



## A Novel System for Determining Clinically Relevant Loosening of Total Knee Arthroplasty Components

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**Introduction:** There is limited data on evaluating loosening in total knee arthroplasty (TKA) and the significance of radiolucent lines on radiographs. The Knee Society's Roetgenographic Evaluation System (KSRES) was developed when osteolysis, rather than implant debonding, was the most common mechanism for aseptic loosening. We sought to determine the sensitivity, specificity, and reliability of the KSRES system compared to a novel rating system to evaluate loosening in contemporary TKA.

**Methods:** We retrospectively reviewed fluoroscopically enhanced images of 48 patients that underwent revision TKA. 21 patients were revised for aseptic loosening and 27 patients for other indications. Images were randomized and 2 reviewers independently used the KSRES to calculate a numerical score based on millimeters of radiolucent lines at implant interfaces; each tibial implant was non-concerning, concerning, or impending failure. Images were again randomized and reviewers analyzed the images with a new system. Evaluating both the AP and Lateral radiograph, the percent involvement of the tibial implant interface of any lucent line was determined and categorized as non-concerning (<10%), concerning (10-25%), impending failure (>25%). We compared the specificity, sensitivity, and interobserver reliability.

**Results:** For the KSRES, the mean sensitivity for determining tibial component impending failure was 6% and mean specificity for identifying non-concerning implants was 96%. The interobserver reliability of grouping tibial components into each category was 73% (kappa=0.50). The new system significantly increased the sensitivity to 88% (p=0.005) while maintaining a specificity of 95% (p =0.9). Interobserver reliability increased to 90% (kappa=0.79).

**Conclusions:** In the modern era of debonding as a primary cause of TKA aseptic loosening, the KSRES significantly underestimates implant loosening. The new system described here demonstrated excellent sensitivity, specificity, and reliability for determining clinical loosening of tibial implants. Radiolucent lines involving 25% of the implant interface is a strong predictor for identifying implants at risk for failure.