

Is it Safe to Immediately Mobilize Ulnar Shaft Fractures or Diaphyseal Shortenings after Fixation?

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INTRODUCTION

- During pronosupination, the radius rotates around the ulna
- Amount of energy transmission through interosseous membrane is unknown
- Therefore, there is significant **variability in postoperative protocols** in the context of **isolated ulnar shaft fractures or ulnar shortening procedures**
- Study aims:
 - Determine amount of micromotion through ulnar shaft fracture/osteotomy during forearm rotation
 - Compare amount of motion through fracture/osteotomy after it has been stabilized with plate

METHODS

- Biomechanical study
- 7 paired-matched cadavers
- Arm mounted in rig with elbow at 90 degrees flexion
- Torque applied to bring arm through full pronation and supination
- Hall effect sensor placed at fracture ends to measure micromotion

- **Four conditions tested:**
 1. **Intact ulnar shaft with plate**
 2. **Fracture without stabilization**
 3. **Fracture with cortical apposition stabilized with plate**
 4. **Comminuted fracture (50% bone loss) stabilized with plate**



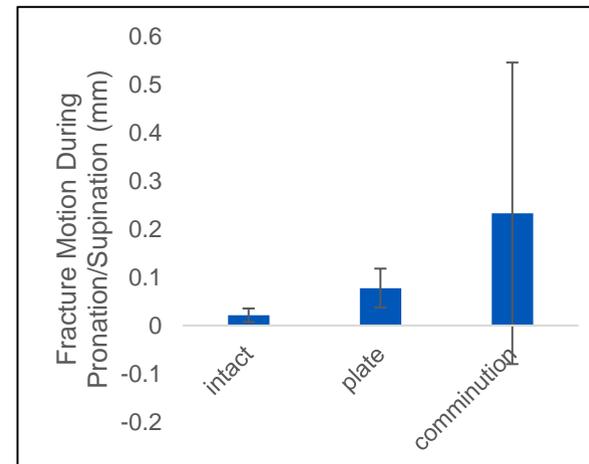
- Interfragmentary strain (IFS) was calculated

$$IFS = \frac{\text{Interfragmentary motion}}{\text{Gap width}}$$

RESULTS

- The greatest amount of fracture site motion was seen in the fracture without stabilization
 - Significantly greater than all other tested conditions
- There were no significant differences between intact ulna, plated fracture with cortical apposition, and comminuted fracture stabilized with plate.
- **The plated fracture with cortical apposition averaged 0.08mm of micromotion during pronosupination**
 - $IFS = \frac{0.08mm}{1.35mm} = 5.8\%$
- **The comminuted fracture stabilized with plate averaged 0.23mm of micromotion during pronosupination**
 - $IFS = \frac{0.23mm}{5.0mm} = 4.7\%$

FRACTURE SITE MICROMOTION



CONCLUSION

- **There is no significant difference in the amount of micromotion between an intact ulnar shaft, an ulnar shaft fracture with cortical apposition that is stabilized with a plate, and a comminuted fracture that is stabilized with a plate**
- Interfragmentary motion of 0.2-1mm or interfragmentary strain up to 10% can be physiologically tolerated^{1,2}
- Therefore, similar amounts of micromotion as seen in this model, are not likely to interfere with callous formation and bony healing
- Given these findings, surgeons may want to re-consider the type of post-operative immobilization in the setting of isolated ulnar shaft fractures or ulnar shaft osteotomies stabilized with plate fixation

REFERENCES

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