although a firm MCL endpoint, and on recurrent range of motion of the knee with meniscal provocation, there was audible clicking of the polyethylene implant. Diagnostic imaging completed the day prior to our clinic showed normal positioning of the polyethylene liner (Fig. 2).

He underwent revision surgery in 2019 using a standard medial parapatellar approach. The polyethylene insert was seen to be spinning and was replaced with a size 7 medium left Oxford polyethylene insert (Fig. 3). This gave excellent stability with a full range of motion.

Fig. 3. a, b Intraoperative images showing the polyethylene liner has spun out of place.

Fig. 4. a Postoperative imaging at 2 years showing correct positioning of the polyethylene liner, note the mediolateral direction of the metallic marker.

The patient made a good postoperative recovery and continues to do well at all his follow-up clinics with full range of motion. His imaging completed 2 years postoperative shows normal positioning of the liner (Fig. 4).

Discussion

Dislocation of the meniscal bearing liner is a common complication seen with a mobile UKA. The cause of the dislocation itself is typically as a result of malalignment of the prosthesis; however, injuries to the supporting structures surrounding the knee, such as the collateral ligaments, have been associated with an increased incidence of dislocation [1, 6, 7].

This case highlights another complication whereby the insert itself can spin 90° on its own axis rather than truly dislocate. Whilst there is no literature around this rare complication, there is a plausible argument to make that the risk factors would be the same as those for a true dislocation given they are both manifestations of the insert moving out of position. For this case, it is of our opinion that he sustained an injury to his MCL which subsequently dislodged the polyethylene liner and caused a degree of posteromedial laxity. This allowed the implant to continually spin in and out of position creating the fluctuating symptoms he was experiencing.

Interestingly, Lee et al. [8] reported 2 cases where the meniscal bearing liner rotated 180° without any history of trauma. The first case occurred 3 years after surgery, and the patient experienced intermittent swelling and discomfort. The second case occurred 5 years after surgery and involved spontaneous locking and knee pain that resolved with massage. In both cases, the lateral radiographs depicted the positioning of the radiographic marker being reversed. The former patient responded well to revision surgery with good resolution of symptoms while the latter declined revision surgery and reports only occasional episodes of discomfort at the 2-year follow-up [8].

Diagnosis of a spinning liner can prove challenging for 2 main reasons highlighted in our case. First, radiographic imaging requires a working understanding of the various components of the implant. The polyethylene liner is radiolucent and therefore can be easily overlooked on X-ray. For this reason, the inserts contain a radiopaque metallic marker that allows you to evaluate and hence deduce the positioning of the liner [5]. In our case, the X-ray was reported as normal given the tibial and femoral implants were correctly positioned and there was no bony injury. However, in retrospect, one can see the metallic marker was facing in an AP direction showing that the liner itself was out of position (Fig. 1). Second, as the insert is spinning on its own axis rather than being truly dislocated, it can relocate back into correct positioning leading to transient symptomology. This could prove problematic for a clinician examining a patient whose liner has spun back into the correct position leading to an unremarkable examination. Lee et al. [8] reflected on these 2 difficulties with diagnosis as their patients were relatively unburdened by symptoms and would have been missed had someone not picked up the displacement of the metallic marker in the lateral radiographs.

Management of a spinning insert requires revision surgery given the recurrent nature of the symptoms. For simple dislocations, a bearing replacement with an upsized insert is often sufficient treatment, and this approach could be extrapolated to a spinning insert [5]. In our case, a size 5 Oxford insert was upsized to a size 7 Oxford insert, and this was seen to show good implant stability and a full range of motion.

We recommend that the possibility of a spinning insert be considered when a patient presents with fluctuating symptoms of swelling, pain, and mechanical symptoms of catching, blocking, or locking. The positioning of the metallic marker must also be considered when evaluating the integrity of a UKA on X-ray, but even with apparently normal X-rays, this complication may exist. Revision surgery should be offered and resulted in good outcomes for our patient.

Statement of Ethics

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. As this was a case report, IRB approval was sought but deemed unnecessary as the single patient consented (and continues to consent) to involvement, negating the need for review board approval.

Conflict of Interest Statement

All authors declare no conflicts of interest or competing interests.

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Author Contributions

C.A.F. and D.C.K. contributed to conception or design of work. C.A.F. and D.C.K. contributed to acquisition, analysis, or interpretation of data for the work. C.A.F. and D.C.K. contributed to drafting of work or revising it critically for important intellectual content. C.A.F. and D.C.K. contributed to final approval of version to be published.

Data Availability Statement

All data generated or analysed during this study are included in this article. Further enquiries can be directed to the corresponding author.

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