# Persistent knee instability following revision total knee arthroplasty

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## ABSTRACT

**Instability is an important cause of failure following total knee arthroplasty (TKA). Knee stability needs to be optimal in both the coronal and sagittal planes. We describe failed revision TKA with persistent deformity and instability secondary to a deficient medial collateral ligament in a 71-year-old Chinese woman. Revision knee arthroplasty using constrained implants was performed on her with good result. During both primary and revision TKA, assessment of knee stability is critical. Constrained prosthesis would need to be considered when there is significant ligamentous deficiency.**


**Keywords: arthroplasty, knee instability, revision knee arthroplasty, total knee arthroplasty**

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## INTRODUCTION

Primary total knee arthroplasty (TKA) has a survivorship to aseptic loosening of as much as 93%–97% at 20–23 years after surgery. Reports on the results of revision TKA have shown reoperation rates ranging from 8% to 19%.[1] Reasons cited for revision TKA have included sepsis, loosening, instability, extensor mechanism problems, fractures of bone or prosthetic components and wear. We describe a case of persistent valgus knee deformity and instability following the patient's first revision TKA.

## CASE REPORT

A 71-year-old Chinese woman, with a previous history of right TKA performed six years ago for valgus knee, was referred to our institution complaining of persistent right knee pain and deformity. She indicated that she had a revision knee surgery performed to correct her persistent right knee deformity a few months after her primary knee surgery, with upsizing of the polyethylene insert. She said that her knee deformity had persisted even after the revision surgery (Figs. 1a & b), and she now complained of severe right knee pain, instability and valgus deformity. Clinical examination revealed that the range of motion of her right knee was 20°–80°, with a 40° valgus deformity and deficient right medial collateral ligament. Her bilateral lower limb pulses were well felt. She had normal rheumatoid factor, C-reactive protein and erythrocyte sedimentation rate.

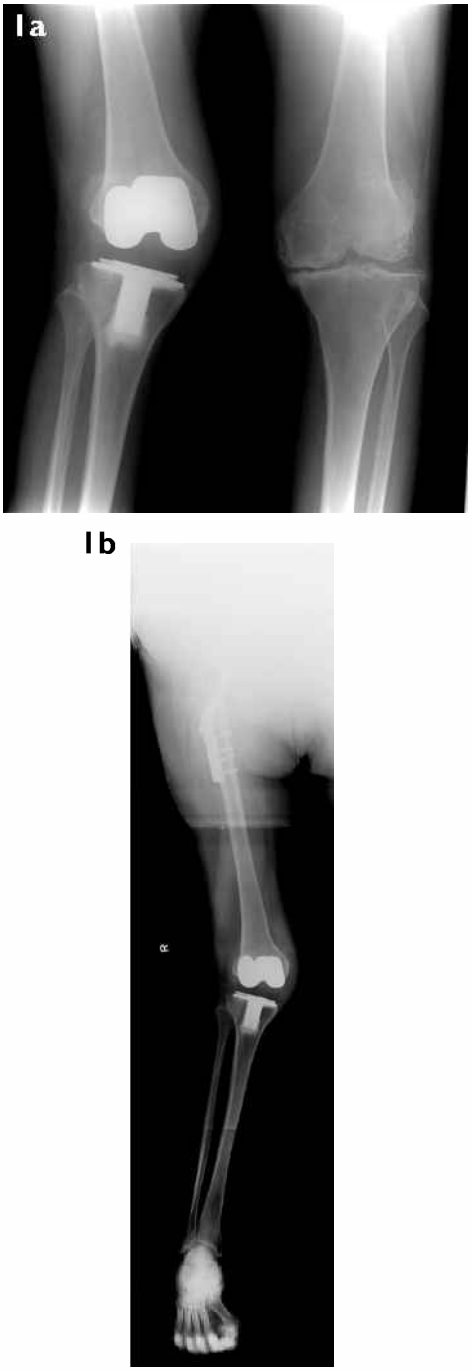


**Fig. 1** (a) Bilateral anteroposterior knee radiograph shows severe right knee valgus deformity. (b) Right leg long film radiograph shows severe valgus knee deformity.

Revision knee arthroplasty was performed for her in our institution in May 2006. Both the femoral and

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**Fig. 2** Bilateral anteroposterior knee radiograph taken postoperation shows correction of severe right knee valgus deformity.

