

Comparison of Phenol and Trichloroacetic Acid Chemical Matricectomies in the Treatment of Unguis Inkarinatus

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Article Information

Received date: Nov 02, 2018

Accepted date: Nov 19, 2018

Published date: Nov 26, 2018

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Article DOI 10.36876/smdj.1029

Abstract

Background: Partial nail plate avulsion and chemical matricectomy is the most successful modality for the treatment of unguis inkarinatus. Phenol, sodium hydroxide and Trichloroacetic Acid (TCA) have been used for chemical matricectomy.

The aim of our study was to compare the efficacy and postoperative morbidity of phenol and Trichloroacetic Acid (TCA).

Materials and Methods: Seventy-five patients with 107 ingrowing nails were treated with either phenol or TCA. In the postoperative period, all patients were evaluated at 48 hours and afterward weekly until full wound healing was achieved for postoperative complication. All patients were followed up for the recurrence and effectiveness of treatment.

Results: The incidence of postoperative pain was found to be equal between phenol and TCA groups. Postoperative infection was occurred 3 patients (8,3%) in the phenol group. Postoperative infection did not occur in TCA group. The incidence of drainage and complete healing duration was significantly higher in the phenol group ($p < 0.05$). The overall success rates in the phenol and TCA groups were found to be 88,2% and 98,2%, respectively ($p > 0.05$).

Conclusion: Postoperative morbidity and recurrence rate was lower in the TCA group. Therefore, we suggest that TCA can be used in stead of phenol for chemical matricectomy.

Introduction

Unguis inkarinatus are a common condition that cause inconvenience, pain and limit daily functioning. Unguis inkarinatus are most frequently seen in adolescents and young adults [1,2].

Unguis inkarinatus are reviewed in 3 stages. Stage 1 unguis inkarinatus are characterized by erythema, slight edema, and pain with pressure to the lateral nail fold. Stage 2 is marked by increased symptoms of stage 1 as well as drainage and infection. Stage 3 unguis inkarinatus display magnified symptoms of stage 1 accompanied by lateral wall thickening and granulation tissue [1,2].

Partial nail plate avulsion and chemical matricectomy is the most successful method for the treatment of ingrown toenails [1,4]. Phenol, sodium hydroxide and TCA were used for chemical matricectomy [1,2]. Chemical matricectomy with phenol has a low recurrence rate and good cosmetic results, but it produces extensive tissue destruction and can result in drainage and a delayed healing time [1,2,4,5]. These side effects have brought forward the use of chemical agents including sodium hydroxide and TCA for chemical matricectomy [1,2,4,5]. It has been reported in that phenol and TCA chemical matricectomies have success rates of about 95% [2-5]. There are no studies in the literature, comparing the efficacy and postoperative morbidity rates of both chemical matricectomy methods.

The aim of our study was to compare the efficacy and postoperative morbidity of phenol and Trichloroacetic Acid (TCA).

OPEN ACCESS

ISSN: 2575-7792

Materials and Methods

Patients

A total of 75 patients with 107 ingrown toenail edges were included in our study. Clinical findings of the patients are shown in Table 1. There were 36 patients in the group 1 who were treated with 88% phenol matrix cauterization. There were 39 patients in the group 2 who were treated with 90% TCA matrix cauterization. All patients were followed-up at two-days intervals during the first week after surgery. Weekly follow-ups were continued until complete healing of the wound. After complete wound healing, the patients were scheduled for follow-up visits every three months.

Appropriate systemic and topical antibiotics were administered before the surgical procedure for patients who were diagnosed with infection. Before the surgical operation the patients were evaluated uncontrolled diabetes mellitus, hemorrhagic diathesis, peripheral vascular disease, hypersensitivity against chemical solution and serious systemic illnesses.

