Pull-out suture method for treatment of volar plate avulsion fractures

Yoshiki Okuda¹, Masafumi Matsuki¹, Maki Asada², Hiroyoshi Fujiwara²
1 Department of Orthopedics, Kyoto Second Red Cross Hospital Kyoto, Japan
2 Department of Orthopaedics, Kyoto Prefectural University of Medicine Kyoto, Japan

【Objective】
Internal fixation of volar plate avulsion fractures caused by hyperextension injury are sometimes difficult to treat because of the small size of the fragment. We report the short-term results of a new method of open internal fixation by the pull-out method using a polyamide suture.

【Methods】
☐ PERIOD : January/2008 ~ September /2016
☐ INJURED FINGER : 2 index, 2 middle, 3 ring and 10 little fingers
☐ CASES : 17 patients 17 fingers
☐ SEX : 7 men and 10 women
☐ MEAN AGE AT INJURED : 28.9 years (12~40 years)
☐ A WAITED MEAN TIME BEFORE SURGERY : 7 days (1~12 days)
☐ CAUSE OF INJURY : Falls in 8 fingers, Sports activity in 9 fingers
☐ A MEAN FOLLOW-UP PERIOD : 7.8 months (4~9 months)

【Surgical method】
* Surgical indication : Either a displacement of 2mm or more or rotated displacement
* Local anesthesia ; Intratenosynovial block

Volar approach was applied. Either the small avulsed fragment of middle phalanx or volar plate was pulled out to the dorsal side through the two small bone holes.

The reduced fragment was fixated by pulling out a 2-0 polyamide suture to the dorsal side tied over a button. The position of the PIP joint was slightly extended.

The range of motion exercises were initiated from the day after surgery. A dorsal splint was applied for 2 weeks. The suture button was removed 1 month after surgery.

【Results】
• Bone union was achieved in all cases.
• The average range of motion of the PIP joint was -5 degrees extension and 94 degrees flexion at the final follow-up.
• 95% total arc of motion compared to the unaffected side.

【Case 1】a 39 year old female
She fell down and pointed her left little finger to the ground, visited our hospital 5 days after the onset.

【Case 2】a 12 year old girl
She sprained her left little finger in playing basketball, visited our hospital 3 days after the onset.

【Discussion】
Treatment of volar plate avulsion fractures of the proximal interphalangeal joint

Fragments size
Small : Conservative therapy ( buddy taping ) etc.
Large : Pinning, ORIF, Pull-out wire, Extraction etc.

In cases of larger or displaced fragments, restricted range of motion or osteoarthritis may occur if proper treatment is not administered.

- Long-term pain due to non-union. ( Wollebn R, 2006)
- Positively achieve bone fusion. ( Nish G, 2001)

Achieve good internal fixation?

The pull-out method using 2-0 ETHILON® (polyamide suture)

<table>
<thead>
<tr>
<th>US Pharmacopeia</th>
<th>Diameter(mm)</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Absorbable</td>
</tr>
<tr>
<td>4-0</td>
<td>0.150~0.199</td>
<td>0.95</td>
</tr>
<tr>
<td>3-0</td>
<td>0.200~0.249</td>
<td>1.77</td>
</tr>
<tr>
<td>2-0</td>
<td>0.300~0.339</td>
<td>2.68</td>
</tr>
<tr>
<td>0</td>
<td>0.350~0.399</td>
<td>3.90</td>
</tr>
<tr>
<td>1</td>
<td>0.400~0.499</td>
<td>5.08</td>
</tr>
<tr>
<td>2</td>
<td>0.500~0.599</td>
<td>6.35</td>
</tr>
</tbody>
</table>

Monofilament
Not twist like the pull-out wire
Enough tensile strength
Fixate the bone fragment with minimal invasion
Easy removal

Early ROM training is possible while holding bone fragments.

【Conclusions】
➢ We performed surgeries with the pull-out suture method using a polyamide suture for volar plate avulsion fractures of the proximal interphalangeal joint and reported the results.
➢ The pullout method using a polyamide suture is an effective option for the treatment of volar plate avulsion fractures.