Early Tibial Component Migration: Comparison between UKA and TKA using Radiostereometry Analysis

Catani F; +Ensini A; Barbadoro P; Belvedere C; Bianchi L; Giannini S
+Department of Orthopaedic Surgery, Istituti Ortopedici Rizzoli, University of Bologna, Italy
andrea.ensini@ior.it

INTRODUCTION:
Unicompartmental knee arthroplasty (UKA) is a valid alternative to total knee arthroplasty (TKA) when a single compartment of the knee is affected by osteoarthritis or avascular necrosis. UKA has many advantages over TKA, such as minimal surgical trauma, good clinical and functional results, low cost; however the revision rate of this type of prosthesis is higher than the total knee. Early migration, as measured with radiostereometry technique (RSA), is a good predictor of aseptic loosening. So far no studies have been compared early migration of UKA and TKA with the same tibial and femoral component geometry using RSA. Two hypotheses are addressed: a) The UKA implant has a good fixation, without risk of aseptic loosening; b) The UKA and TKA have the same pattern of early migration.

METHODS:
The present prospective cohort study was performed in 18 patients (6 male and 12 female) with medial gonarthrosis or avascular necrosis, where an Optetrak® cemented UKA (Exactech, Gainesville, Florida, USA) was implanted. UKA tibial and femoral components have the same geometry of the Optetrak® TKA. UKA tibial component presents an all-polyethylene fixed bearing. The mean age of the patients at the time of surgery was 68.5 years (range 53–86). The criteria for selecting patients for this study were according to indications for UKA surgery. All the surgery was performed by the same surgeon in the Rizzoli Orthopaedic Institute (IOR) of Bologna (Italy), from June 2005 to May 2007. All patients subscribed Ethical Committee certification for this study. Informed consent was signed before surgery by each patient included in the study. A medial parapatellar arthroscopy (midvastus approach) was performed, with mini-invasive surgery. The patella was mobilized laterally without any dislocation, and no soft tissue release was made. Drill holes were made in the tibial plateau. Before cementing the final components, 4 to 6 markers (0.8-mm-diameter tantalum beads) were inserted into the tibial metaphysis and into the polyethylene tibial component for RSA measurements. Radiographical and clinical evaluation was made using respectively RSA and international knee society (IKS) scoring system postoperatively and at 3, 6, 12 and 24 months.

PS-TKA ▲ CR-TKA ◊ UKA

RSA was used to calculate the migration of tibial component using Model-based RSA 3.2 software (Medis specials – Leiden, Netherlands) that reconstructs the three-dimensional models of the two rigid bodies (tibia and polyethylene). Prosthesis migration was expressed as translational and rotational movements long and around the longitudinal (Y), medium-lateral (X) and anterior-posterior (Z) anatomical axes. The parameter that was evaluated as a predictive index of instability is maximum total point motion (MTPM), which quantifies the movement of the tibial marker that moved most in any one position. The prosthesis was classified as stable or unstable. As described in literature, the implant has a continuous migration and MTPM increase of greater than 0.2 mm between the 1st and 2nd year follow up examinations. RSA data of this study were compared to a previous RSA study with Optetrak® cruciate-retaining (CR) TKA and 20 patients with Optetrak® posterior-stabilized (PS) TKA.

RESULTS SECTION:
The medium MTPM values of UKA at 3, 6, 12, 24 months of follow up were respectively 0.4 ± 0.1 mm, 0.6 ± 0.2 mm, 0.6 ± 0.3 mm, and 0.7 ± 0.3 mm. The medium MTPM values of CR TKA at 3, 6, 12, 24 months were respectively 0.5 ± 0.3 mm, 0.6 ± 0.4 mm, 0.6 ± 0.5 mm, and 0.6 ± 0.4 mm. The medium MTPM values for the PS TKA were respectively 0.5 ± 0.5 mm, 0.6 ± 0.6 mm, 0.6 ± 0.5 mm and 0.7 ± 0.5 mm. In the UKA group, only one patient presented a continuous migration and MTPM increased greater than 0.2 mm between 1st and 2nd years of follow up, with a variation of 0.5 mm (MTPM at 1 year after surgery was 0.8 mm and at 2 year was 1.3 mm). In the CR and PS TKA groups respectively one and two patients presented an MTPM increased greater than 0.2 mm between 1st and 2nd years of follow up. UKA migration data shown that there was not a prevalent direction of movement. The absolute values of motion at two years from surgery results always lower than 0.2 mm for translations and lower than 1° for rotations.

The mean IKS score for UKA at two years of follow up was 94.8 ± 10.1 for knee score and 87.7 ± 15.4 for function score with a range of motion (ROM) of 126.7 ± 14 degrees. The mean IKS score for CR and PS TKA at two years of follow up was respectively 89 ± 10 and 90 ± 9 for knee score, 81 ± 17 and 76 ± 19 for function score with a ROM of 97 ± 15 and 114° ± 21degrees.

DISCUSSION:
This study confirm the excellent clinical results of UKA. The good tibial component fixation results of this study were similar to RSA data presents in other UKA fixation studies. The prosthesis considered in this study presents fixation data overlap to which to Optetrak® TKA1, which have excellent ten years results and presents components with the same geometry of Optetrak® UKA. Is particularly conspicuous overlap between the CR TKA and UKA curve (Fig 1). The same pattern of early migration for the Optetrak UKA and for the CR and PS Optetrak TKA has been demonstrated. If surgical indications are presents and a good surgical technique is used, the Optetrak® UKA will have a good long term fixation and a risk of aseptic loosening.

REFERENCES:

ACKNOWLEDGMENTS: Medis specials – Leiden, Netherlands