Surgery

Digital anesthesia with epinephrine- free 1% lidocaine was performed after cleaning the side of operation with the povidone-iodine solution. A tourniquet was applied proximal to the big toe. By using septum elevators, the ingrown nail was lifted of the nail bed by starting at the edge. The nail was cut longitudinally 3-4mm away from the ingrown portion, and extracted. Eighty eight percent phenol was applied with a cotton tipped applicator to the matrix of extracted part and rubbed into the nail bed in the group 2 patients. Ninety percent TCA was applied with a cotton tipped applicator to the matrix of extracted part and rubbed into the nail bed in the group 2 patients. Phenol and TCA application were performed two times for two minutes each (a total 4min). The site of operation was thereafter flushed with isotonic saline solution in order to neutralize the effect of phenol and TCA. The tourniquet was removed, antibiotic containing ointment was applied. A gauze bandage was wrapped around the nail.

Postoperative Care

All patients were followed-up at two-days intervals during the first week after surgery. Weekly follow-ups were continued until complete healing of the wound. Postoperative complications such as postoperative pain, discharge, infection and tissue destruction were evaluated during postoperative follow-ups. After complete wound healing, the patients were scheduled for follow-up visits every three months. During the follow-up period, recurrence rate and cosmetic results were evaluated in order to determine the effectiveness of the surgical treatment. Relapse was defined as evidence of ingrowth of the nail edge or the formation of spicules.

When evaluating the results from the study, NCSS (Number Cruncher Statistical System) 2007&PASS 2008 Statistical Software (Utah, USA) was used for statistical analyses. When evaluating the data from the study, Student's t-test was used for comparisons of quantitative data, in addition to descriptive statistical methods. Chi-square test, Fisher's exact chi-square and Mann Whitney U tests were used for comparisons of qualitative data. Statistical significance was defined as $p < 0.05$.

Results

The mean age of the patients was 35.05 ± 17.48 (1-79). Of the 75 patients, 38 patients (50.67%) were male and 37 (49.33%) female. There were 36 patients (20 male, 16 female) with 51 ingrowing nail sides in group 1 who were treated with phenol and 39 patients (21 female, 18 male) with 56 ingrowing nail sides in group 2 who were treated with TCA. The mean age of group 1 was 35.25 ± 17.83 years (range 14-79 years). The mean age of group 2 was 32.94 ± 17.13 years (range 1-66 years). There was no difference between two groups regarding sex, age and side of ingrowing nail. The mean follow-up duration of patients was 37.54 ± 13.79 months (7-72 months). The mean follow-up duration of group 1 was 20.17 ± 9.26 . The mean follow-up duration of group 2 was 58.28 ± 11.19 . Stages of the treated nail sides are given in table 1.

Postoperative Evaluation

Postoperative Pain: The severity of pain was mild or moderate between two groups. None of the patients experienced severe pain. While 9(25%) of the group 1 patients had mild pain, 7(19,4%) moderate pain, 20(55%) experienced no pain. While 12(30,8%) of group 2 patients had mild pain, 5(12,8%) moderate pain, 22(56,4%) experienced no pain. There was no statistically significant difference between two groups regarding the incidence and severity of pain ($p > 0.05$).

Postoperative Drainage: Postoperative drainage improved within 15 days in 25 of the group 1 patients (69.4%), within 21 days in 6 of the group 1 patients (16.7%) and within one month 5 of the group 1 patients (13.9%). Postoperative drainage improved 10 days in 36 of the group 2 patients (92.3%) and within 15 days in 3 of the group 2 patients (7,7%). The duration of postoperative drainage was significantly higher in the group 1 (phenol group) ($p < 0.001$). 20 patients in the group 1 (phenol group) completely recovered within 15 days, 7 patients within 21 days and 9 patients within 1 month. All patients of group 2(TCA group) completely recovered within 21 days. The duration of complete recovery was significantly higher in the group 1 (phenol group) ($p < 0.001$).

Table 1: Clinical findings of the patients.

