Comparison of partial matrixectomy and combination treatment (partial matrixectomy + phenol) in ingrown toenail

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ABSTRACT

To compare only partial matrixectomy and combination techniques (partial matrixectomy + phenol application) in the treatment of patients with an ingrown toenail in terms of recurrence, residual pain level and time of return to daily activities.

Methods The study included 118 patients with moderately ingrown toenails who were unresponsive to conservative treatment together with severely ingrown toenail patients. Of these patients, 76 cases were treated with a partial matrixectomy technique and 42 patients received combination treatment. Patients having nail infection received preoperative oral antibiotics.

Results Of 118 patients, 87 were males and 31 were females. The disease relapsed in seven (9.2%) of the patients treated with the partial matrixectomy technique, and in two (4.8%) patients from the combination treatment group (p=0.5). No statistically significant difference was found between the groups in terms of return time to daily activities (p=0.5) nor in terms of residual pain (p=0.7).

Conclusions Treatment costs and operation times of patients who underwent phenol application in addition to partial matrixectomy were found to be higher compared to only partial matrixectomy, however combined therapy was not found to be superior to only partial matrixectomy in terms of recurrence, post-op pain and return to daily activities.

Key words: ingrown toenail, surgical treatment, phenol, matrixectomy
INTRODUCTION

Ingrown toenail is one of the most common complaints of young adults presented to the physician because of foot problems (1-3). It may result in cosmetic problems, loss of labor, difficulty wearing shoes, and consequently extreme restrictions in daily activities (4). In the disease management, conservative methods are preferred for mild cases (5). However, moderate and severe cases may require advanced treatments such as removal of the nail affected, partial matrix excision, matrixectomy with phenol, CO\textsubscript{2} laser matrixectomy, sodium hydroxide application, Vandenbos technique and several surgical techniques (6). Sometimes, combination treatments are also implemented. The recurrence rates may vary depending on the treatment modality. Besides, there is no consensus for the treatment of ingrown toenails. Surgeons generally choose the technique they are used to. Recurrence rates are higher with conservative treatment modalities especially in moderate and severe ingrown toenail cases, therefore surgical treatment becomes more popular and newer techniques are increasingly used (7,8).

The goal of the treatment is to minimize the rate of recurrence and to make the patient return to daily activities as soon as possible without pain in ingrown toenail. In our present study, we aimed to compare the outcomes of only partial matrixectomy and combination (partial matrixectomy + phenol application) treatment. The patients who had the infection in their toenail received oral antibiotic treatment with cefuroxime sodium 500 mg for three days preoperatively. After the resolution of the infection, these patients underwent a surgical procedure.

Surgical procedure

Digital block was done using 2% prilocaine hydrochloride. A tourniquet was applied to the toe to provide a bloodless surgical field. First, the ingrown part of the nail was excised. A vertical incision was made with the tip of No. 15 surgical blades. Incision line was extended proximally including the nail bed up to 4-5 mm proximal to the nail-skin border. The adjacent hypertrophic tissues offending the nail fold were cleaned. The ingrown part of the nail was excised (Figure 1). A partial matrixectomy was done. At this step, more attention was paid to avoid perforating the inter-phalangeal joint or cutting the extensor tendon (Figure 2). The matrix overlying the cortex of the distal phalanx was superficially curetted. The skin at the lateral margin of the nail was attached to the nail with 3/0 prolene and tourniquet was removed when Winograd technique was applied. When the patient was treated with the combination technique, phenol was applied to the excision line of the matrix following the partial matrix excision (Figure 3). 80% phenol solution was applied for 1 minute. Prior to the application, attention was paid to make the field on which phenol will be applied fully blood-free and dry to prevent reducing the concentration of the phenol. Tourniquet was removed when Winograd technique was applied. When the patient was treated with the combination technique, phenol was applied to the excision line of the matrix following the partial matrix excision (Figure 3). 80% phenol solution was applied for 1 minute. Prior to the application, attention was paid to make the field on which phenol will be applied fully blood-free and dry to prevent reducing the concentration of the phenol. Tourniquet was removed after the application of phenol. The skin at the lateral margin of the nail was attached to the nail with 3/0 prolene (Figure 4). The dressing was changed every other day for the first two changes, and every three days later on until the 10th postoperative day. The patients were recommended not to wear closed shoes until the removal of the sutures. The sutures were removed within the second week and the patients were allowed to return to their daily activities.
The patients were evaluated in postoperative one-year follow up, in terms of relapse, residual pain and return to daily activities. Pain assessment was performed by compression of the distal nail region, also including the record of pain when wearing shoes.

**Statistical analysis**

All statistical analyses were performed using the SPSS software package 15.0 (SPSS Inc, Chicago, IL, USA). Data were shown as mean ± SD or median for continuous variables and frequencies and percentages for categorical variables. The groups were compared using the chi-square test for the categorical variables and Student’s t-test for the continuous variables. Recurrence and post-op pain were compared by Fisher’s exact test. A value of p<0.05 was considered statistically significant.

**RESULTS**

Of 118 patients, 87 (73.7%) were males and 31 (26.3%) were females. Partial matrixectomy technique was performed for 76 (64.6%) nails, and combination treatment was performed for 42 nails (35.4%). Of 76 patients, who were treated with partial matrixectomy technique, 53 (69.7%) were males and 23 (30.3%) were females. Of 42 patients, who underwent the combination treatment, 33 (75.8%) were males and nine (24.2%) were females (p=0.41). None of the patients developed deep infection, osteomyelitis, prolonged drainage or iatrogenic tendon damage. In the combination treatment group, 37 (88%) had moderate ingrown toenails and five (12%) had severe ingrown nails. In the only partial matrixectomy group, 67 (88.1%) had moderately ingrown toenails and nine (11.9%) had severely ingrown nails (p=0.9) (Table 1).

