Comparison of computer navigated vs non navigated techniques in leg length restoration in total hip arthroplasty

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Introduction: Leg length discrepancy following total hip arthroplasty (THA) can be functionally disabling for affected patients and can lead on to litigation issues. Limb length restoration has traditionally been done by measuring the discrepancy on plain antero-posterior radiographs and having a mental picture of how much length needs to be gained or lost during the procedure. Also, during the procedure in lateral decubitus position with the trial implant in place, the surgical side leg is placed on top of the ‘normal’ non operated leg with both knees flexed to 45-60 degrees. Then the levels of the patellae were felt with the flat of the hand to give a rough estimation of the limb lengths. A few other methods have been described in literature. Assessment of limb length discrepancy using these non navigated methods has been shown to produce inconsistent results. The aim of our study was to compare the accuracy of computer navigated limb length restoration with non navigated techniques in THA.

Methods: Prior to the use of computer navigation of all THA in our unit, we have been using conventional methods to restore the length of the operated leg. This gave us two cohorts of patients. Group 1 where conventional methods were used and Group 2 where computer navigation was used for limb length restoration. We did a retrospective analysis of 160 consecutive THAs performed by a single surgeon team in our arthroplasty unit. There were 57 patients in Group 1 (Non navigated) and 103 patients in Group 2 (Navigated). Pre operative and post operative plain radiographs were used for calculating limb length discrepancy. The difference in the perpendicular distance measurement between an inter tear drop line and the most prominent points on the lesser trochanters gave the limb length discrepancy. We retrieved the intra-operative computer generated limb length alteration data pertaining to the navigated group. We used independent sample t tests and descriptive statistics to analyse the data.

Results: The two subgroups were found to be matched for their age, diagnosis and preoperative leg length discrepancy. The mean age of the patients was 69.12 (37-89, SD - 8.3) years and the mean BMI was 29 (19-44, SD - 5.03). The mean post op limb length discrepancy in the non navigated group (Group 1) was 5 (-8 to 21, SD-6) mm as compared to a mean of 3.5 (-9 to 21, SD-6.5) mm for the computer navigated group (Group 2). This difference was statistically significant (Two tailed t test, p=0.04). 18% of patients in the non navigated group (Group 1) had a limb length discrepancy of more than 10 mm (clinically relevant discrepancy) as compared to 12% in the navigated group (Group 2). There was no statistically significant difference between the computer predicted leg length alterations and those measured on plain radiographs. (Two tailed t test, p>0.15)

Discussion and Conclusion: The use of Computer navigation in THA can be useful in reducing errors related to leg length discrepancy. It helps in reducing the rates of unacceptably high discrepancies. Although plain radiographs are not the best method of predicting leg length (CT scans would have been better), the routine orthopaedic practice in most countries is based on plain radiographs and most clinicians accept plain radiographs to calculate their leg length discrepancies and plan surgery based on that. Even on plain radiographs there can be inter and intra-observer variations in length measurements. In our experience, the results of computer navigation were predictable and reproducible. The computer may be even better at calculating leg length than is found in our study since plain radiographs (method used in

13th Annual Meeting of the International Society for Computer Assisted Orthopaedic Surgery
Orlando, FL, USA, June 12-15, 2013
this study for comparison and analysis) are subject to a large degree of variability and hence are likely to be less accurate for measurement of these parameters. We intend to continue using computer navigation for our total hip arthroplasties.