	Grup 1(Phenol)	Grup 2(TCA)
NUMBER OF PATIENTS	36	39
GENDER		
Male	20	18
Female	16	21
AGE	$35,25 \pm 17,83$	$32,95 \pm 17,13$
DURATION OF FOLLOW-UP	$20,17 \pm 9,26$	$58,28 \pm 11,19$
STAGE		
Stage 1	12	7
Stage 2	33	47
Stage 3	6	2
AFFECTED NAIL EDGE		
Lateral	29	22
Medial	22	34

Table 2: Postoperative complications and success rate.

Postoperative Complications	Group 1 (Phenol)	Group2 (TCA)
Pain		
Mild	9 (25,4 %)	12 (30,8 %)
Moderate	7 (19,4 %)	5 (12,8 %)
Severe	-	-
Duration of Drainage		
10 days	-	36 (92,3%)
15 days	15 (69,4%)	3 (7,7%)
21 days	6 (16,7%)	-
1 month	5 (13,9%)	-
Infection	3 (8,3%)	-
Success rate	88.20%	98,2%.

Postoperative Infection: Postoperative infection was occurred 3 patients (8,3%) in the group 1(phenol group). Postoperative infection did not occur in group 1(TCA group).

Success Rates: One patient who underwent TCA matricectomy had recurrence in a single nail edge (1,8%) at 12 months follow-up. No recurrence was observed among 38 patients in the group 2(TCA group) during the follow-up period. Six patients who underwent phenol matricectomy had recurrence in six nail edges (11,8%) during follow-up period (Table 2).

Phenol group showed signs of recurrence within mean period of 10.8 ± 2.35 months. The overall success rates in the phenol and TCA groups were found to be 88.2% and 98,2%. There was no statistically significant difference between the recurrence rates and overall success rates of the two groups ($p > 0.05$).

Discussion

Chemical matricectomy is known as a successful and safe surgical treatment options for the ingrown toenails [1-7]. Chemical matricectomy was first introduced in 1945 by Boll and it is a widely used method since then [5]. The aim of treatment is to chemically destroy the lateral matrix horn in order to prevent the lateral nail plate grow into the fold in the future. Generally phenol, sodium hydroxide and TCA are used in chemical matricectomy [1,2,4-7]. Phenol is an effective protein denaturant. Phenol cauterizes by producing a coagulation necrosis in the matrix and surrounding soft tissues. It has antibacterial and local anesthetic effects that offer additional advantage for its use [8]. Phenol matricectomy has been the choice of treatment for many investigators with high success rates (91-100%) for years [5,8]. However, the disadvantage of performing this procedure include unpredictable tissue damage due to chemical burn caused by phenol, excessive drainage, persistent infection and extended healing times [2,5]. Following phenol applications abdominal pains, dizziness, hemoglobinuria, cyanosis and occasionally severe systemic reactions such as cardiac arrhythmia may occur in addition to local side effects [2,4,9].

In recent years, matricectomy with sodium hydroxide has been found to be as effective as phenol matricectomy, with shorter healing periods and a lower risk of local and systemic toxicity [1,2,4,5,7].

Sodium hydroxide causes alkali burns and liquefaction necrosis, resulting in less postoperative drainage and faster healing, however prolonged application of a strong alkali can cause excessive damage due to slowly progressing liquefaction necrosis [10].

TCA is one of the most commonly used agents for the chemical peeling. It is used for superficial or medium depth chemical peeling. TCA is a caustic chemical agent that causes coagulation necrosis, like phenol. It produces epidermal and dermal necrosis and then neutralized by itself without serious systemic toxicity. In a recent study, Su-Han et al. applied chemical matricectomy with 100 % TCA in 25 patients with ingrowing toenail edges and showed that the success rate was 95% [2]. They showed that side effects such as postoperative pain, postoperative infection and drainage were mild, that postoperative drainage usually decrease within 1 week and did not last more than 2 weeks [2]. