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Tibia Component Under-Sizing Is Related To High Degrees Of Migration In Cementless TKA.

- 111 Patients With Cementless Tibia Components, RSA Data, Blinded X-Ray Assessments And Two Years Follow-Up.

REGION H

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Background

Cementless fixation of tibia components components mostly reserved for younger patients with high physical demands and good bone quality. The technique is bone sparring and eliminates the risk risk of late bone resorbtion at the bone cement interphase. Radiostereometric analysis (RSA) studies have shown that continuous migration of tibia components can predict aseptic loosening after total knee replacement (TKA).
Previous RSA studies have found the predominant direction of migration of cementless tibia components occur as subsidence (negative Y-translation) and posterior tilt (negative x-rotation) (figure 1).

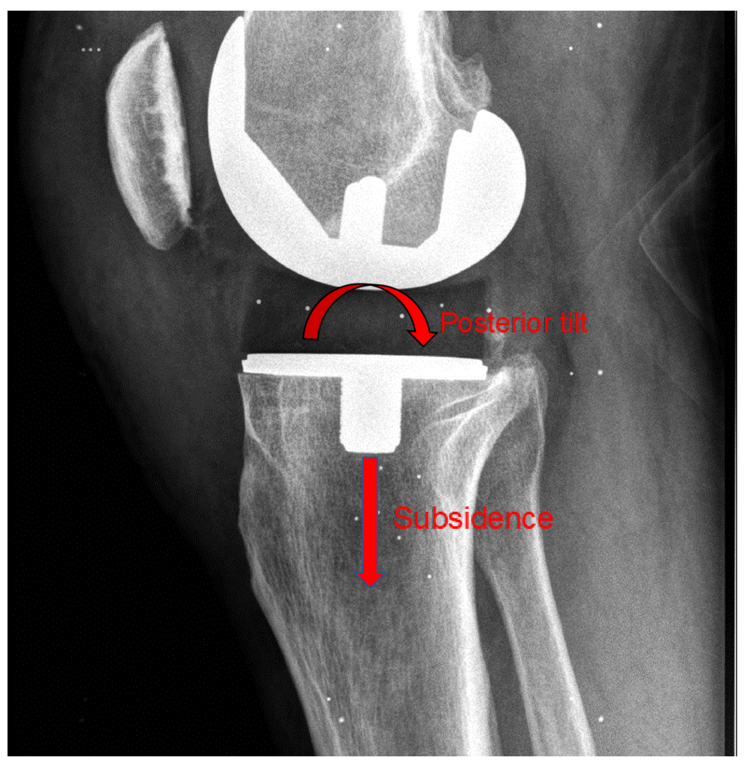


Fig 1. X-ray of cementless TKA. Arrows indicate the predominant migration directions of cementless tibia component. Curved arrow: Posterior tilt. Straight arrow: Subsidence.

In this study we investigated if accurate size and placement of cementless tibia components, is related to the degree of migration evaluated objectively using RSA measurements.

Methods and materials

We included 111 patients who underwent cementless TKA due to primary osteoarthritis and had completed two-year follow up with RSA data. Patients received either, the Vanguard® Porous Plasma Spray (Biomet Inc., Warsaw, Indiana, USA), the Vanguard® Regenerex (Biomet Inc., Warsaw, Indiana, USA) or the monoblock or modular version of the Nexgen® Cruciate Retaining Trabecular Metal Technology (Zimmer, Warsaw, Indiana, USA) uncemented tibia component. All patients received cruciate retaining cementless femur components, and patella resurfacing with cemented all-poly patella components. All operations were performed, by experienced knee surgeons, at the Department of Orthopedics, Clinic for Knee and Hip Replacement Herlev-Gentofte Hospital or Hørsholm Knee Clinic.

