SCIENTIFIC ARTICLE

Lateral Tilt Wrist Radiograph Using the Contralateral Hand to Position the Wrist After Volar Plating of Distal Radius Fractures

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Purpose Lateral tilt (radially inclined) radiographs are useful after volar locked plate fixation of distal radius fractures to assess the radiocarpal joint, subchondral bone congruity, and volar tilt. The purpose of our study was to define the reliability of our positioning method using the patient's opposite hand to position the injured wrist to obtain an inclined lateral radiograph with good visualization of the subchondral bone.

Methods A retrospective review identified adult patients who had a unilateral distal radius fracture treated with a volar locked plate and who had an initial postoperative lateral tilt radiograph using the contralateral hand to position the injured wrist. Intraoperative fluoroscopic images were reviewed to confirm the ability to see the extra-articular placement of all hardware. The inclined lateral wrist radiograph was obtained by positioning the injured wrist at a height determined by the contralateral hand being placed under the ulnar wrist crease. The wrist was then supported there with firm blocks in all cases. The radiographic beam was directed perpendicular to the horizontal cassette. Two reviewers (authors) then blindly reviewed postoperative radiographs to determine whether the radiocarpal joint and subchondral bone were visualized and whether any screws or pegs appeared to cross the radiocarpal joint. An accceptable lateral tilt radiograph was defined as good visualization of the subchondral bone while allowing only the most radial peg to appear to cross the joint. We also placed 15 normal volunteers into the lateral tilt position, using their opposite hand, to measure the inclined forearm angle.

Results A total of 24 wrists (24 patients) were identified and 23 patients had lateral tilt radiographs with acceptable visualization of the subchondral bone. The concordance of the subchondral bone visualization was 100% (95% confidence interval, 85.5% to 100%). The mean angle with lateral tilt positioning was 18° from horizontal (range, 15° to 23°; standard deviation, 2.4°).

Conclusions Using the contralateral hand to position the lateral inclined view, our lateral tilt position produced radiographs with reliable visualization of the distal radius subchondral bone in 96% of our cases. Visualization of the subchondral bone in the region of the radial aspect of the scaphoid fossa requires more tilt than is achieved with this technique. *(J Hand Surg 2010;35A:900–904. Copyright © 2010 by the American Society for Surgery of the Hand. All rights reserved.)*

Key words: Lateral radiograph, radiocarpal imaging, wrist, distal radius.

From the Mayo Clinic, Rochester, MN.

Received for publication May 28, 2009; accepted in revised form March 4, 2010.

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

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0363-5023/10/35A06-0003$36.00/0
doi:10.1016/j.jhsa.2010.03.010

DISTAL RADIUS FRACTURES are common injuries that can be treated with open reduction and internal fixation using a volar locked plating system.[1] Distal screws or pegs should be placed close to or directly beneath the subchondral bone to act as a buttress against collapse and the loss of reduction.[1] Because the position of the distal pegs or screws varies depending on the position of the plate on the radius and the differing angles of screw placement with reference to the shaft, multiple fluoroscopic views should be taken intraoperatively to verify the extra-articular position of all screws. Several authors have reported various techniques to obtain inclined lateral images, with inclination ranging from 15° to 23°, and have described the importance of these images, as well as stressed the importance of multiple intraoperative fluoroscopic images to carefully visualize the radiocarpal joint and subchondral bone and to inspect for prominent hardware.[2–6]

Following volar locked plating, it is helpful to visualize the subchondral bone and radiocarpal joint with a lateral tilt radiograph. With this view, the subchondral bone can be seen well as the radiographic beam is directed more tangentially, following the inclination of the distal radius. This allows careful inspection for the maintenance of reduction of the fracture. This lateral tilt view also allows the surgeon to more easily assess volar tilt and radiocarpal alignment because the wrist is inclined and the metal implant is thus not obstructing the view of the radiocarpal joint.

Currently, postoperative lateral tilt radiographs are often obtained using multiple radiographs at varying tilt angles or a specially constructed table for positioning the forearm,[2] or using fluoroscopy[6] to obtain this view. We describe a method for reliably obtaining a tilt lateral radiograph that requires no measurement and no special equipment and only one radiograph. This involves using the contralateral hand placed under the injured wrist at the ulnar wrist crease to position the wrist in an inclined position for the subsequent lateral tilt radiograph.

MATERIALS AND METHODS

An institutional review board–approved retrospective chart review identified adult (18 years of age or older) patients with a distal radius fracture who underwent open reduction and internal fixation with a volar locked plate (Hand Innovations, Miami, FL) from July 2008 to January 2009, and who had a lateral tilt radiograph postoperatively. The lateral tilt radiograph was obtained by placing the forearm in neutral rotation on the radiographic cassette. The elbow remained on the horizontal cassette and the contralateral hand was clenched and placed on the cassette and under the distal forearm, just proximal to the ulnar wrist crease of the injured wrist (Fig. 1A). The wrist was then maintained at this height by a firm foam block (or combination of blocks) built to this height and the contralateral hand was removed. We used a 2-inch block and a 1-inch block of firm foam to provide options to support the wrist at the height dictated by the opposite clenched hand. This required using either one or both blocks to achieve sufficient height. The contact point on the distal ulna then could be varied slightly to duplicate the height from the opposite clenched hand. The radiographic beam was positioned perpendicular to the cassette and centered at the radiocarpal joint (Fig. 1B). Radiology technicians obtained all radiographs and all wrists were supported with blocks.

Inclusion within the study required an uninjured contralateral hand and wrist, and a review of all intraoperative fluoroscopic images to confirm both the extra-articular placement of hardware and the ability to visualize the subchondral bone and radiocarpal joint around the implant. We then analyzed the initial postoperative lateral tilt radiographs. The amount of radiocarpal joint and subchondral bone obstruction by the implant was then graded. An accceptable lateral tilt radiograph was defined as either a completely unobstructed view of the radiocarpal joint and subchondral bone or with the allowance of only the most radial styloid screw to "cross" the subchondral bone and joint space, because the radial styloid screw angles the most acutely toward the joint. This was chosen as our definition because the amount of tilt obtained with this technique often allowed for visualization of the lunate fossa and the ulnar portion of the scaphoid fossa, but did not seem to routinely provide enough tilt to see around the most radial screw or peg. The visualization of any other screws (other than the most radial one) across the subchondral line resulted in an unacceptable radiograph, indicating that the inclination was insufficent. We also evaluated radiographs for obliquity in neutral, pronation, or supination, determined by the pisiform position relative to the scaphoid.[7] All radiographs were reviewed by the 2 authors, one fellowship-trained hand surgeon and one hand surgery fellow, who were blinded to the other's interpretation of the data. We identified 24 patients (24 wrists); 6 were male and 18 were female. The mean age was 56 ± 19 years. Postoperative lateral tilt radiographs were taken from August 2008 through February 2009.

To measure the degree of forearm inclination obtained with this technique, 15 normal subjects without