DETERMINATION OF THE PRECISION OF DUAL ENERGY X-RAY ABSORPTIOMETRY (DEXA) WHEN APPLIED AT THE KNEE

Methods: The precision of DEXA when applied to the knee.

The aim of this study, therefore, was to analyze which factors influence the precision of DEXA when applied to the knee. The overall precision varied between different parts of the knee. Precision was higher in bone with high bone mineral density (BMD) and lower in bone with low BMD. Variations of 15° in external or internal rotation of the knee did not influence on the precision, which probably was caused by the use of rather large and regularly shaped regions of interest. There was no difference in precision between the Plexiglas rod and the rice bags. The presence of the metallic prosthesis in the scanning area did not affect the precision.

Statistics: Non parametric Friedman and Mann-Whitney U test.

Conclusion: The overall precision varied between different parts of the knee. Precision was higher in bone with high bone mineral density (BMD) and lower in bone with low BMD. Variations of 15° in external or internal rotation of the knee did not influence on the precision, which probably was caused by the use of rather large and regularly shaped regions of interest. There was no difference in precision between the Plexiglas rod and the rice bags. The presence of the metallic prosthesis in the scanning area did not affect the precision.

Results: The precision in the respective ROIs are displayed in Tables 1 - 3. The precision of the different paired scans were performed using software developed for the hip. Therefore different soft tissue equivalents (rice bags, Plexiglas rod) have been developed to aid the measurements. The effect of these on the precision has, however, not been presented. When using DEXA in analyzing the longitudinal bone remodeling around total knee arthroplasty (TKA) occurring after operation, knowledge about factors influencing the precision is required.

The aim of this study, therefore, was to analyze which factors influence the precision of DEXA when applied to the knee.

Methods: Subjects: 12 knees in 10 patients (6 women and 4 men, mean age 70 years) operated with TKA 1 to 3 years previously were investigated. In 3 of the patients the contra-lateral non-operated knee was also investigated. All prosthetic knees were operated with the Miller-Galante II TKA (Zimmer, Warsaw, Indiana, U.S.A.). The tibial component had 4 pegs but no stem. In 6 of the patients the implants were uncemented, and 6 were cemented. Bone densitometer: A dual energy x-ray absorptiometer (DPX-L, Lunar Corp., Wisconsin, U.S.A.) with a fast 3000 µA scan model was used. To evaluate the effect of different soft tissue equivalents, scans were performed either with a 150-mm long Plexiglas rod positioned in the detector opening, or with rice bags placed around the knee.

Bone mineral density was measured using the software “Orthopedic” (Lunar Corp., Wisconsin, U.S.A.), in the “manual analysis” mode. In all knees, 5 consecutive scans were performed using the Plexiglas rod as a soft tissue substitute. At the first scan the knee was positioned in neutral rotation. The second scan was performed immediately after the first with no repositioning of the knee. The third to fifth scans were performed with the knee in neutral rotation, 15° external rotation, and 15° internal rotation, respectively. Before performing each of these 3 latter scans the patients were allowed to ambulate. In 9 of the operated knees, a sixth and a seventh scan was performed with rice bags around the knee as a soft tissue substitute in stead of the Plexiglas rod. Between the 6th and the 7th scans the patients ambulated. The first (and 6th) scans served as the reference and the subsequent scans were compared with the reference, thus making up 4 + 2 different paired scans.

The Orthopedic software automatically sets up a base value (BV), which serves as an “attenuation threshold”. The difference in base value (ABV) was calculated for each paired scan and compared with the coefficient of variation (C.V.) for that scan.

Statistics: Non parametric Friedman and Mann-Whitney U test.