**Fig. 3** Intraoperative photograph shows tibia polyethylene post indentation.

tibial components were relatively loose. There were no features of infection and all tissue specimens were negative for microbial cultures. There was significant medial collateral ligament attrition and this necessitated the use of a constrained-condylar knee prosthesis (Zimmer, Warsaw) (Fig. 2). Intraoperative assessment of knee stability in both coronal and sagital planes was satisfactory. At 12 months following her revision TKA, she was ambulating independently with no complaints of knee pain or instability. Her knee range of motion was from 0° to 120°. There were no clinical features of either mediolateral or anteroposterior instability.

Analysis of the retrieved TKA components was done. There was significant polyethylene indentation and this was more significant on the lateral side (Fig. 3). It is probable that during her first revision surgery, the medial collateral ligament deficiency was not addressed using either a constrained prosthesis or medial collateral ligament soft tissue augmentation. This resulted in persistent mediolateral instability, resulting in progressive polyethylene deformation. The mediolateral forces were probably also transferred to the bone-metal interfaces, thus facilitating eventual component loosening.

## DISCUSSION

Most primary TKAs are performed for knees without substantial deformity or the need for difficult ligament balancing. In these cases, either a posterior-stabilised or a posterior cruciate retaining design is appropriate. In certain situations, such as patients with substantial deformities, a posterior-stabilised knee may be favoured. Instability occurs when the available soft-tissue structures, articular design and limb alignment are unable to provide the stability necessary for adequate function in the presence of stresses transmitted across the knee joint. Instability may be the result of generalised soft-tissue laxity, inadequate flexion/extension gap balancing, improper component position or alignment, or ligamentous insufficiency. Such instability may occur in any plane, and in such instances, consideration must be given to increase the constraint in the TKA.

Constraint is defined as the effect of the elements of knee implant design that provides the stability needed to counteract forces about the knee after arthroplasty in the presence of a deficient soft-tissue envelope. Treatment options for persistent knee instability following TKA include revision to a thicker, more conforming polyethylene insert, revision to posterior-cruciate-substituting components (in cruciate-retaining knee), revision to varus-valgus constrained components, or even to hinged implants with or without ligamentous reconstruction. Increasing component constraint may reduce instability, but doing so also can cause increased forces to be transmitted to both fixation and implant interfaces, which can lead to premature aseptic loosening. The increased stresses can also result in increased backside polyethylene wear in modular tibial components, and ultimately to implant failure. Most authors therefore recommend using the least amount of implant constraint necessary to achieve a satisfactory result.[2]

A thicker insert increases the space between the tibial and femoral components and thus tightens the collateral ligaments, thereby enhancing the stability of the joint. During the first revision knee arthroplasty of our patient, she had revision knee with a thicker polyethylene insert. A thicker insert, however, cannot compensate for insufficiency of the collateral ligaments or for unequal flexion and extension spaces. Furthermore, the joint line is abnormally raised. Pagnano et al reported on patients with flexion instability, three of whom were managed

with replacement of the polyethylene liner with one of a thicker size. Two of these inserts failed and were re-revised because of pain and recurrence of instability.[3] Engh reported on eight patients with flexion instability who were managed with placement of a thicker tibial insert. Only four knees were stabilised, and one knee was re-revised.[4] Treatment of instability by simple insert exchange yields unpredictable results. The surgeon should have a clear understanding of the type and cause of instability and should use the appropriate constrained implant for each knee.[5]

With their large posts, varus-valgus constrained implants typically are reserved for patients with substantial coronal plane instability, which is difficult to balance with a posterior-stabilised or cruciate-retaining implant alone. A posterior-stabilised knee with medial soft-tissue augmentation using allograft tissue could have been considered in our patient. However, the potential problem with this approach would have been failure of soft tissue to osseous integration, which would have led to recurrent instability. Thus, a varus-valgus constrained implant was used. The patient declined for the option of additional soft-tissue augmentation using allograft tissue, due to the possible risk of disease transmission.

Despite substantial progress during the past three decades in component design, surgical technique, and prevention of infection, patients who require revision TKA remain at substantial risk of having one or more problems for which they require a reoperation.[1] Both in primary and revision TKA, soft-tissue balancing must be meticulous to optimise long-term component survivorship. When the available soft tissue envelope is significantly compromised, consideration must be given for increasing the constraint in the TKA construct.

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