

Case Report

Spontaneous Late Dissociation of the Tibial Insert After High-Flex Posterior-Stabilized Genesis II Total Knee Arthroplasty

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Abstract: We report a rare complication of spontaneous late dissociation of the tibial insert 2 years after total knee arthroplasty using a high-flex posterior-stabilized Genesis II prosthesis (Smith & Nephew, Memphis, Tenn). It appears that 2 factors may have contributed to dissociation, namely, incomplete seating of the insert and the design of the prosthesis, which involves a shallow anterior tab snap-fit locking mechanism and thin dovetail lips. **Keywords:** dissociation, Genesis II, polyethylene insert, total knee arthroplasty.
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Dissociation of the polyethylene insert from the tibial base plate is usually associated with mobile-bearing total knee arthroplasty (TKA) [1,2]. In contrast, tibial insert dissociation is extremely rare in fixed bearing TKA and has nearly always been associated with cruciate-retaining type prostheses [3]. Recently, 2 reports have described tibial insert dissociation after high-flex posterior-stabilized (PS) Genesis II TKA (Smith & Nephew, Memphis, Tenn) [4,5]. Collective features of those cases were early displacement, trauma, and tibial post damage.

The present report describes tibial insert dissociation after high-flex PS Genesis II TKA using a mini-midvastus approach. Unlike previous cases, this case involved late displacement (>2 years postoperatively), no trauma, and no post damage. The case was unusual in that although the displacement was late onset, it appeared to be due to implant misplacement. We also believe that the implant design may have contributed to dissociation.

Case Report

A 56-year-old woman with bilateral knee osteoarthritis underwent a right TKA using a high-flex PS Genesis II prosthesis with an oxidized zirconium femoral component. A mini-midvastus approach was used. The patella was resurfaced, and all components were fixed with cement. A 9-mm high-flex PS polyethylene insert was slid into the tibial baseplate until it engaged the locking mechanism. Medial and lateral aspects of the tibial baseplate were checked to confirm complete locking of the posterior dovetails. The postoperative course was uneventful, and the patient achieved a pain-free range of motion of 0° to 145° by 3 months postoperatively. Radiographs showed that all components were well fixed with the knee joint at 7° of valgus.

At 2 and a half years postoperatively, the patient complained of sudden onset right knee pain that had lasted for 1 month. There was no popping sound or clicking sensation. A physical examination was unremarkable; however, the range of motion was restricted to 0° to 125°. Plain radiographs revealed dissociation and anterior displacement of the tibial insert with no evidence of loosening of the femoral or tibial components (Fig. 1). Surgery was undertaken to change the polyethylene insert. At surgery, the insert was found to be completely dissociated from the tibial baseplate and displaced anteriorly. Examination of the retrieved insert revealed deformation of both the posteromedial and posterolateral dovetail lips, with the latter being more extensively damaged. Some deformation was evident on

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Fig. 1. Lateral radiograph showing anterior displacement of the dissociated polyethylene tibial insert.

the inferior surface of the anterior aspect of the insert, but the anterior locking mechanism was not damaged (Fig. 2A). The superior articular surface did not show any sign of wear, and no deformation of the post of the insert was noted (Fig. 2B). Intraoperative evaluation did not reveal any rotational abnormality or damage to the femoral component or the tibial baseplate. All components, including that attached to the patella, remained well fixed to bone. No impingement by osseous or soft tissue structures was evident, and the flexion-extension gap balance was acceptable. Therefore, a new 9-mm high-flex PS polyethylene implant was placed. Engagement of the locking mechanism and full seating of the insert into the tibial baseplate were confirmed by checking the medial and lateral dovetail mechanisms. The knee immediately regained a movement range of 0° to 140°. The patient recovered uneventfully and was discharged 1 week after the reoperation. At 2 weeks postoperatively, she was able to walk independently without any support. At the 22-month follow-up, the range of motion was 0° to 145°, and there were no complaints of pain or instability or further episodes of dissociation.

Discussion

The present report describes a rare case of insert dissociation after a PS-type TKA. A remarkable aspect of this case was that although dissociation appeared to be due to intraoperative misplacement, the symptoms did not present for over 2 years postoperatively.

A TKA tibial insert is primarily loaded with compression, and there is a relative absence of tensile forces acting between the insert and its baseplate [3]. For this reason, dissociation of a polyethylene insert from its metal tibial baseplate is rare, especially in fixed bearing TKA. There are few reports of insert dissociation after fixed bearing TKA, and they have involved cruciate-retaining prostheses [3,6,7]. Previous reports indicate there are 2 main reasons for dissociation of a fixed bearing insert after TKA: misplacement of the insert during surgery that can lead to early dissociation and ligament imbalance leading to locking mechanism failure due to excessive polyethylene wear that can lead to late dissociation [5,6,8].

