Effectiveness of Local Tenoxicam Versus Corticosteroid Injection for Plantar Fasciitis Treatment

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abstract

Plantar fasciitis is one of the most common causes of foot pain in adults. In this prospective study, the outcomes of local tenoxicam injection and corticosteroid therapy for the treatment of plantar fasciitis were compared.

Patients were randomly assigned to either the tenoxicam or corticosteroid group. The tenoxicam group (n=31) was treated using a local injection of 1 mL of tenoxicam (20 mg/2 mL) and 1 mL of 2% lidocaine, whereas the steroid group (n=30) was treated with a local 1-mL injection containing 40 mg of methylprednisolone acetate and 1 mL of 2% lidocaine. Clinical evaluations, which were performed before the injection and 6 and 12 months after the injection, consisted of patient-assessed pain using a visual analog scale. In addition, patient satisfaction was measured using the Roles and Maudsley score. Comparison of pre- and posttreatment visual analog scale scores demonstrated a statistically significant difference in both groups (P < .05). Furthermore, no significant difference was found between the steroid and tenoxicam groups in terms of visual analog scale scores measured 12 months after injection (P > .05).

The tenoxicam injection was not significantly more effective than the corticosteroid injection. However, both methods were effective and successful in treating patients with plantar fasciitis. Tenoxicam therapy appears to provide pain relief, but its effectiveness in the long term should be explored in additional studies.

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The authors have no relevant financial relationships to disclose.

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doi: 10.3928/01477447-20130920-27
Plantar fasciitis, which is one of the most common causes of foot pain in adults, is an inflammation of the plantar fascia. However, etiopathological studies have shown that it is a degenerative process (e.g., noninflammatory fasciitis, fasciosis) of the plantar fascia that results from repeated trauma at its origin site on the calcaneus. The cause of degeneration is recurrent microtears of the plantar fascia that overcome the body’s capacity to repair itself. Calcaneal spurs (i.e., epin calcanei) at the plantar fascia insertion site can be observed on lateral foot radiographs. These spurs are often completely asymptomatic, although the spurs are visible on radiographs. However, local pressure to the medial edge of the calcaneus may be painful.

Various therapies have been used to treat plantar fasciitis. Local injection of corticosteroids is commonly used, although complications, such as plantar fascia rupture, osteomyelitis, or recurrent pain, are possible. Nonsteroidal anti-inflammatory drugs (NSAIDs), including tenoxicam, are also widely used to treat fasciitis. Local tenoxicam injection has not been reported for plantar fasciitis treatment in the English literature.

The authors hypothesized that the treatment of plantar fasciitis with a tenoxicam injection is more effective than a corticosteroid injection. The outcomes of local tenoxicam injection and corticosteroid therapy for the treatment of plantar fasciitis were compared.

### MATERIALS AND METHODS

#### Study Population and Design

This prospective, randomized, controlled study was conducted with ethics committee approval. Informed consent was obtained from all patients. The patients were randomly allocated to the tenoxicam group or the corticosteroid group by the drawing of lots, and the patients were not informed of the randomization results. All patients and the study investigators were blinded to the patient groups for the duration of the study.

Patients included in the study were diagnosed with plantar fasciitis between February 2010 and March 2012 using the following clinical criteria: localized tenderness at the plantar fascia insertion site, start-up pain after rest, and negative radiographic findings to exclude other causes of heel pain. Patients who were diagnosed with plantar fasciitis and who had been treated conservatively (e.g., oral NSAIDs, stretching, custom or nonprescription orthoses, heel cups) for more than 3 months but had no signs of improvement were included in the study. In addition, patients who reported a visual analog scale (VAS) pain score greater than 6, which was measured after taking initial steps in the morning, were included in the study.

Exclusion criteria were the following: patients younger than 18 years or older than 60 years; patients with symptoms that lasted less than 3 months or more than 12 months; bilateral plantar fasciitis; history of any previous injection treatment or surgery for heel pain; history of tarsal tunnel syndrome or effusion around the ankle, indicative of intra-articular disease; calcaneal fracture; calcaneal bone cysts; malignancy; osteomyelitis; abnormal erythrocyte sedimentation rate or C-reactive protein level; systemic disorders (e.g., rheumatoid arthritis, hematological diseases, diabetes mellitus, or gout); or pregnancy.

#### Therapy

The tenoxicam group (n = 31) was treated with a local injection of 1 mL of tenoxicam (20 mg/2 mL) and 1 mL of 2% lidocaine; the steroid group (n = 30) was treated with a local 1-mL injection of 40 mg of methylprednisolone acetate and 1 mL of 2% lidocaine. Only a single injection was administered in both groups.

#### Injection Technique

The injections were administered blindly by the same physician (S.G.). Patient were placed in the supine position. The medial approach was used when the injection was administered. The most painful site of the medial aspect of heel was identified by palpation. Proper preparation with antiseptic solution of the skin overlying this point was performed. Subsequently, either 2 mL of tenoxicam (1 mL of tenoxicam and 1 mL of lidocaine) or 2 mL of steroid (1 mL of methylprednisolone and 1 mL of lidocaine) were injected using a 22-gauge needle into the plantar fasciitis following a peppering technique. This peppering technique involved a single skin portal and penetrations of the fascia.

#### Postinjection Protocol

After the injection, patients were kept in the sitting position without moving the foot for 10 minutes. Patients were released with orders to limit the use of their feet for approximately 4 weeks. After 48 hours, patients were given the stretching protocol by a physiotherapist. A formal strengthening program was initiated after the stretching exercise. Four weeks after the injection, patients were allowed to proceed with normal sports or recreational activities as tolerated. Any type of foot orthoses was not encouraged.

#### Evaluation

The basic characteristics of both groups, including height, weight, and body mass index (BMI), were recorded (Table 1). Patients were evaluated by physicians who were blinded to the injection type. Clinical evaluations were performed before the injection and 6 and 12 months after the injection; the evaluation consisted of patient-assessed pain using a VAS on a scale of 0 to 10. On this scale, 0 reflected a total absence of symptoms and 10 indicated the worst imaginable pain. Patient satisfaction was measured by a nurse (S.I.G.), according to the Roles and Maudsley score (Table 2).

#### Statistical Analysis

Descriptive statistics for the study variables (patient characteristics) were
presented as the mean±SD and range. Student’s *t* test was used to compare groups. In addition, the paired *t* test was used to compare VAS scores recorded before and after the injection. A power analysis was performed for all properties. Furthermore, 95% confidence intervals were used to detect the differences between the groups. The results were considered to be statistically significant at a *P* value less than .05. Statistical analyses were performed using SPSS version 13.0 statistical software (SPSS Inc, Chicago, Illinois).

### Table 1

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
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<tr>
<td>Height, cm</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Tenoxicam</td>
<td>31</td>
<td>160.52</td>
<td>10.125</td>
<td>144</td>
<td>183</td>
</tr>
<tr>
<td>Steroid</td>
<td>30</td>
<td>159.03</td>
<td>10.043</td>
<td>146</td>
<td>180</td>
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<td>Weight, kg</td>
<td></td>
<td></td>
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<td>Tenoxicam</td>
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<td>9.741</td>
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<td>98</td>
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<tr>
<td>BMI, kg/m²</td>
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<td></td>
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<tr>
<td>Tenoxicam</td>
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<td>1.996</td>
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<tr>
<td>Steroid</td>
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<td>30.40</td>
<td>2.884</td>
<td>24.35</td>
<td>36.89</td>
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**Abbreviations:** BMI, body mass index; Min., minimum; Max., maximum

### Table 2

<table>
<thead>
<tr>
<th>Level</th>
<th>Roles and Maudsley Score</th>
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<tr>
<td>Excellent</td>
<td>No pain, full movement, full activity</td>
</tr>
<tr>
<td>Good</td>
<td>Occasional discomfort, full movement, full activity</td>
</tr>
<tr>
<td>Acceptable</td>
<td>Some discomfort after prolonged activities</td>
</tr>
<tr>
<td>Poor</td>
<td>Pain limiting activity</td>
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</table>

### Results

A total of 69 patients were eligible for the study. Before randomization, 5 patients were excluded from the study (1 because of a history of a conservatively treated calcaneal bone cyst; 3 because of a high C-reactive protein level; and 1 because of pregnancy). No patient chose to withdraw; however, 3 patients (1 in the tenoxicam group and 2 in the steroid group) who did not regularly attend the follow-up visits were omitted from the study. A total of 61 patients who were regularly followed up completed the study. The dropout rate was 4.7% (Figure 1).

