

## **Dorsal Screw Penetration With the Use of Volar Plating of Distal Radius Fractures: How Can You Best Detect?**

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**Purpose:** The valley between the sigmoid notch and Lister's tubercle make evaluation of screw prominence difficult with conventional fluoroscopic images. Various projections have been described to detect dorsal cortex screw penetration. This cadaveric study is designed to evaluate which described fluoroscopic images are useful to detect dorsal cortex penetration with the use of volar locking plates.

**Methods:** 21 embalmed forearm cadaveric specimens were used. Volar locking plates (Smith & Nephew, Memphis, TN) were secured in position proximally. Four 2.5-mm locking screws were inserted distally using 18 mm, 20 mm, and 22 mm screws in 7 specimens for each length. The specimen was evaluated to count the number of screws breaching the dorsal cortex. Four fluoroscopic images (lateral, 45° supination, 45° pronation, dorsal tangential view) were taken of each wrist. A group of 63 orthopaedic surgeons with different levels of experience were then asked to evaluate if the screws penetrated the dorsal cortex after viewing each image. The data were analyzed for sensitivity and specificity in the evaluation of dorsal screw penetration and interobserver reliability using the interclass correlation coefficient.

**Results:** The 21 cadaveric specimens had an average age of 78 years (range, 25-91). Dorsal cortex screw penetration of at least one screw occurred in 14% (1/7) of specimens with 18 mm screw, 57% (4/7) of specimens with 20 mm screw, and 86% (6/7) specimens with 22 mm screws. The sensitivity of the lateral view was 64.1%, 90.3% on the 45° supination view, 63.9% on the 45° pronation view, and 73.2% on the dorsal tangential view. An increase in the number of years of orthopaedic experience demonstrated an inverse relationship with respect to sensitivity / specificity (Table 1).

**Conclusion:** Dorsal cortex screw penetration can lead to tendon irritation and rupture. This can occur especially with penetration of the third dorsal compartment due to its relationship to Lister's tubercle. This cadaveric study gave us direct visualization of screw penetration to accurately determine which fluoroscopic images detected this breach. The lateral and 45° pronation views detected screw penetration about two-thirds of the time. The sensitivity increased with dorsal tangential views to 73% and the 45° supination view to 90%. Clinicians should consider use of these views to diagnose dorsal screw penetration after volar plating.

**Table 1. Sensitivity and Specificity of the 4 Fluoroscopic Views in Detecting a Screw Penetrating the Dorsal Cortex**

Years Experience	Lateral View		45° Supination View		45° Pronation View		Dorsal Tangential View	
	Se.	Sp.	Se.	Sp.	Se.	Sp.	Se.	Sp.
>10	58.3%	72.5%	88.6%	79.2%	51.0%	66.3%	62.9%	74.2%
6-10	54.0%	81.8%	86.1%	84.7%	50.0%	70.6%	67.4%	80.6%
1-5	57.6%	80.0%	86.4%	80.0%	54.2%	78.3%	66.7%	86.7%
Resident	64.2%	67.1%	90.4%	70.6%	58.8%	61.2%	70.6%	80.6%
Cumulative	64.1%	82.0%	90.3%	78.1%	63.9%	66.7%	73.2%	78.4%

Values expressed as a percentage. Se = sensitivity, Sp = specificity.

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