

Evaluation of the Role of Dynamic Elbow Stabilizers on Radiocapitellar Joint Alignment

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Purpose: Fluoroscopic images are frequently utilized to determine appropriate alignment radiocapitellar (RC) alignment during operative treatment of elbow fracture-dislocation injuries. Use of regional anesthesia during surgical repair of elbow fracture-dislocations leads to temporary paralysis of elbow dynamic stabilizers, which may affect the RC joint. The study aim was to determine the effect of the dynamic stabilizers on RC joint alignment, before and after administration of regional anesthesia.

Methods: A single institution study of 14 prospectively enrolled patients with a self-control design was performed, with 1 AP and 9 lateral fluoroscopic images of the elbow obtained from each patient presenting for ipsilateral hand surgery. The lateral images were obtained with maximal forearm pronation, neutral rotation, and supination with the elbow (1) fully extended, (2) flexed to 90° with 0° of shoulder internal rotation (IR), and (3) flexed to 90° with 90 degrees° of IR. After obtaining 10 initial images, a supraclavicular regional block was performed to achieve less than 3/5 motor strength of the imaged elbow. Once motor blockade effect was confirmed, the same 10 images were again obtained in each patient. The carrying angle was measured on all AP images and the RC ratios (RCRs) were measured on all lateral images. Normal data were described with mean ± standard deviation. The paired t test was used to compare carrying angles and RCRs between groups. The significance level was 0.05.

Results: The 14 patients had a mean age of 47.8 ± 15.7 years and 10 patients (71.4%) were female. Significant differences between RCRs calculated before and after regional anesthesia were seen with (1) forearm neutral rotation/elbow flexed to 90°/shoulder at 0° of IR ($2.25\% \pm 4.63\%$ to $-1.05\% \pm 6.12\%$; $P = 0.0073$), (2) forearm maximally supinated/elbow flexed to 90°/shoulder at 0° of IR ($0.95\% \pm 8.96\%$ to $-3.02\% \pm 5.68\%$; $P = 0.0396$), and (3) forearm maximally supinated/elbow flexed to 90°/shoulder at 90° of IR ($-3.27\% \pm 5.50\%$ to $-6.17\% \pm 5.33\%$; $P = 0.0304$). No significant difference was seen in carrying angles (15.5 ± 4.09 to 16.6 ± 4.25 ; $P = 0.314$).

Conclusion: A statistically significant posterior subluxation of the RC joint was found after paralysis of the dynamic stabilizers. Radiocapitellar alignment was maintained, however, as long as the forearm was in maximal pronation. This confirms that the dynamic stabilizers play a role in elbow stability and that loss of their function alone can lead to posterior displacement of the radial head radiographically. These findings suggest if a patient has received a peripheral nerve block preoperatively, the best way to examine elbow stability intraoperatively is to do so with the forearm in maximum pronation, thus avoiding any potential posterior radial head displacement that could be due to paralysis of the dynamic stabilizers alone.