A Surgical Skills Simulation Training Program in an Articular Fracture Model for Junior Orthopaedic Residents

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Introduction

Our group has previously developed an articular fracture simulation model that was able to distinguish performance between junior and senior residents in terms of their overall hand motion.

Junior residents are a good target for articular fracture reduction training. There is scant literature describing a simulation training program for common procedures, such as articular fractures, in orthopaedic trauma.

Aims

- Develop a surgical skills simulation training program for junior residents utilizing an articular fracture model.
- Compare performance in residents exposed to the training program vs. those who are not.

Methods

- Six PGY1 and six PGY2 residents were randomized into intervention and control groups (n=3 each)
- Articular fracture simulation model was a surrogate three-segment fracture model made from polyurethane foam, placed inside a synthetic soft tissue housing
- Training program consisted of 1) an online-based cognitive module on Iowa Courses Online (ICON, https://icon.uiowa.edu) and 2) a skills module directed by a traumatologist.
  - Cognitive module – content included background on plafond fractures, anatomy, surgical technique for reduction, basics on fluoroscopy, pre-test/post-test
  - Skills module – one evening session, allowed for subject to practice on similar articular fracture model
- Baseline performance captured for all 12 residents, followed by re-evaluation one month later
- Outcomes included Objective Structured Assessment of Technical Skills (OSATS) score, articular step-off, hand motion, fluoroscopy time, and radiation dose

Figure 1.
Simulation session, with subject wearing a head-mounted camera and optoelectronic hand motion sensors (left), and demonstrating fluoroscopy use (right).

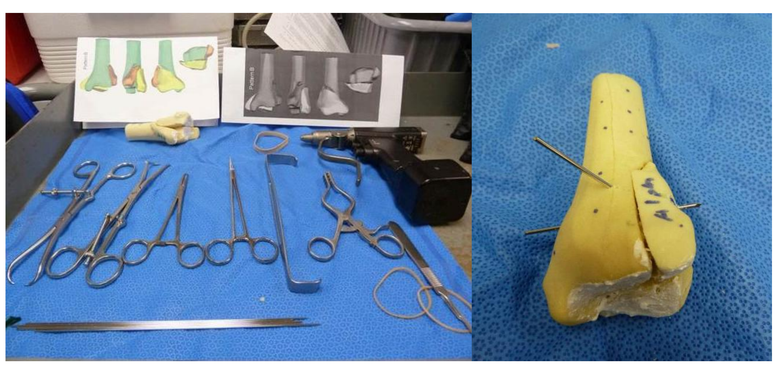


Figure 2. Instruments (left) and completed model (right).

Results

- Intervention group had statistically significant higher median OSATS scores compared to control group after simulator training (Figure 3).
- Intervention group had significantly less median fluoroscopy time and radiation dose after training (Figure 4).
- There was no significant difference in articular step-off (Figure 5) or hand motion (Figure 6) between the two groups.

Figure 3. OSATS score at final evaluation between control and intervention group

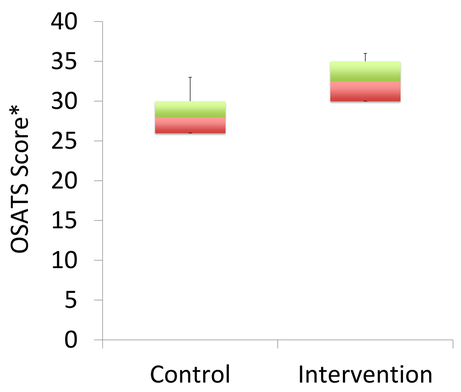


Figure 4. Fluoroscopy time in intervention group before and after training

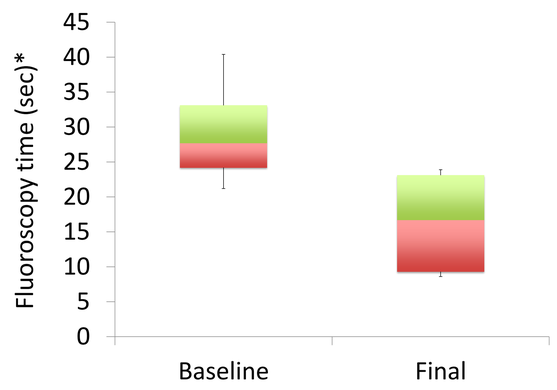


Figure 5. Articular step-off at final evaluation between control and intervention group

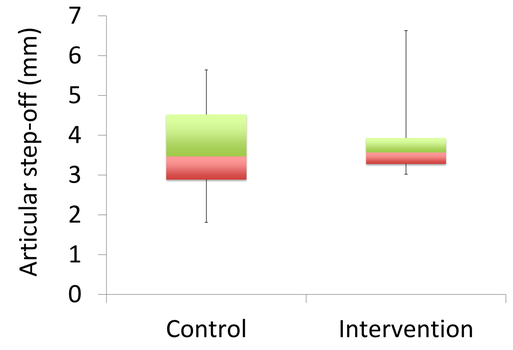
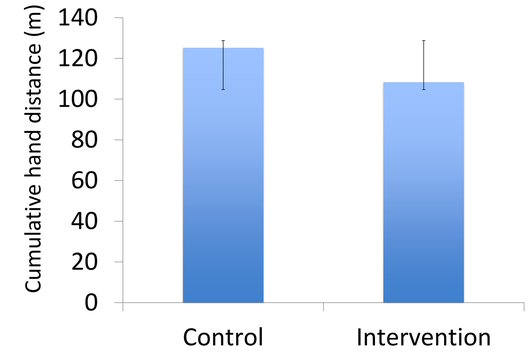


Figure 6. Cumulative hand distance at final evaluation between control and intervention group



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Discussion

- A surgical skills training program utilizing a simulated articular fracture model has the potential to improve performance in junior residents in a short period of time, as measured by higher OSATS score, less fluoroscopy time, and lower radiation dose.
- More subjects and training sessions may be needed to demonstrate a statistically significant difference in articular reduction and hand motion.

References

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2. Michelson JD. Simulation in orthopaedic surgery: an overview of theory and practice. *J Bone Joint Surg [Am].* 2006;88(6):1405-11.

Acknowledgements

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