

Leg length and offset measurements in navigated total hip replacement (THA)

EL HAJ M, MATTAN Y, KANDEL L, RIVKIN G, LUBOVSKI O, LIEBERGALL M

Department of Orthopedic Surgery, Hadassah Hebrew University Medical Center, Jerusalem, Israel

madi.elhaj@gmail.com

Introduction: Differences between the lengths of the upper and/or lower legs are called Leg length discrepancies. Leg length discrepancy after total hip replacement is a major concern in reconstruction surgery since it may contribute to gait asymmetry, unstable hip, low back pain and revision surgery.

The present study compares the accuracy of intra-operative assessment of Limb length discrepancy and offset as measured by computer assisted navigation system – (ORTHOsoft, Inc Tm.) and post operative measurements.

Aim of the Study: Delineate the accuracy of intraoperative navigation measurement of Leg length discrepancy and offset changes, compared to pre and post operative pelvic radiograph using TraumaCad™ software system.

Materials & Methods: Fifty consecutive patients went through navigation Total Hip Replacement between November 2008 and August 2010. The inclusion criteria were:

- Primary osteoarthritis.
- Patients that were operated using computerized navigation (approximately 10% of total cases).

Twenty Four patients were operated on the left side and twenty seven on the right side. They were retrospectively enrolled in this single-centre study. Post operative Limb length discrepancy and offset were measured in relation to pre operative X-rays. This was compared with the corresponding intra-operative navigated values.

Measurements were done pre-op and 6 weeks post-operatively on digital standard X-ray, using the Digital TraumaCad™ templating software (Orthocrat Ltd, Israel). Calibration between x rays was done using customized magnification markers (metal ball of known size 25 mm) at the level of both femurs.

The Study was approved by the institutional review board committee in Hadassah.

Statistical Analysis: We performed two tailed Pearson correlation and paired sample student T- test between intra-operative assessment of Limb length discrepancy and offset as measured by computer assisted navigation and pre operative X-rays. The statistical analysis was done using IBM SPSS Statistics version 20.0

Results: We found a high significant correlation between the two related measurements of change in Limb length discrepancy, and the change in offset. Limb length discrepancy mean change as measured by computer assisted navigation was 6.58 ± 6.00 mm, compared with 6.12 ± 6.06 mm intra-operatively. ($r^2 = 0.8$ $p < 0.001$) offset change was -2.55 ± 8.16 mm, compared with -1.86 ± 6.74 mm intra-operatively change. ($r^2 = 0.9$ $p < 0.001$). We observed no differences between Limb length discrepancy changes (mean difference 0.60 mm, 95% Confidence Interval, -0.48 –1.67 mm, $p < 0.27$), and offset changes (mean difference -0.74 mm, 95% Confidence Interval -1.78 -0.28 mm, $p < 0.15$). The additional operative time was less than 10 minutes (average 5 min).

Conclusions: Computerized technology provides a robust tool that gives real time intra operative accurate information about the change in Limb length discrepancy and in the offset.

Traumacad is feasible and easy method tool in determining the concurrent central of rotation. This can help the surgeon to execute accurately the pre-operative planning. This accurate tool may help the operating surgeon in choosing the best fitting implant size and length for a given patient. The

combination of pre operative planning and intraoperative navigation monitoring help to restore the native hip biomechanics.