Is early hardware removal compulsory after retention of angled drill guides in palmar locking plates? The role of pronator quadratus reconstruction

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Abstract Palmar plate fixation is becoming a well recognized treatment for distal radial fracture. Tendon ruptures or irritations have been reported after this procedure. Inadvertent retention of angled drill guides useful for easy placement of locking screws in proper direction in volar plating can represent a high risk of secondary tendon rupture. In this case, we presented our experience in one patient in whom drill guides removal could be delayed for one year and summarized our techniques to prevent the aforementioned complications.

Key words: Radius fractures; Volar plates; Complications

CASE REPORT

A 56-year-old woman who fell on the outstretched wrist and sustained a closed extra-articular distal radius fracture was referred to our institution four weeks after trauma. The radiographs showed 40° of dorsal angulation with dorsal comminution at the distal radius. Initial bone callus formation was detectable at the fracture site (Figures 1A and 1B).

Preoperatively a consent form describing the surgical technique including hardware removal at 1 year in case of “plate intolerance” was discussed and signed. The patient underwent a corrective osteotomy through a flexor carpi radialis (FCR) extended approach.1 The distal and radial borders of the pronator quadratus were elevated and the volar aspect of the radius was exposed subperiosteally. After volar tilt restoration and anatomic reduction, internal fixation was performed with a distal volar radius (DVR) locking plate (Hand Innovations, Miami, Florida, USA). The proximal row of the plate was filled with locking screws and all screws except one were used in the distal row. All screws were completely locked down in order to avoid tendon irritation and maintain the position of fracture fragments. One drill guide was inadvertently left in place. After fixation, the pronator quadratus muscle was repaired with absorbable suture material to cover the plate and creating a gliding layer for flexor tendons. Postoperative radiographs showed one retained angled drill guide (Figure 2).
The radiographs were shown to the patient and removal of the plate and drill guides was fixed at one year after the operation. Eleven months later, with fracture-healing confirmed, the plate and drill guides were removed without incident. Neither tendon ruptures nor flexor tendon tenosynovitis were detectable intraoperatively over the muscle layer that covered the plate. At the one-year follow-up, the patient had full range of motion of the wrist, with early return to work without difficulty (Figures 3A and 3B).

**DISCUSSION**

Despite the recent popularity of volar plating for dorsally displaced distal radius fractures, there is a paucity of data documenting the results of this treatment method. In spite of excellent preliminary results, a few reports describe potential hardware-related tendon complications. In 2002, Orbay and Fernandez reported 1 case of extensor tendon irritation from a long peg in their series of dorsally displaced fractures. In 2003, Drobetz and Kutscha-Lissberg described the ruptures of flexor pollicis longus tendon in six cases using the Mathys plate. In 2006, Al-Rashid described three extensor tendon ruptures due to prominent screws on the opposite dorsal cortex. Rozental described two cases of flexor carpi radialis irritation with concomitant subluxation of the flexor pollicis longus tendon over the plate. In 2008, Cross and Schmidt described two cases of flexor tendon ruptures following locking plate fixation. Arora described 2% of extensor pollicis longus (EPL) and 3% of flexor pollicis longus (FPL) rupture rate with the use of a palmar locking-plate system.

Ultrasound examination can represent a helpful tool to detect “early” screw impingement on tendons in the distal third of the forearm after volar plating. It seems obvious that an abnormal impingement between the plate or screws and flexor tendons on the volar side of the wrist can lead to secondary ruptures and early hardware removal is mandatory. Bhattacharyya described three cases of inadvertent retention of angled drill guides after locking plate fixation. In the first case, nine months postoperatively, the patient presented with a spontaneous rupture of the flexor digitorum profundus tendon to the index finger. In the second case, the plate and drill guides were removed without incident at three months. In the third case, the patient underwent immediate guide removal postoperatively. On the basis of the three
cases, he suggested removing all the guides left inadvertently in place “as soon as possible” so as to prevent flexor tendon ruptures.

From our experience, we underline the importance for flexor tendons to glide on bone, not the edge of the plate. The pronator quadratus either directly repaired or sutured onto the brachioradialis distal tendon represents an anatomic thick gliding layer for flexor tendons. We confirm the following points to prevent retained angled drill guides: taking intraoperative X-rays before closing the skin, filling all the screw holes and palpating the plate prior to closure.

In addition, the number of drill guides can be counted and recorded at the beginning of surgical procedures. Each drill guide removed is placed in a sterile box. Prior to closure, the number of drill guides within the sterile box should equal the number on the plate. In case of inadvertent retention of angled drill guides, immediate return to the operating room is “not” mandatory if the pronator quadratus muscle has been previously reconstructed to prevent the flexor tendons from rubbing directly against plate. So hardware removal can be delayed for one year as previously fixed in the consent form.

REFERENCES


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