

Introduction

- Hallux valgus (HV) is a tri-plane deformity of the foot corresponding to a medial deviation of the first metatarsal and a lateral deviation of the hallux.
- While two-dimensional (2D) imaging can provide some information; utilizing three-dimensional (3D) imaging can include more precise and accurate measurements

The purpose of this study is to evaluate the metatarsal osteotomies for correction of hallux valgus deformity in axial, coronal and sagittal plane with 2D and 3D measurements.

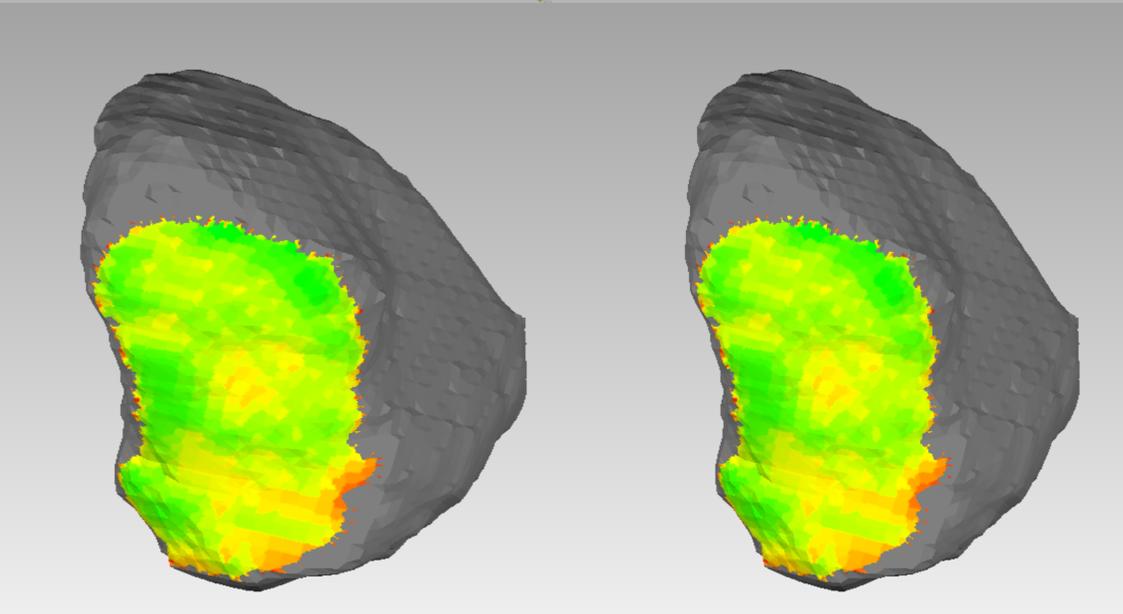
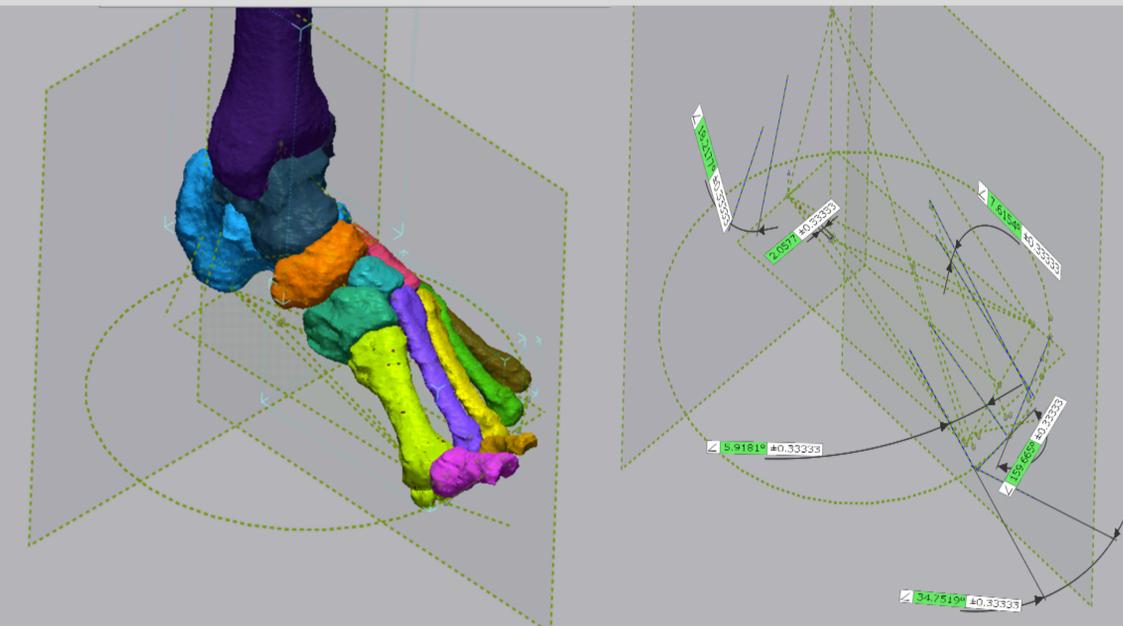
Results

3D measurements of the Inter-Metatarsal (IM) Angle, was 12.3 degrees pre-operative and 10.4 degrees post-operative with no significant differences in all three planes

M1M5 Angle, measured between the principle axes of the first metatarsal and fifth metatarsal was 25.3 degrees pre-operative and 22.0 degrees post-operative were statistically significant with the greatest change in the axial plane.

2D measurements of the hallux valgus angle, measured the longitudinal axes of the first metatarsal and proximal phalange of the hallux was 22.6 degrees preoperative and 21.7 degrees post operative with no statistical difference

Metatarsal parabola, measured in two dimensions projected onto the axial plane was 157.1 degrees before and 141.5 degrees after surgery was statistically significant



Methods

Weightbearing CT (CurveBeam, Inc) of 10 cadaveric specimens were taken preoperatively with an 80-pound axial load applied. Midshaft osteotomies were performed on the first metatarsal by fellowship trained foot & ankle surgeon followed by post operative Weightbearing CT scans of cadaveric specimens with 80-pound axial load

3D models of the pre-operative and post-operative specimens were created and differences in pre and post operative changes were analyzed using conventional 2D and 3D models of the first metatarsal (M1), second metatarsal (M2), fifth metatarsal (M5), and proximal phalanx of the hallux (PP1) using a paired student t-test.

Quantitative examination of foot and ankle offset (FAO) alignment along with congruity of first metatarsal phalangeal and distance mapping of the first tarsometatarsal joints were evaluated

Conclusion

- When comparing 2D and 3D pre and post surgical hallux valgus values, the only significant differences were identified in the absolute M1M5 values in the axial plane.
- 3D measurements allows for precise, efficient measurements in axial, coronal and sagittal planes that is previously unknown through two-dimensional radiographic measurements for quantifying the effect of metatarsal osteotomies on hallux valgus.

References

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