Nontraumatic, Spontaneous Dislocation of Polyethylene Tibial Insert 1 Year After TKA

RUSSELL C. WRIGHT, BS; ANDREW CROUCH, BA; STEPHAN V. YACOUBIAN, MD; RAYMOND B. RAVAN, III, MD; YURI FALKINSTEIN, MD; SHAHAN V. YACOUBIAN, MD

The authors report a case of nontraumatic, spontaneous dislocation of a polyethylene insert detected 1 year after total knee arthroplasty. The patient demonstrated initial improvement and returned to work 4 months postoperatively. At 6 months postoperatively, the patient developed pain and a clunking sensation with motion; however, he denied any traumatic precipitating events. An arthroscopic procedure revealed arthrofibrotic formations but no signs of locking mechanism failure. At 12 months postoperatively, the patient developed sudden instability, and radiographs demonstrated an anteriorly dislodged insert. Revision surgery was performed, and the insert was removed. The insert showed some signs of fatigue due to the locking mechanism. We postulated that repetitive flexion produced an anterior superior force leading to failure of the locking mechanism.

Messrs Wright and Crouch, and Drs Yacoubian, Ravan, Falkinstein, and Yacoubian are from the Orthopaedic Surgery Specialists, Burbank, California.

Messrs Wright and Crouch, and Drs Yacoubian, Ravan, Falkinstein, and Yacoubian have no relevant financial relationships to disclose.

Correspondence should be addressed to: Russell C. Wright, BS, Orthopaedic Surgery Specialists, 2625 W. Alameda, Suite 116, Burbank, CA 91505 (russellc.wright@gmail.com).

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Figure: Anteroposterior (A) and lateral (B) radiographs of the knee obtained 1 week after primary total knee replacement demonstrating proper position of the implant.
Complications of total knee arthroplasty (TKA) include infection, loosening, osteolysis, peri-prosthetic fracture, catastrophic wear of polyethylene, patellar maltracking, and instability. The polyethylene tibial insert is subjected to stress and fatigue over time as a result of chronic use, which can lead to fracture or catastrophic failure of the insert. Displacement of the tibial insert from the tibial baseplate is a rare complication and is often the result of trauma. This case report details a nontraumatic, spontaneous dislocation of a tibial insert detected 1 year after a TKA.

CASE REPORT

A 67-year-old healthy female airline stewardess with varus osteoarthritis of the right knee elected to proceed with a TKA after failing conservative treatment measures. The patient was 65 inches tall, weighed 179 pounds, and had a body mass index of 29.78 kg/m^2. The TKA was performed via a medial parapatellar approach using the Advance Stature total knee system (Wright Medical Technology, Inc, Arlington, Tennessee). No complications were observed during the procedure, and postoperative radiographs demonstrated proper position of the implant (Figure 1).

The patient’s postoperative course was uncomplicated until approximately 4 months postoperatively, when she returned with concerns of clicking. Physical examination revealed mild clunking on the lateral border of the patella with range of motion (ROM). The clunking was considered to be possibly associated with fibrotic tissue developing around the patella that was getting caught in the patellofemoral joint. The patient was advised to continue quadriceps and hamstring strengthening exercises and was allowed to return to work.

The patient returned 6 months postoperatively stating that she had been doing well until recently, when she began having difficulty standing during long flights. She reported lateral pain and persistent clunking with activity. Her ROM at this time was full extension to 130° of flexion, with no clinical evidence of instability in extension or in flexion. It was assumed that scar tissue was interfering with the mechanics of the implant, and the patient elected to proceed with arthroscopic surgery, which was performed 1 week later.

Surgery revealed moderate amounts of fibrotic tissue in the lateral compartment and extensive fibrotic tissue in the medial compartment, which were debrided. The tibial polyethylene insert was visualized intraoperatively and noted to be properly seated. After the arthroscopic procedure, the patient returned to physical therapy and work. During subsequent follow-up examination, the clunking episodes stopped and the patient demonstrated clinical improvement and regained full strength and ROM.

Twelve months following the initial TKA, the patient presented with sudden onset of knee pain with instability. She did not recall any specific trauma that may have precipitated the events. The events increased in frequency to daily incidences in which the knee would give way. Radiographs obtained in the clinic demonstrated an anteriorly displaced polyethylene tibial insert (Figure 2). Failure of the polyethylene locking mechanism was suspected, and a right TKA revision was performed. The polyethylene insert was found to be dislodged anteriorly and was removed.

Signs of fatigue were visualized on the underside of the insert along the posterior aspect of the locking mechanism. No clear signs of wear or damage were observed on any other areas of the insert. Meticulous visual inspection of the femoral and tibial implant components demonstrated no signs of damage or loosening. A new insert was implanted and locked into the tibial base plate. Postoperative radiographs demonstrated proper positioning of the implant. The patient showed immediate clinical improvement and returned to work 10 weeks later. Currently, the patient is approximately 1 year post-revision surgery and has no clicking or instability of the knee.

DISCUSSION

The incidence of nontraumatic dislocation of tibial inserts following TKA is extremely low, with few accounts in the literature. The cause of such occurrences is not entirely understood, and to our knowledge this complication has not been previously reported with the Advance Stature polyethylene implant.

Improper surgical placement and traumatic failure of the locking mechanism are frequently alluded to as possible causes of the base plate. Postoperative radiographs demonstrated proper positioning of the implant.
insert dislodgement. Although trauma can result in damage and failure of the locking mechanism, no reported trauma or other precipitating event was reported in the current case. An improperly seated tibial insert can lead to increased strain on the locking mechanism and eventual failure. Improper surgical placement is not a probable cause in the current case due to the late onset of failure combined with the asymptomatic intervals experienced by the patient. In addition, proper placement of the implant was confirmed arthroscopically 5 months after the TKA.

Physiologic forces applied to the joint during deep flexion may have contributed to the failure of the locking mechanism observed in this case. The Advance Stature polyethylene insert is secured into the tibial tray during surgery by being slid posteriorly to engage the dove tail locking mechanism until it contacts the posterior lip of the tibial tray. Once the insert is completely in place, the anterior lip of the tibial tray prevents anterior dislocation. Theoretically, physiologic forces produced during flexion can push the insert anteriorly, in the opposite direction of its insertion.

At the time of failure, the insert was displaced anteriorly and the locking mechanism on the undersurface of the tibial insert showed fatigue with no other appreciable defects. It is possible that repetitive high-flexion motions associated with the patient’s occupation as a flight attendant may have caused the fatigue to the polyethylene insert’s locking mechanism and eventual disengagement, in the manner described.

Surgical intervention is typically indicated in cases of suspected polyethylene insert dislocation. Most accounts in the literature report successful treatment with replacement of the tibial insert alone. Anderson et al reported a case of recurrent insert dislocation and postulated that a defect of the tibial base plate may lead to recurrent insert dislodgment. Replacement of the tibial base plate in addition to the tibial insert was recommended if motion between the old base plate and the new insert was observed at the time of revision.

In the current case, no signs of damage or wear were observed on the tibial base plate or the femoral component at the time of revision. In the absence of damage or defect to the metallic components, we did not perceive any indication for replacement of these components. The new tibial polyethylene insert was seated without difficulty and confirmed to be secure.

The current case demonstrates the potential for failure of the polyethylene insert locking mechanism. Although dislodgment most likely occurred as a result of physiologic forces straining the insert’s locking mechanism, other etiologies to consider when evaluating insert dislodgment include defect of the locking mechanism, improper surgical placement, or trauma.

REFERENCES