The study participants included 47 (77%) women and 14 (23%) men with a mean age of 41.4±12.23 years (range, 18-60 years). A total of 28 (45.9%) left and 33 (54.1%) right feet were studied. Height, weight, and BMI were examined, and no statistically significant differences were found between the groups (Table 1).

The follow-up period in the tenoxicam group was 12 months. Using the VAS, mean pretreatment pain score was 8.26, and mean 6- and 12-month posttreatment pain scores decreased to 3.06 and 2.94, respectively. The follow-up period in the steroid group was also 12 months. Using the VAS, mean pretreatment pain score was 7.97, and mean 6- and 12-month posttreatment pain scores decreased to 2.97 and 3.17, respectively (Table 3).
statistical significance was found for both groups when comparing the pretreatment and 12-month posttreatment VAS scores (P<.05). No statistically significant differences were found between the tenoxicam and steroid groups when comparing the 6- and 12-month posttreatment VAS scores (P>.05).

According to the criteria of the Roles and Maudsley score, results in the tenoxicam group were rated as excellent in 12 (38.7%) patients, good in 8 (25.8%), acceptable in 6 (19.4%), and poor in 5 (16.1%) at 12-month follow-up; and results in the steroid group were rated as excellent in 7 (23.3%) patients, good in 11 (36.7%), acceptable in 7 (23.3%), and poor in 5 (16.7%) at 12-month follow-up.

No significant difference was found between the steroid and tenoxicam groups in terms of the VAS, which was measured at 6 and 12 months after the injection (P>.05). No complications attributable to either the tenoxicam or corticosteroid injections were observed.

**DISCUSSION**

Many therapies have been used to treat plantar fasciitis, but none has provided a high level of efficacy. The conservative treatment methods described for plantar fasciitis include stretching, changes in daily activities, taping, orthoses, NSAID therapy, and local steroid injections.\(^6^{10,12}\) Local steroid injections are frequently used secondary to conservative therapies in the treatment of patients with plantar fasciitis.\(^3\) However, local steroid injections and NSAIDs are not innocuous. The steroid injection itself has limited use in patients with diabetes mellitus or infection,\(^13\) and oral NSAIDs cause gastrointestinal and renal side effects.\(^14\) Although no complications associated with the steroid injection were found in the current study, the potential risks associated with steroid use, such as osteomyelitis of the calcaneus, fat pad atrophy, and iatrogenic rupture of the plantar fascia, were taken into consideration.\(^5,6,8\) In contrast, the local injection of tenoxicam eliminates systemic complications.\(^15,16\)

In the current study, the authors compared the outcomes of patients with plantar fasciitis treated with tenoxicam or steroid injection. The patient satisfaction results, which were assessed using the Roles and Maudsley score measured 12 months post-treatment, revealed that only 5 patients from both injection groups had poor results. No significant difference was found in the VAS scores of the tenoxicam and steroid groups at 6 and 12 months posttreatment (P>.05).

Tenoxicam, which is an NSAID in the oxicam class, is a powerful analgesic and anti-inflammatory agent, and its pain relief efficacy has been shown.\(^17\) The analgesic effect of local injections of tenoxicam in the treatment of painful inflammatory conditions has been reported in several studies.\(^15,16\) The local injection of tenoxicam for rotator cuff tendinitis has also been used with good results.\(^16\) Other NSAIDs are unsuitable for local injection due to the solvents used, which cause problems related to local tolerability.\(^15\) No reports of the application of local tenoxicam injections for plantar fasciitis treatment are found in the English literature. In the current study, the authors observed no local or systemic side effects due to the local injection of tenoxicam.

The most important limitation of the current study is the short follow-up period in the study group. Another limitation is the absence of a placebo group for assessing the treatment’s success. Additional studies should include a placebo group.

**CONCLUSION**

In the current study, the tenoxicam injection was not significantly more effective than the corticosteroid injection for the treatment of plantar fasciitis; rather, both methods were effective and successful in treating the condition. The tenoxicam therapy appears to provide pain relief, but its effectiveness in the long term should be explored in future studies.

**REFERENCES**


