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Original article

In vivo confirmation of the reliability of the dorsal tangential view of the wrist

Confirmation in vivo de la fiabilité de l'incidence dorsale tangentielle du poignet

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ABSTRACT

The purpose of the study was to evaluate the reliability of the dorsal tangential view (DTV) of the wrist using direct visualization of the extensor compartments in vivo. Twelve patients with extensor tendon complications [nine patients with extensor synovitis, two patients with isolated extensor pollicis longus (EPL) rupture, one patient with EPL and extensor indicis proprius rupture] after volar plating of a distal radius fracture were enrolled in the study. We obtained DTVs in the operating room before implant removal and explored the extensor compartments during synovectomy or tendon reconstruction to confirm suspected screw penetration. We confirmed screw penetration on 10 patients during exploration of the extensor compartments. DTV was able to detect seven of these dorsal cortex breaches. There were no false positive results, which we had defined as a screw penetrating an extensor compartment preoperatively, but not visible on the DTV. Of these seven breaches, one was in the second compartment, four were in the third compartment, and the remaining two were in the fourth compartment. The DTV is sufficiently reliable to be used routinely to reduce postoperative extensor tendon complications during volar plating of the distal radius.
Level of evidence: 4 (case series) diagnostic.

Mots clés :
Incidence tangentielle dorsale
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Tendons extenseurs
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RÉSUMÉ

Cette étude avait pour but l'évaluation de la fiabilité de l'incidence dorsale tangentielle (IDT) par la visualisation directe des compartiments des extenseurs in vivo. Douze patients présentant des complications au niveau des tendons extenseurs (neuf ténosynovites des extenseurs, deux ruptures isolées de l'extensor pollicis longus EPL, un patient avec rupture de l'EPL et de l'extensor indicis proprius) après ostéosynthèse d'une fracture distale du radius par plaque antérieure ont été inclus dans l'étude. Les IDT ont été réalisées en salle d'opération avant l'ablation de l'implant et les compartiments des extenseurs ont été explorés pendant la synovectomie ou la reconstruction tendineuse pour confirmer les saillies soupçonnées de l'extrémité des vis. La pénétration de l'extrémité des vis a été confirmée chez dix patients pendant l'exploration des compartiments des extenseurs. L'IDT a permis la détection de sept de ces violations de la corticale dorsale. Il n'y avait aucun faux positif défini comme le constat peropératoire d'une vis pénétrant dans un compartiment des extenseurs, mais invisible sur l'IDT. Sur ces sept violations, une était dans le 2^{e} compartiment, quatre étaient dans le 3^{e} compartiment et deux dans le 4^{e} compartiment. En conclusion, l'utilisation systématique de l'IDT est nécessaire pour réduire les complications postopératoires intéressant les tendons extenseurs lors de l'ostéosynthèse par plaque antérieure des fractures distales du radius.
Niveau de preuve. – 4 (série de cas de diagnostic).

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1. Introduction

Extensor tendon rupture after volar plating of a distal radius fracture (DRF) is a well-known complication. Irritation of a dorsally-comminuted fracture or tendon entrapment between fracture fragments may lead to this complication, but these are rare cases (0.07% to 0.88% of patients with DRF) [1–3]. Most of the time, the cause of extensor tendon rupture is a screw-tip penetrating through the dorsal cortex and chronically irritating the extensor tendons [4–7].

It is difficult to detect screw penetration with standard AP and lateral views. The individual and the combined height of Lister's tubercle and depth of the extensor pollicis longus (EPL) groove are considerable. These variations may confuse surgeons on lateral fluoroscopic views and mislead them about a dorsal penetrating screw-tip [8].

To overcome this problem, pronation and supination views were described to detect dorsal screw penetration in addition to the lateral view of the wrist [9,10]. Despite the combined use of these views with standard AP and lateral views, dorsal screw penetration may still be unnoticed, especially on the ulnar side of Lister's tubercle [11,12].

The dorsal tangential view (DTV) of the wrist is an additional option to detect dorsal penetrating screws. Studies with this view showed that it can increase the likelihood of detecting dorsal screw penetration intraoperatively [12,13]. However, there are questions about the reliability of DTV when the second extensor compartment is penetrated by a screw [14].

We studied the reliability of DTV under direct visualization of the extensor compartments during removal of symptomatic hardware.

