



Understanding Proximal Ulnar Anatomy on Static Fluoroscopy Images

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Objectives

The three-dimensional anatomy of the proximal ulna can be difficult to interpret with two-dimensional imagery techniques, especially standard intraoperative fluoroscopy. Without appropriate visualization, surgeons risk placing implants in suboptimal locations, perhaps even within the joint. The purpose of this study is to delineate the borders of the trochlear ridge, and the medial and lateral facets, and provide identifying measurements to assist surgeons intraoperatively.

Methods

Ten fresh-frozen cadaveric elbows were analyzed: five female and five male specimens with an average age of 62 years. Female height ranged from 5'0"- 5'2" and male height ranged from 6'0"-6'2". True lateral static fluoroscopic images were obtained for each specimen with a customized radiographic scale to allow assessments of true measurements. Specimens were opened medially and radiographic markers were placed intra-articularly (Figure 1) and closed anatomically (Figure 2). The specimens were imaged again and measurements taken using the customized scale (Figure 3).



Figures 1 and 2



Methods



Figure 3



Figure 4

Results

In the small specimen group, the average distance to the trochlear ridge, the medial facet, and lateral facet from the center of the trochlea were 10.2mm (95% CI 9.7 to 10.6mm), 13.6mm (95% CI 12.4 to 14.8mm), and 11.2mm (95% CI 10.9 to 11.5mm) respectively. The large specimens had average distances of 11.9mm (95% CI 11.3 to 12.4 mm), 16.6mm (95% CI 15.8 to 17.4mm), and 14mm (95% CI 13.3 to 14.7mm) respectively. Interobserver and intraobserver reliabilities were good to excellent with values .85 to .98 for all endpoints.

Results

Distance from center of trochlea to:	Large specimens	Small specimens	Average
Trochlear ridge	11.9mm (+/-0.63)	10.2mm (+/-0.52)	11.0mm
Lateral fossa	14.0mm (+/-0.76)	11.2mm (+/-0.34)	12.6mm
Medial fossa	16.6mm (+/-0.93)	13.6mm (+/-1.33)	15.1mm

Conclusions

When viewing a true lateral of the elbow by intraoperative fluoroscopy, the lateral facet may be easily visualized and resides 11-14mm from the center of the trochlea in most patients. The trochlear ridge and medial facet, however, are not readily seen. The trochlear ridge may be identified by measuring 10-12mm from the center of the trochlea, appearing flush with the trochlear groove. The medial facet may be identified by measuring 13.5-16.5mm from the center of the trochlea, or approximately 2mm posterior to the radiographic line representing the lateral facet.

Clinical Significance

This cadaver study provides parameters for using intraoperative fluoroscopy to delineate joint line limits which should be considered when placing implants about the trochlear notch of the proximal ulna. A screw aimed from posterior to anteromedial should measure about 2mm less than one aimed laterally.