

Tear Drop Angle, Dorsal Metacarpal Distance and Capitate Distance in Normal Wrist Radiographs

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Introduction

Distal radius fractures are the most common fractures of the upper extremity and account for up to one-sixth of all skeletal fractures. While standard radiographic measurements of the distal radius (articular alignment, length, volar tilt and inclination) are used to help define treatment plans, other measurements are available to understand the deformity of the fracture or malalignment of the wrist. Medoff introduced the tear drop angle (TDA) measurement, reinforcing the importance of the position of the volar lunate facet. We sought to determine the variability of the TDA as well as to measure the dorsal metacarpal translation and the volar and dorsal capitate distance in a series of consecutive wrist radiographs.

Methods

A random selection of patients undergoing comparison radiographs of the wrist from April 2012 to August 2012 was performed with institutional approval. After initial review, 33 wrists with adequate radiographs were selected with an average patient age of 35 years (18 - 58 y). Electronic radiographs were evaluated for the TDA and the dorsal metacarpal distance, measuring from dorsal radial line to third metacarpal dorsal cortex. The center of capitate distance was also measured to the dorsal and volar radial lines. A method for standardizing the TDA measurement was proposed from the volar radial line.



Results

- The average value for TDA from the volar radial line was $52.2^\circ \pm 3.7^\circ$. The average dorsal metacarpal distance was $5.6\text{mm} \pm 4.9\text{mm}$, the average distance of capitate center to the volar radial line was $3.0\text{mm} \pm 2.5\text{mm}$ and the average distance of capitate center to the dorsal radial line was $9.0\text{mm} \pm 3.6\text{mm}$.

Table 1:

Tear Drop Angle	52.2 ± 3.7
Capitate Volar Translation	3 ± 2.5
Capitate Dorsal Translation	9 ± 3.6
Dorsal MC Translation	5.6 ± 4.9

Conclusion

Our results demonstrate that the mean TDA (based on the volar radial line) was 52.2° (44° - 63°) with a standard deviation of only 3.7° . This suggests that the volar radial line could be a reliable reference line when measuring radiographs. This has a relative similar standard deviation as measurements from the center axis proposed by Medoff (70.7°) which had a SD of $\pm 4.2^\circ$. The dorsal metacarpal translation had a mean of 5.6mm (0 - 21.3mm) with a relatively high standard deviation of 4.9mm . The volar capitate distance ($3.0\text{mm} \pm 2.5\text{mm}$) was more reliable compared to the dorsal capitate distance ($9.0\text{mm} \pm 3.6\text{mm}$). The volar radial line may serve as a reliable reference line for measuring capitate translation and the teardrop angle.