The Retinaculum Flap for Dorsal Fixation of Distal Radius Fractures

Noémie Devaux, MD,* Julia Henning, MD,*† Mathias Haefeli, MD,‡ Philipp Honigmann, MD*

In spite of the more popular volar approach for plating of distal radius fractures (DRFs), there are still indications for dorsal plating and even combined dorsovolar plating in complex DRFs. Dorsal plating carries a concern for complications such as tenosynovitis, extensor tendon adhesions, and delayed extensor tendon ruptures. These risks can be minimized by use of modern low-profile plates and the use of an extensor retinaculum flap to cover the distal plate and screws. We describe the technique of the dorsal retinaculum flap for dorsal plating of DRFs. *(J Hand Surg Am. 2018;43(4):391.e1-e7. Copyright © 2018 by the American Society for Surgery of the Hand. All rights reserved.)*

Key words Open reduction and internal fixation (ORIF), distal radius fracture, dorsal plate, retinaculum flap, complications.

Online Exclusive

As a consequence of innovative plate design, volar plate fixation has become the most popular choice for management of distal radius fractures (DRFs). Several publications have demonstrated lower complication rates with volar open reduction and internal fixation in comparison to dorsal plating.[1–3] However, there are also recently lower complication rates from dorsal plate fixation, resulting from improvements in plate design such as low-profile precontoured dorsal plates with locking screw heads. This has reduced the tendon complications to similar rates as in palmar plating.[4] Recent publications demonstrate no significant differences in overall complication rates[5–7] comparing volar and dorsal approaches. However, more neurological complications are seen in volar approaches[4] and more tendon-related complications with the dorsal approaches. In studies by Simic et al[8] and Chou et al,[3] there were no reported tendon complications following dorsal plate fixation of DRFs; this study employed the technique of using extensor retinaculum to cover the plate beneath the extensor tendons.

Placement of the dorsal plate on the radius deep to the extensor tendons results in complications such as synovitis, tendon ruptures, or adhesions with pain and reduced range of motion. Tendon-related complications (including irritation and tenosynovitis) after dorsal plate fixation are reported between 3.3%[1] and 62.5%[9] and for tendon ruptures between 1.3%[10] and 10%.[11] The most commonly affected extensor compartments for tenosynovitis are the second compartment (23%), the fourth compartment (5%), and the third compartment (3.3%).[12] Although not often reported, the extensor carpi radialis longus (ECRL) or brevis (ECRB) may rupture. Associated ruptures rates for the extensor pollicis longus (EPL) are as high as 1.6% and for the extensor digitorum communis (EDC) up to 10%.[12]

Dorsal wrist pain following dorsal plate fixation is well known[4,10,11] and has been documented between 19%[12] and 94%[13] and is significantly higher than with palmar fixation.[2] This can be explained by the chronic gliding of the tendons against the foreign

*From the Department of Hand Surgery, Kantonsspital, Baselland Liestal, Liestal; the †Department of Plastic and Hand Surgery, Inselspital, Bern; and the ‡Department of Hand Surgery, Kantonsspital, Baden, Switzerland.

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Corresponding author: Philipp Honigmann, MD, Hand Surgery, Kantonsspital Baselland Liestal, Rheinstrasse 26, 4410 Liestal, Switzerland; e-mail: philipp.honigmann@ksbl.ch.

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plate surface. Another postulated cause is the irritation of the terminal articular branch of the posterior interosseous nerve under the plate.[13]

Authors have described using an extensor retinaculum flap to cover the plate in variety of techniques such as U-, V-, Z-shaped flaps from the ulnar or radial side or both sides. There is little published information on how to perform this reconstruction.[2,8,11,14] To minimize the rate of tendon-related complications, we routinely perform an easy and reliable technique of retinaculum flap to cover the plate and protect the extensor tendons of the second compartment. The aim of this article is to describe the surgical steps.

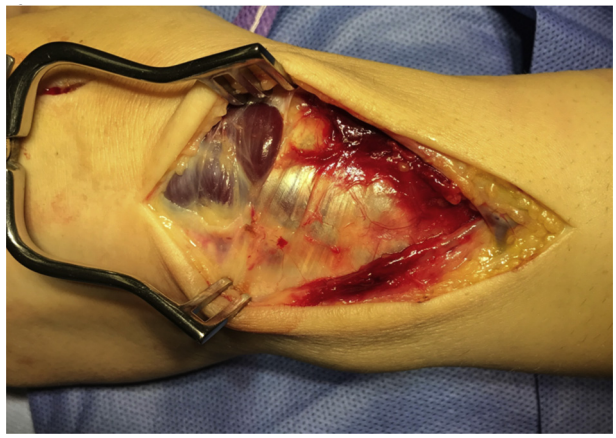

FIGURE 1: Hematoma of the third extensor compartment.

FIGURE 2: Prepared skin incision for the dorsal approach.

INDICATIONS AND CONTRAINDICATIONS

Some complex fracture patterns may warrant a dorsal approach. These include displaced fragments of the dorsoulnar corner type C1.2 and C2.1 according to the AO classification of distal radius fractures,[15] irreducible intra-articular or extended extra-/intra-articular dorsal comminution that cannot be reduced by ligamentotaxis only or difficult to access/address from palmar (ie, AO B2/C3, die punch, type III/IV Fernandez classification[16]), and in the presence of bony or ligament lesions especially of the proximal carpal row.[1,17]

The dorsal approach to the distal radius gives several advantages: reduction of intra-articular fragments under direct visual control by dorsal arthrotomy (AO B-type),[17] the diagnosis and treatment of concomitant lesions of carpal bones and ligaments (scaphoid fracture, scapholunate ligament rupture, triangular fibrocartilage complex lesion), the release of the EPL tendon from fracture pieces, and allows hematoma evacuation from the third compartment, which could also lead to EPL rupture, and to evaluate any tendon lesions from fracture fragments. Central depressed fragments can be elevated and augmented and fragments of the dorsal ulnar corner can be controlled and fixed.

Contraindications to the dorsal approach are volar angulated fractures (Smith), volar shear fracture (Barton, AO B3), or isolated marginal fractures of the lunate facet,[17] and in cases of poor dorsal soft tissue. A combined dorsal and volar approach with a buttressing volar plate may also be required in cases of additional volar instability or to specifically address a volar lunate facet fragment of the volar ulnar corner.[18]

The creation of a retinaculum flap to cover the plate is always indicated, except in rare cases where the deep part of the second compartment is completely intact and its closure is possible without tension.

SURGICAL ANATOMY

In contrast to the relatively flat bone surface of the volar distal radius, which is covered by the pronator quadratus muscle, the dorsal aspect of the radius is convex, triangular-shaped like a tent, with the Lister tubercle most distally as a gable. The periosteal surface of the dorsal aspect is confluent with the floor of the extensor compartments. The thick tendons of ECRL and ECRB run through the second compartment on the radial side of Lister tubercle with the deep part of this compartment being very thin.[17] The third compartment contains the EPL that is situated immediately ulnar to the Lister tubercle using it as a fulcrum to retropulse the thumb. The EPL is at risk of injury during DRFs involving the Lister tubercle in 2 ways: first, by direct injury from sharp bone fragments and, second, by ischemia resulting from hematoma and swelling within the tight compartment (Fig. 1). The extensor indicis and EDC lie on the ulnar side of the radius in the fourth compartment,