Accurate Intraoperative Evaluation of Dorsal Screw Prominence after Polyaxial Volar Plate Fixation of Distal Radius Fractures Utilizing the Hoya View: A Cadaveric Study

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Objectives

Complications after volar plating include tenosynovitis and extensor tendon rupture which can be attributed to dorsal screw prominence. We propose that a new intraoperative technique, the Hoya View, will allow for quick and accurate assessment of dorsal cortical screw penetration during volar plating of distal radius fractures. Due to the irregular nature of the dorsal distal radius it has traditionally been difficult to accurately detect prominent screws with standard static fluoroscopic images. The purpose of this study is to evaluate the accuracy of a new radiographic view compared to standard views for the assessment of dorsal cortical screw penetration and evaluation of proper screw length with volar plating of distal radius fractures.

Methods

Eight fresh frozen human cadaveric wrists underwent application of volar distal radius plating. Utilizing a mini C-arm, AP, lateral, and Hoya views were obtained with notation of any dorsal screw penetration by independent observers. Dorsal dissection allowed for direct visual evaluation of any screw penetration. The distal locking screws were then exchanged sequentially for screws 2 mm longer than their initial measurements. All three fluoroscopic views repeated; any dorsal cortical penetration was recorded and subsequently validated with direct dorsal visualization.

Methods (con't)

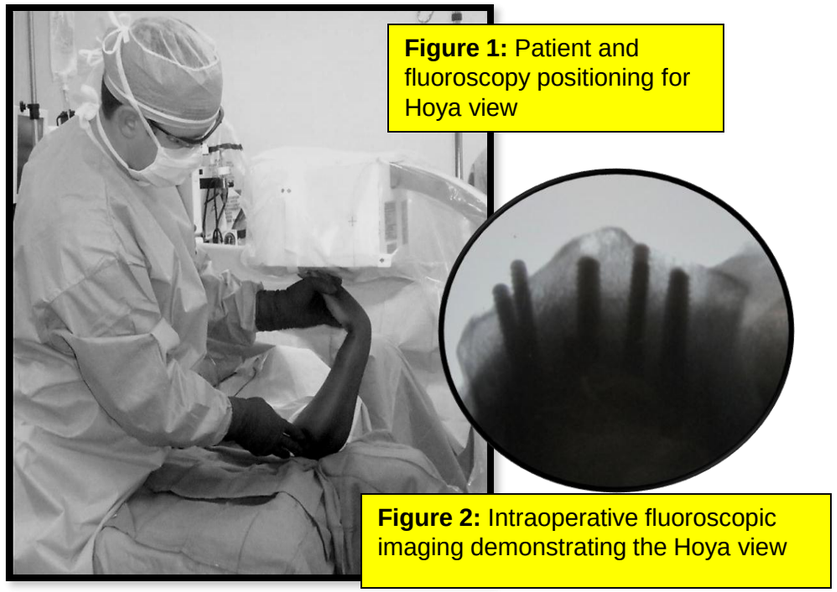

Figure 1: Patient and fluoroscopy positioning for Hoya view

Figure 2: Intraoperative fluoroscopic imaging demonstrating the Hoya view

Results

After plating, dorsal wrist dissections revealed 6 of 64 screws (9.4%), penetrated the dorsal radial cortex. The average screw protrusion was 1.08 mm (range 0.5-2 mm) and was most frequently encountered at the two most radial screw positions of the distal and proximal rows (83.3%); this region corresponded with the 1st and 2nd dorsal compartments. On lateral views none of the 6 screws which were prominent were able to be detected compared to the Hoya view where 6 of 6 prominent screws were detected.

Results (con't)

With the distal and proximal rows of locking screws exchanged for screws 2 mm longer, 49 of 64 of the screws, or 76.6%, violated the dorsal cortex. The lateral and Hoya views were repeated with 24.5% detected on the lateral image versus 100% with the Hoya view. On lateral images, the most frequently visible prominent screws were in the two most ulnar screw positions of the distal and proximal locking rows (75%), with an averaged dorsal protrusion of 1.63 mm.

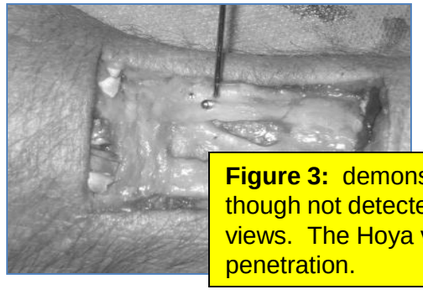

Figure 3: demonstrates screw penetration though not detected on standard fluoroscopic views. The Hoya view clearly detected the penetration.

Conclusions

It is difficult to accurately detect prominent screws with standard AP and lateral fluoroscopic images. This study supports the intraoperative use of the Hoya view to accurately assess proper screw length and any dorsal cortical screw penetration with the use of volar-plate fixation of distal radius fractures. The Hoya view was most effective in detecting screw prominence within the distal 2 cm of the distal radius and was able to detect 100% of all prominent screws with no false negative results.