Of the patients treated with only partial matrixectomy technique, seven (9.3%) relapsed, six of them had moderately and one had severely ingrown nail. Of the patients in the combination treatment group, two (4.8%) relapsed, one of them had moderate and other had severely ingrown nail (p=0.6) (Table 2).

**Table 1. The ratio of moderate and severe ingrown toe nail cases**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Partial matrixectomy + phenol</th>
<th>Partial matrixectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>37 (88%)</td>
<td>67 (88.1%)</td>
</tr>
<tr>
<td>Severe</td>
<td>5 (12%)</td>
<td>9 (11.9%)</td>
</tr>
</tbody>
</table>

**Table 2. Recurrence rates by the treatment modalities and the stage of ingrown nail**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Stage</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Moderate</td>
<td>Severe</td>
</tr>
<tr>
<td>Partial</td>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td>matrixectomy</td>
<td>No</td>
<td>36</td>
</tr>
<tr>
<td>+ phenol</td>
<td>Total</td>
<td>37</td>
</tr>
<tr>
<td>Partial</td>
<td>Yes</td>
<td>6</td>
</tr>
<tr>
<td>matrixectomy</td>
<td>No</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>67</td>
</tr>
</tbody>
</table>

Figure 1. A) A vertical incision was made after removal of the granulation tissue and ingrown part of the nail was excised, B) A partial matrixectomy was done. The field was ensured to be fully dried prior to the phenol application, C) Phenol application after matrixectomy in the patients treated with combination treatment, D) The wound was closed with 3/0 prolene after the surgery (Cakici H, and Cengiz Isik C, 2011)
The average elapsing time of return to daily activities was 11.4 days (9-15) for the combination treatment and 11.6 days (9-15) for partial matrixectomy technique alone (p=0.5).

Of the patients treated with only partial matrixectomy technique, two (2.6%) had pain both with compression and when wearing shoes, and one (1.3%) had pain only with compression. On the other hand, two (4.7%) of the patients treated with combination technique had pain with compression and one (2.38%) of them had pain when wearing shoes (p=0.7).

**DISCUSSION**

An ingrown toenail is a disorder that negatively affects life quality of particularly young adults, causes severe loss of labor, and may result in psychological disturbances (4). Although several treatment modalities have been tried until today, it has been provided that recurrence rates are lower with surgical treatment in comparison with conservative treatment (4). One of the most common surgical treatment methods for ingrown toenails is the partial matrixectomy procedure (1-4, 10). Recently, combination treatments with phenol preferred to reduce the rate of recurrence. Vaccari et al described this combination approach and published their series with 98.5% success rate (8). However, they did not have any control or other treatment group for comparison. This study has compared partial matrixectomy group together with the combination treatment group, and found no statistically significant difference between the combination and only partial matrixectomy groups.

Bostancı et al. reported success rates as high as 98.8% with phenol application among 350 patients with ingrown nails (11). Also 95.2% and 90.7% success rates were revealed in our combination and only partial matrixectomy treatment groups, respectively. In another study, Tatlıcan et al. evaluated the patients exposed to phenol for 1, 2 and 3 minutes to establish chemical matrixectomy. The authors demonstrated that one-minute phenol application for germinal matrix cauterization was safer in terms of pain, drainage and tissue injury (3). In our study, patients who were treated with combination therapy with partial matrixectomy and phenol application for 1 minute, none of the patients suffered from tissue injury and prolonged drainage time. It may be due to short application time in a small selective area.

When the literature is reviewed, recurrence rates vary in a wide range from 0% to 27% with partial matrixectomy technique. Sadhu et al. made partial matrix excision surgically in 50 patients and they did not observe any recurrence (12). Aydin et al. found recurrence in 4 (6.5%) of 62 patients treated with partial matrixectomy technique (13). The recurrence rates found in our study among the patients treated with only partial matrixectomy technique were close to the other published articles.

In a retrospective study, Hassel et al. compared chemical matrixectomy with phenol and surgical matrixectomy. They reported that the patients treated with phenol had lesser sense of pain and more rapid healing, but more recurrences compared with surgical matrixectomy (14). In a study, Ehsani et al. denoted that the matrixectomy with curettage was more successful than the matrixectomy with phenol (15). Our matrixectomy group recurrences ratio is similar to those in literature. In a study including 89 nails of 66 children younger than 16 with ingrown nails, Kaleal et al. found that the outcome of matrixectomy was more successful, the authors did not recommend ablation with phenol. They reported higher recurrences (30.47%) with combination treatments (1). We found lower recurrence rates among the patients given the combination treatment in patients aged between 13-86. The difference between our results and Kaleel’s results may come from the difference of patients’ age and tissue regeneration potential in younger population.

A limitation of the present study is the difference in the number of the patient in each group. Since the study was planned in a retrospective manner, we could not establish the same number of patients in the treatment groups. In conclusion, we found the combined therapy not to be superior to only partial matrixectomy in terms of recurrence, post-op pain and return to daily activities.

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**TRANSPARENCY DECLARATIONS**

Competing interests: none to declare.
REFERENCES