2. Material and methods

We included patients in the study who had extensor synovitis or extensor tendon rupture after volar plating of DRF. Before the volar plate was removed, we took a DTV of the wrist to detect protruding screw-tips and to check the extensor compartments for penetrating screw-tips while performing synovectomy or tendon transfer to confirm the DTV findings. DTV was obtained by live fluoroscopy with the wrist in a hyperflexed position. The fluoroscopic beam was aimed 0–30 degrees off-axis to the forearm until Lister's tubercle was visible at its highest point (Fig. 1).

Twelve patients were included in the study. Nine patients had extensor tendon synovitis that could not be managed conservatively. Symptoms were: pain during finger and wrist extension and swelling of the extensor tendon sheaths around the wrist. Patients had crepitation on the dorsal aspect of the wrist when they were asked to move their fingers, but there was no screw-tip palpable on the dorsal aspect of the radius. Three patients were referred to the clinic because they were unable to extend their thumb after a sharp pain occurred during daily activity.

We included only patients who were already undergoing an exploration of extensor compartments for synovectomy or tendon reconstruction and did not perform any additional incisions or explorations on these patients.

3. Results

Exploration of extensor compartments during synovectomy and tendon transfers showed screw penetration into the extensor compartments in 10 patients. Two patients had no screw penetration in the dorsal compartments: one had a bony spur that was irritating the extensor digitorum (ED) in the fourth compartment, and the other had partially damaged ED tendons of third and fourth fingers that may have been caused by overdrilling of the dorsal cortex during the initial procedure.

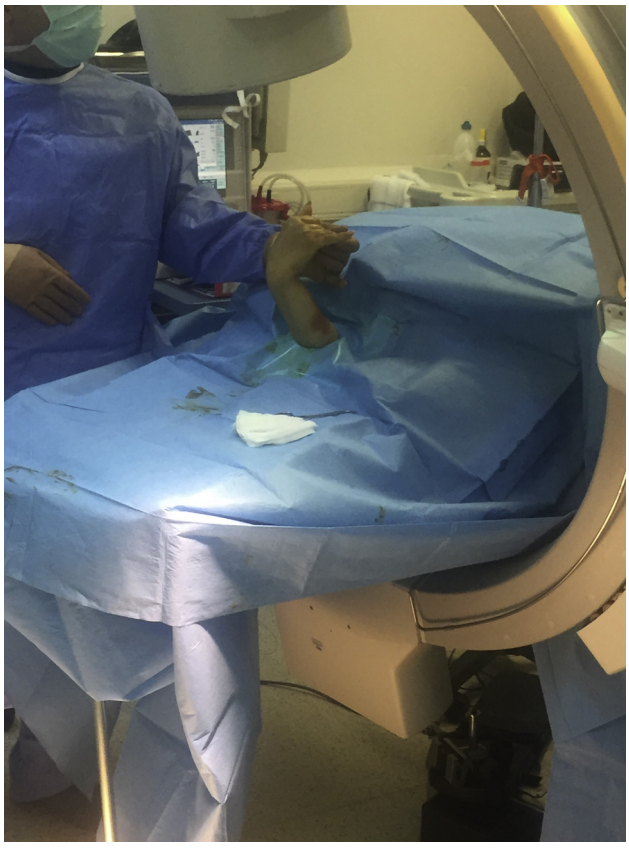

Fig. 1. Alignment under continuous fluoroscopy to obtain a clear view of the dorsal rim.

Of the three patients with loss of thumb extension, two had isolated extensor pollicis longus (EPL) tendon rupture and one had EPL and extensor indicis (EIP) rupture (single variable angle oblique screw damaged both adjacent tendons). Two were treated with EIP to EPL transfer and one was treated with a palmaris longus tendon graft. Exploration showed a breach of the third extensor compartment by a screw-tip in these patients (Figs. 2 and 3).

Seven patients had extensor tendon synovitis due to screw penetration in the dorsal cortex. Two patients had screw penetration in the second compartment, one in the third compartment and four in the fourth compartment (Fig. 4).

DTVs obtained by fluoroscopy before dorsal exploration and implant removal detected screw penetration in seven patients. There were no false positive results, which we defined as a screw penetrating an extensor compartment preoperatively on the DTV, but not visible during compartment exploration. Of these seven breaches, one was in the second compartment, four were in the third compartment, and the remaining two were in the fourth compartment. In three patients, the screw penetration found during surgical exploration was not detected with the DTV.

4. Discussion

This study showed that routine use of DTV in the operating room helps to avoid extensor tendon complications after volar plating. Previous studies have shown a decreased sensitivity of DTV for second and fourth compartment breaches [10,12,14,15]. While our results were similar, the small sample size prevented us from drawing any statistical conclusions.

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