There have been 2 recent reports describing tibial insert dissociation after high-flex PS Genesis II TKA. The case reported by Rutten and Janssen [5] involved trauma at 14 months after a conventional approach TKA. There were no abnormalities on the baseplate or femur component, nor was there wear on the articulating surface. However, the retrieved insert showed slight damage on the center of the posterior side, and a

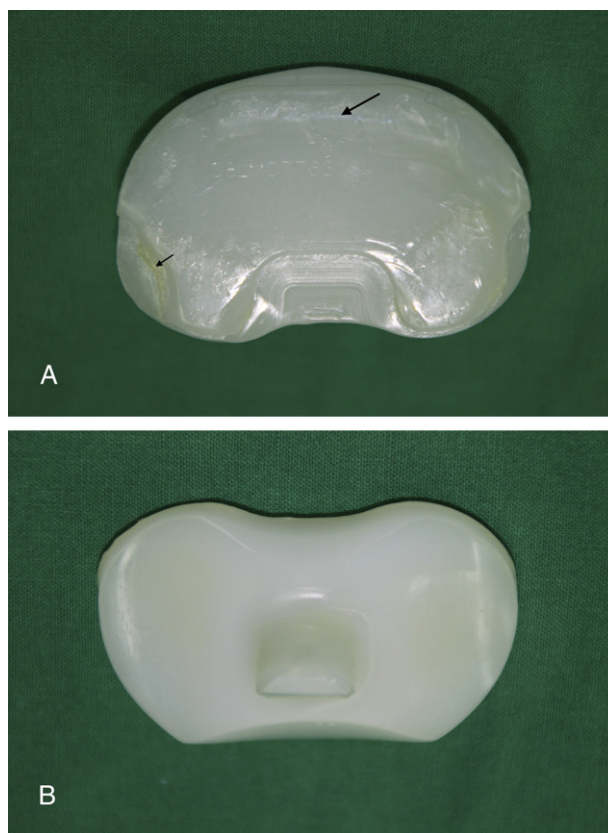


Fig. 2. A, View of the back side of the retrieved insert. Note the greater damage to the posterolateral dovetail lip (small arrow) than the posteromedial lip. Some deformation was also present on the anterior aspect (large arrow). B, The superior surface of the retrieved insert. Note the lack of any deformation on the articular surface, including the post.

critical review of the radiograph revealed an osteophyte on the posterior aspect of the femur. Those findings suggested that the dissociation was due to gradual posterior lift-off of the insert from the baseplate due to impingement of an osteophyte at the posterior femoral condyle on the posterior aspect of the insert with the knee in deep flexion. The second report of tibial insert dissociation after Genesis II TKA was by In et al [4], and that case involved a mini-subvastus approach and was unusual as the dissociation was recurring. Those 2 reported cases involved dissociation occurring approximately 1 month after either a first primary TKA or a second insert change, respectively. The latter authors postulated that limited exposure due to a mini-subvastus approach resulted in incomplete seating of the insert, which in turn lead to early dissociation. Furthermore, they believed that the use of a PS insert with a post may also have contributed to dissociation because strong lift-off forces during high flexion can damage the post of the insert. This opinion was supported by their observations that there were no further recurrent insert dissociations after conversion to a nonpost deep-dished insert and that the retrieved insert showed damage at the medial and lateral aspects of the insert post.

The current case differed from the 2 above cases. Unlike the case of Rutten and Janssen [5], there was no associated trauma, and unlike the case of In et al [4], the time interval between symptom onset and primary TKA was relatively long, and there was no tibial post damage in the retrieved insert. Although the retrieved polyethylene insert showed some chronic damage at the posterolateral dovetail lip, this does not prove that the insert was seated incorrectly. However, we describe the most likely clinical scenario, with reference to the existing literature and intraoperative findings, as follows. Intraoperatively, no rotational malpositioning or damage to the femoral component or tibial baseplate was observed. All components, including that attached to the patella, were strongly fixed to bone. In addition, no osseous or soft tissue impinged on components of the insert, and soft tissue balancing was good (the flexion-extension gap was rectangular). Therefore, we believe that the cause is likely to be incomplete seating of the tibial insert at the time of surgery, despite the present case involving late onset in nature. Firstly, it is our experience that when using a minimally invasive approach with sliding of the patella to the lateral side of the knee, the intraoperative task of confirming complete seating of the insert is difficult, both in verifying the locking mechanism of the dovetail lips as well as in ruling out soft tissue impingement. Secondly, examination of the retrieved insert showed that there was more damage to the posterolateral dovetail lip than the posteromedial lip, indicating that the incompletely seated posterolateral side of the insert toggled around

the completely seated posteromedial lip as a pivot. Finally, there was no definite trauma history, which could lead to ligament laxity, which is considered the usual trigger of late insert dissociation [7,8].

The design of the high-flex PS Genesis II prosthesis might also have contributed to the polyethylene insert dissociation. We believe that the anterior tab snap-fit locking mechanism is too shallow. With the knee flexed, downward force on the posterior half of the polyethylene insert causes anterior lift-off of the tibial component. If the insert was not seated completely into the tibial metal tray, the insert would tend to lift off the tray. The shallowness of the anterior tab would facilitate a transition from initial lift-off to complete dissociation (of the insert) from the tibial component. In addition, inserts retrieved in all instances of dissociation (of this particular insert design) to date, including the insert of the present case report, showed significant deformation of the dovetail lips. This suggests that these lips, which are very thin, are susceptible to damage. We postulate that after any part of the insert becomes deformed, for whatever reason, the resultant micromotion causes progressive wear of the dovetail lips, leading to eventual failure of the locking mechanism. The thin posterior dovetail lip also prevents the surgeon from confirming whether the polyethylene insert is correctly seated on the tibial baseplate without soft tissue impingement. The combination of a shallow anterior tab snap-fit locking mechanism and thin dovetail lips may explain why this design is more prone to insert dissociation.

In conclusion, the present findings demonstrate that, although late dissociation of a tibial insert is extremely rare if the fixed PS insert type is used, this complication can occur after TKA even when soft tissue balancing is acceptable and there is no impingement of the insert on soft tissue or osseous structures.

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