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Original article

## Results of conservative treatment of volar plate sprains of the proximal interphalangeal joint with and without avulsion fracture

*Résultat du traitement conservateur des entorses de la plaque palmaire des IPP des doigts avec versus sans arrachement osseux*

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### Abstract

The prognosis of isolated volar plate sprains of the proximal interphalangeal (PIP) joint is related to the extension deficit. Some consider an associated avulsion fracture as a sign of severity. The goal of this study was to find out whether the outcomes of conservative treatment in PIP volar plate injury was impacted by the presence of an avulsion fracture. Our series included 75 patients, 27 years old on average, of which 58 were men. All sprains were stable. The X-rays were normal in 52 cases (group 1); an avulsion fracture was found in 23 cases (group 2). The patients were treated by buddy taping during the day and a straight finger splint at night for 3 weeks. At the last follow-up, no significant difference was found between the two groups regarding pain, extension/flexion range of motion or edema. The results of this study show that the prognosis of conservative treatment of PIP volar plate injuries does not depend on the presence of an avulsion fracture.

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*Keywords:* Volar plate; Sprain; Proximal interphalangeal; Finger; Avulsion fracture

### Résumé

Le pronostic des entorses isolées de la plaque palmaire des articulations interphalangiennes proximales (IPP) est lié au déficit résiduel d'extension. Certains considèrent un arrachement osseux comme un signe de gravité. Le but de cette étude était de vérifier si le résultat du traitement conservateur des entorses de la plaque palmaire des IPP dépendait ou non de l'existence d'un arrachement osseux. Notre série comportait 75 patients d'âge moyen 27 ans, dont 58 hommes. Toutes les entorses étaient stables. La radiographie était normale 52 fois (groupe 1) et montrait un arrachement osseux 23 fois (groupe 2). Les patients ont été traités par syndactylie diurne et orthèse en rectitude nocturne pendant 3 semaines. Au dernier recul, aucune différence significative n'était trouvée dans les 2 groupes concernant la douleur, la mobilité en flexion/extension et l'œdème. Les résultats de cette étude ont montré que le pronostic du traitement conservateur des entorses de la plaque palmaire des IPP des doigts ne dépendait pas de l'existence d'un arrachement osseux.

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*Mots clés :* Plaque palmaire ; Entorse ; Interphalangiennne proximale ; Doigt ; Arrachement osseux

### 1. Introduction

Isolated proximal interphalangeal (PIP) joint volar plate injuries are common [1]. Most authors suggest conservative treatment [2], usually by taping the injured finger to a healthy

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neighboring finger [3] and/or a sustained extension splint [4]. In the absence of treatment, the short-term complication is an active extension deficit [5] and osteoarthritis in the long-term [6]. The prognosis depends of the promptness of the treatment; the extension deficit is usually permanent 6 months after the injury event [7]. To some authors, the presence of an avulsion fracture on X-rays is a sign of a more serious injury [8], although this claim has never been confirmed by any published study.

The aim of this study was to determine whether the result of conservative treatment for volar plate injuries of the PIP joint depended on the presence of an avulsion fracture.

## 2. Patients and methods

This retrospective study gathered the files of patients who suffered an indirect injury to the PIP joint in hyperextension and were treated in our surgery department between May 2015 and February 2016. We included patients who had injured their PIP joint in hyperextension but had stable ligament testing in all planes, consistent with an isolated volar plate sprain. We excluded patients under 18, patients with an articular fracture of the middle phalanx associated with sagittal plane instability, patients with an associated dislocation even when it was stable after reduction, and patients with instability in the frontal plane.

One hundred and twenty-seven patients were lost to follow-up. Our case series included 75 patients, aged 27 years old on average (range 19 to 63 years), of which 58 were men. Lateral X-rays were normal in 52 cases (group 1) and showed an avulsion fracture at the volar aspect of the base of the middle phalanx in 23 cases (group 2) (Fig. 1).



Fig. 1. Lateral X-ray of a PIP joint volar plate injury with an avulsion fracture at the volar aspect of the base of the middle phalanx (arrow).

All patients were treated using the same protocol for the first 3 weeks that involved mobilization of the PIP joint through buddy taping to the adjacent finger during the day and immobilization of the proximal and distal interphalangeal joints by a straight volar splint at night. Sport participation was allowed after 6 weeks.

The evaluation consisted of gathering the following data at the last follow-up: pain levels evaluated with a visual analog scale ranging from 0 (no pain) to 10 (worst imaginable pain), active range of motion of the PIP joint in flexion and extension in degrees, presence or absence of edema.

The statistical analysis consisted first of verifying that the follow-up between the two groups was comparable. Since the distribution of the follow-up variable was asymmetrical, a Mann-Whitney test was used to compare the median of the two groups. Since this difference was not statistically significant ( $P = 0.7971$ ), the two groups could be compared. Next, the following four unpaired variables – pain, extension, flexion, and edema – were first verified by a Shapiro-Wilk test to determine if they were symmetrical. Since the “pain” and “edema” variables were symmetrical, a Fischer’s exact test was used to compare the percentages of the two groups, with a significance threshold at 0.05. Since the “extension” and “flexion” variables were asymmetrical, a Mann-Whitney test was used to compare the median of the two groups with a significance threshold at 0.05.

## 3. Results

The results are given in Tables 1 and 2. In our study, the mean follow-up was 4.5 weeks. At the last follow-up, the average pain level was 0.65/10 in group 1 and 0.91/10 in group 2. The difference was not statistically significant ( $P = 0.79$ ). The average PIP extension was  $-2^\circ$  in group 1 and  $-0.68^\circ$  in group 2. The difference was not statistically significant ( $P = 0.24$ ). The average PIP flexion was  $86^\circ$  in group 1 and  $85^\circ$  in group 2. The difference was not statistically significant ( $P = 0.18$ ). We found an 11.5% edema rate in group 1 and 13% in group 2. The difference was not statistically significant ( $P = 1$ ).

## 4. Discussion

The volar plate of the PIP joint in the long fingers is a very strong ligament structure that limits passive hyperextension. It can be injured during forced hyperextension of the PIP joint [6]. We differentiate dislocations and unstable fractures (affecting more than one-third of the articular surface for which a surgical treatment can be performed [1]) from volar plate sprains (for which the treatment is always conservative [2,7]). The presence of instability in the frontal plane is a sign of associated collateral ligament damage. The diagnosis of isolated volar plate sprain is clinical [6]. X-rays are used to define the type of lesion, based on the presence of an avulsion fracture at the base of the middle phalanx (distal avulsion) or not (tear in the middle of the ligament).

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