Late Repair of Combined Extensor Carpi Radialis Longus and Brevis Avulsion Fractures

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Abstract: Concomitant avulsion fractures of the extensor carpi radialis longus and brevis tendons are relatively rare injuries. The usual injury mechanism is forced hyperflexion to an actively extended wrist. No consensus exists regarding the appropriate management of this injury, with some surgeons advocating closed treatment and others favoring operative fixation. The authors describe a novel surgical technique for the late repair of combined extensor carpi radialis longus and brevis tendon avulsion using suture anchor repair of the extensor carpi radialis brevis and tenodesis of the retracted extensor carpi radialis longus to the brevis.

Combined extensor carpi radialis longus (ECRL) and extensor carpi radialis brevis (ECRB) avulsion fractures are relatively rare, with fewer than 5 incidents reported in the literature.1,2 These injuries can be difficult to diagnose in the acute setting and are often missed on initial presentation. Once diagnosed, appropriate management of these injuries is a subject of debate, with some surgeons advocating closed treatment and others advocating operative fixation. In the few reports of concomitant ipsilateral ECRL and ECRB avulsion fractures, early operative fixation has generally been favored, with techniques ranging from suture anchor to K-wire fixation.3,4 However, a late repair using suture anchor fixation of the ECRB into the third metacarpal base with tenodesis of the retracted ECRL to the ECRB has not been reported in the literature.

CASE REPORT
A 33-year-old right-hand–dominant automobile plant worker presented to an outside facility with right dorsal wrist pain and limited wrist extension after a fall from a standing position. He described a mechanism whereby his extended wrist was forced into flexion by the fall. Initial radiographs showed minimally displaced fractures of the second and third metacarpal bases with a bony fragment of unknown etiology over the radiocarpal joint (Figure 1). No tendon injury was suspected, and the arm was immobilized using a short arm cast while placed in the neutral position.

After 2 weeks, the cast was removed. The patient continued to report dorsal right wrist pain with limited active wrist extension. Magnetic resonance imaging showed intact extensor tendons without evidence of a tear or avulsion. The wrist pain continued to be severe and limiting. On physical examination, there was limited active wrist extension, which improved to 30 degrees with the wrist in neutral rotation. The patient was referred to the Department of Orthopaedic Surgery, Greenville Health System, Greenville, South Carolina.

Figure 1: Preoperative lateral (A) and posteroanterior (B) radiographs of the injured wrist.
imaging of the wrist showed bony avulsion of the ECRL with 3 cm of retraction and avulsion of the ECRB with 5 mm of retraction.

Approximately 5 weeks after the initial injury, the patient presented to the authors’ institution for surgical consultation. He reported continued dorsal wrist pain with limited wrist extension. On physical examination, the patient had 60° of passive wrist extension but only 20° of active extension. In addition, his wrist deviated ulnarly during attempted wrist extension. The patient was unsatisfied with this level of function and was concerned that his potential future with a lack of active wrist extension could prohibit him from returning to his job at the automobile plant. After thorough discussion of the nature of his injury and the risks of surgery, operative fixation of the avulsion fractures was planned.

**Surgical Technique**

A 6-cm longitudinal incision was made over the dorsum of the hand centered over Lister’s tubercle. Dissection was carried through the floor of the third dorsal compartment. On dissection over the radiocarpal joint, a large fragment of bone still attached to the distal aspect of the ECRL was encountered. The ECRL and attached bone had retracted approximately 3 cm from its normal insertion on the second metacarpal base. Due to the degree of contracture and chronicity of the injury, the ECRL could not be repaired to its anatomic insertion despite extensive mobilization. On distal dissection, it was noted that the ECRB was also avulsed from its insertion on the third metacarpal base, but it had only retracted approximately 5 mm. It also contained attached bone.

The remaining bony fragments attached to both the ECRL and ECRB were debrided. The ECRL was tenodesed to the ECRB using a side-to-side technique with a 3-0 Ethibond suture (Ethicon, San Angelo, Texas). The ECRB was then anatomically reinserted onto its insertion on the third metacarpal using 2 mini-Mitek suture anchors (DePuy Mitek, Raynham, Massachusetts). The first suture anchor was placed in the third metacarpal fracture bed and the second was placed slightly distal to provide additional repair strength for the construct (Figure 2). First, the suture from the more proximal anchor was woven through the ECRB tendon using a Krackow stitch. Next, the suture from the more distal anchor was woven through the ECRB tendon in a volar-to-dorsal direction using a horizontal mattress pattern (Figure 3).

The wrist was then placed in full extension. The suture from the more proximal anchor was tensioned and tied first to enable anatomic fixation of the ECRB into its footprint. The suture from the more distal anchor was tensioned and tied next. Due to its horizontal mattress configuration, the suture from the second anchor enabled dorsal-to-volar compression of the tendon to its insertion site. At the conclusion of the procedure, the arm was placed in a volar splint with the wrist in full extension.

The patient was examined 1 week postoperatively. His sutures were removed, and he was placed in a thermoplastic splint in approximately 40° of wrist extension. He began occupational therapy the following day, with instructions to begin passive wrist extension from 20° to 60°. At 4 weeks postoperatively, passive wrist extension was advanced from 0° to 60°. Active wrist extension and active wrist flexion were started 6 weeks postoperatively, followed by wrist extension against resistance at 8 weeks postoperatively.

**DISCUSSION**

Combined avulsion fractures of the base of the second and third metacarpals are rare injuries. The typical history is one of forced wrist flexion with resulting wrist extensor weakness and a painful lump on the dorsum of the hand. However, these injuries can be subtle and are often missed on initial presentation. For the current patient, magnetic resonance imaging assisted in making a definitive diagnosis.

No conclusive guidelines exist for the management of combined ECRL and ECRB avulsions. Some studies have shown that both operative and nonoperative management of these injuries can restore
full wrist extensor function, whereas others argue that open reduction and internal fixation better restores wrist extensor strength.

The current patient was offered surgical fixation due to his severely compromised wrist extension and potential problems from the bony fragment located over the dorsum of his radiocarpal joint. Overall, he did well after his surgery and was pleased with the result. By his 4-month postoperative examination, he had gained active wrist extension to 55° and had already returned to his regular job at the automobile plant.

This report is the first to describe late repair of the ERCB into the third metacarpal base with tenodesis of the retracted ECRL to the ECRB using suture anchor fixation. Given the patient’s overall good outcome, the authors advocate use of this technique in similar late wrist extensor tendon repairs.

REFERENCES