

## Factors affecting polyethylene wear in total knee arthroplasty

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A complication of total knee arthroplasty (TKA) is fatigue-type wear, which can destroy a tibial inlay in <10 years. This deleterious wear mechanism occurs during cyclic loading if the yield stress of polyethylene is exceeded. Because increased stress on and within the polyethylene inlay is associated with increased wear, it is important to reduce the inlay stress by either activity restrictions or conformity changes of design. All stress parameters are more sensitive to conformity changes (eg, design changes) than to load changes (eg, activity restrictions). However, the reduction of stress on and within the polyethylene through increased conformity will increase the stress at the tibial fixation interfaces. An attempt was made to solve this problem with the introduction of mobile-bearing designs. Many mobile-bearing designs exist with good long-term results. One important difference among the various designs is the amount of flexion range with full conformity between the femoral component and the tibial inlay. Although a single radius design reduces polyethylene stress throughout the flexion range, it may be disadvantageous for a revision design to intraoperatively adapt to different degrees of constraint. Aseptic loosening and osteolysis due to small abrasive and adhesive wear particles have also been reported as a cause of failure. The design and material parameters affecting polyethylene wear in TKAs, as well as the potential detrimental effects of wear particle size, are the key issues in defining the life of a TKA.

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