



Research Week 2023

Closing wedge osteotomies: what's the best way?

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Keywords

Humans, Child, Osteotomy, Bone and Bones

Abstract

Introduction

Closing-wedge osteotomies are utilized to treat various pediatric deformities in long bones. Currently, limited evidence exists evaluating various modalities for performing osteotomies. This study investigates the effectiveness of several measuring and marking methods for completing wedge-shaped osteotomies.

Methods

An observational cohort study was completed. Participating orthopaedic residents (PGY 1-5) completed 30-degree wedge osteotomies on a Sawbones femur utilizing a standard oscillating saw under three measuring conditions: (1) no measurement tool, (2) 30-degree triangle, and (3) goniometer, in combination with two different marking methods: (1) marking pen or (2) pin placement, for a total of six discrete permutations. Demographic characteristics and osteotomy performance (osteotomy quality, completion time, and angle accuracy) were assessed. Quality was ranked as perfect (1), mild step-off (2), or gross surface irregularity (3). Multivariate regressions were performed to fit demographic characteristics to osteotomy performance. ANOVA was performed comparing osteotomy performance and measuring methods.

Results

24 residents were included for analysis; 6 were female (31%). No significant difference was observed between gender and surface quality or wedge angle accuracy; however, female gender was independently associated with longer completion time compared to male residents (143 seconds versus 98 seconds). The use of guide wires was associated with a longer completion time (152 seconds v 83 seconds) and lower surface quality (1.49 v 1.23) compared to marking pen across all measuring methods. Of all methods, the use of a triangle with a marker was the most accurate and had the highest average osteotomy quality compared to all tested conditions.

Conclusion

The combination of fixed-angle triangle and marking pen is the most accurate modality producing the highest osteotomy quality for closing-wedge osteotomies in long bones. Kirschner guide-pin placements increases OR time without improving quality. While male residents complete wedge osteotomies quicker than female residents, quality and accuracy are comparable amongst trainees.