A Comparative Study of the Saltzman and the Modified Long-leg Radiograph for Assessing Hindfoot Alignment

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Category: Radiology

Keywords: Long leg; alignment; hind foot; knee; replacement; Saltzman

Introduction/Purpose: There is growing evidence suggesting that the alignment of the leg (hip-knee-ankle or HKA axis) should be considered when planning an ankle replacement and alignment of the hindfoot (tibio-calcaneal or TC axis) should be considered when planning a knee replacement. The alignment of the HKA axis is assessed from standard long-leg radiographs, while the hindfoot alignment requires special views like Saltzman’s or Coetzee’s or similar. However we have discovered that by making minor adjustments to the way a standard long-leg radiograph is taken, it is possible to measure both the HKA as well as the TC axis from the same radiograph. The aim of our study was to compare the hindfoot alignment between a Saltzman’s view and the modified long-leg view.

Methods: Approval was obtained for a prospective observational study on 65 consecutive patients referred to our hospital for a knee replacement. Patients with multiple joint arthritis, previous lower-limb surgery, or limb length discrepancy requiring shoe-raise were excluded. All patients had a preoperative modified long-leg view as part of our routine for radiographic assessment of a knee replacement; as well as a Saltzman’s view which served as a standard for hindfoot alignment. The long-leg alignment was measured using the standard HKA (hip-knee-ankle) axis, and the alignment of the hindfoot (tibio-calcaneal angle) was measured using the method described by Van Dijk et al. A difference of 3 degrees between the two observations was agreed to be considered as significant. Results were recorded by two Surgeons independently and analysed using the Bland-Altman Plot. The Intraclass Correlation Coefficient was used for inter-observer variation.

Results: 48 patients were eligible for the study. The hindfoot angle measured in the modified long-leg view (mean 9.29 degrees, SD 4.26 degrees) was similar to that in the Saltzman’s view (mean 8.99 degrees, SD 4.16 degrees). The Scatter Plot showed a linear distribution, with Spearman Correlation Coefficient of 0.892. Bland Altman Plot showed the differences in the measurements residing within the agreed difference of 3 degrees. Intraclass Correlation Coefficient was 0.94 for the modified long-leg view and 0.87 for the Saltzman’s view, suggesting excellent interobserver agreement.

Conclusion: Our study shows that the position of the hindfoot can be reliably measured from the modified long-leg view, and this removes the need for additional radiographs for hindfoot alignment. As the entire femur, tibia and the hindfoot is accessible in the same long-leg view, this creates a platform for further research in to the mechanical axis of the entire lower limb as opposed to the HKA axis, and the effects of malalignment of the lower extremity in patients undergoing knee or ankle replacements.