Carpal Translocation Following Dorsal Bridge Plate Fixation of Distal Radius Fractures: A Cadaveric Study

Hyuma A. Leland, MD; Ali Azad, MD; Jeffrey Hill, BS; Jessica Intravia, MD; Milan Stevanovic, MD; Alidad Ghiassi, MD

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INTRODUCTION: Dorsal bridge plate fixation is a technique increasingly utilized to establish and maintain anatomic reduction of the distal radius in the setting of complex fracture patterns involving significant comminution, a large zone of injury, or osteopenic bone. This study investigates carpal translocation resulting from bridge plate distal fixation to the second vs. third metacarpal bone.

MATERIALS AND METHODS: Three paired (left-right) cadaveric upper extremities with no history of trauma were imaged in 3-views by fluoroscopy (Group A). Each specimen served as an internal control. A 1-cm osteotomy distal radius fracture model was created via volar Henry approach. Following incision and dissection, dorsal bridge plates were inserted from distal to proximal under the extensor retinaculum (Group B). Distal fixation to the second or third metacarpal was randomly assigned to the right or left hand of each specimen. Cortical locking screws were used to secure the plate to the metacarpal and radial diaphyses. 3-view wrist fluoroscopic images were repeated and measured for ulnar translocation, ulnar variance, radial inclination, radial height, and radiocarpal angle. Carpal translocation was calculated using Taleisnick's Classification, Chamay's, and McMurtry's translation indices.

RESULTS: Randomly, distal fixation to the 2nd metacarpal occurred on the right hand and fixation to the 3rd metacarpal in the left hand in all three cadavers. Ulnar variance, radial inclination, radial height, and radiocarpal angle were not statistically different between Group A and Group B ($p > 0.25$); similarly, there was no difference between Group A and Group B when evaluating distal fixation to the 2nd vs. 3rd metacarpal bone ($p > 0.96$). Taleisnick Type 1 ulnar translocation was calculated using radial styloid-scaphoid distance and radiolunate/proximal lunate linear articular surface distance. Several wrists demonstrated ulnar translocation in Group B based on Taleisnick classification, Chamay's, and McMurtry's translocation indices, however, the results were not statistically significant.

CONCLUSION: Dorsal bridge plate fixation of distal radius fractures restores preoperative physiologic measures of the radius, ulna, and carpus. No significant carpal translocation occurred during distal bridge plate fixation to the 2nd or 3rd metacarpal bone. While additional studies are needed, fixation to the 2nd metacarpal is preferred as it does not translocate the wrist, and previous studies demonstrate fixation to the 3rd metacarpal bone can entrap the 1st and 3rd extensor compartments.

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