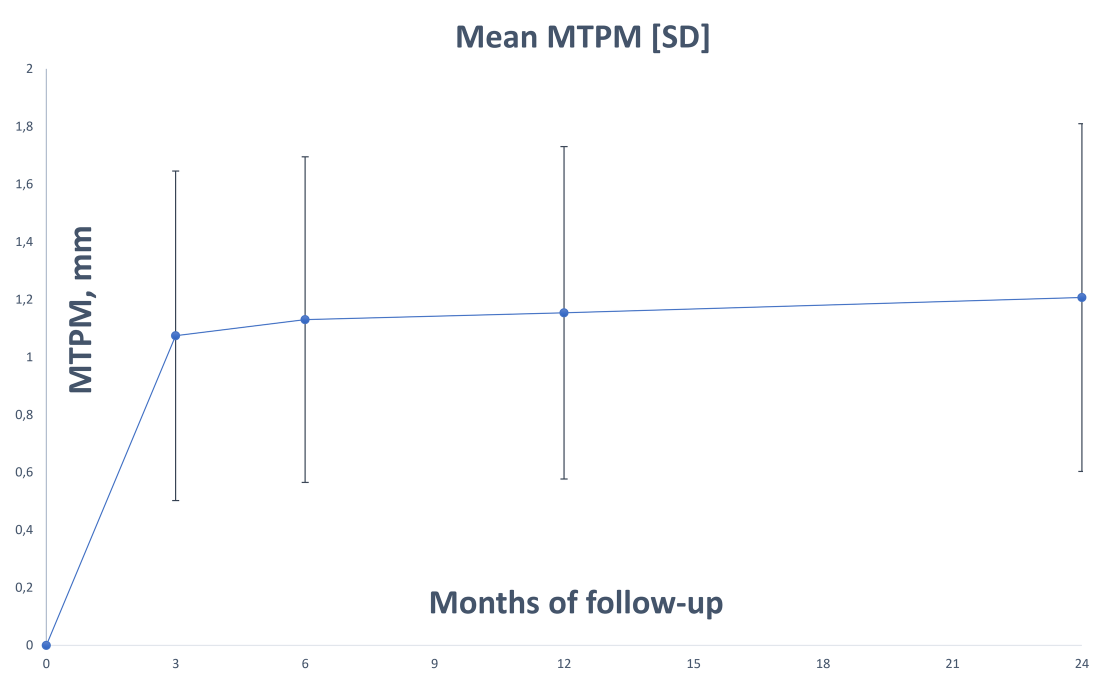
Postoperative x-rays were assessed by two experienced knee surgeons, at different institutions, blinded to patient identity, responsible surgeon, migration data and clinical outcome. The assessors were asked to judge the x-rays regarding the following factors: Tibia size (undersized, fitting, oversized), gap to epiphyseal bone-shell support (anterior-, lateral-, medial- and posterior support: yes or no), frontal-plane alignment (varus-, neutral- or valgus), sagittal-plane alignment (posterior-, anterior-slope).

The RSA-analyses were done using marker-based software (UmRSA v6.0, RSA Biomedical, Umeå, Sweden). Tantalum markers (0.8 mm) were inserted in the tibial host bone and in the polyethylene (1 mm). Markers were inserted using the same technique in similar grids in all patients. RSA X-rays were performed at Rigshospitalet, Department of Radiology within seven days after surgery and after 3, 6, 12, and 24 months.

Statistics: Multivariate linear regression.

Results

The migration pattern for all subjects during the 24 months of follow-up, followed the expected migration pattern for cementless tibia component, with a relatively high initial migration (mean total MTPM after 3 months: 1.07 mm (1.14SD)). From 6 to 12 months the components stabilized with a mean MTPM increase from 1.13 (SD) to 1.15 (SD) mm only. From 12 to 24 months
MTPM was continuously stable with a mean MTPM of 1.21 (SD) mm after 24 months (graph1).



Graph 1: Maximum total point motion (MTPM) 0-24 months.
Mean all subjects +/- [SD].

The tibia component sizing was negatively related to both total migration and continuous migration, that is small tibia components relative to tibia host bone, was related to high degrees of continuous migration (table 1).
Subsidence (total negative Y-translation) was statistically significantly related to both tibia size, posterior and lateral shell support and varus malalignment of the components.

REGRESSION	B	CI (95%)	P-value	R^2
Total migration ($MTPM_{0\text{-}24\ months}$)				
Tibia Component Size	-.72	-1.19 to -.24	.003	67%
Posterior shell support	1.33	.70 to 1.95	.000	
Anterior shell support	.18	-.27 to .63	.428	
Lateral shell support	-1.49	-2.31 to .67	.001	
Medial shell support	-.51	-1.14 to .13	.115	
Frontal malalignment	-.57	-1.40 to .27	.178	
Sagittal malalignment	.13	-.27 to .53	.514	
Continous migration ($MTPM_{12\text{-}24\ months}$)				
Tibia Component Size	-.21	-.33 to -.08	.001	44%
Posterior shell support	.05	-.13 to .22	.602	
Anterior shell support	.06	-.06 to .18	.350	
Lateral shell support	-.15	-.37 to .07	.172	
Medial shell support	-.11	-.28 to .06	.216	
Frontal malalignment	.01	-.21 to .23	.961	
Sagittal malalignment	.00	-.10 to .11	.949	
Total SUBSIDENCE (NEGATIVE Y-TRANSLATION)				
Tibia Component Size	.37	.06 to .68	.021	62%
Posterior al bone support	-.69	-1.09 to -.28	.001	
Anterior cortical bone support	-.13	-.43 to .17	.376	
Lateral cortical bone support	.83	.29 to 1.37	.003	
Medial cortical bone support	.37	-.05 to .79	.081	
Frontal malalignment	.64	.12 to 1.16	.017	
Sagital malalignment	.02	-.25 to .28	.912	

Table 1: Multivariate regression results.

Discussion

The migration pattern for cementless components is characterized by a relatively high initial migration within the first 6 months followed by a stabilization period similar to that of the cemented tibia components. Implants that do not achieve stabilization are considered at risk of aseptic loosening.
The findings of this study indicate that under-sizing cementless tibia component results in poorer fixation with both higher degrees of continuous migration and increased subsidence and posterior tilt.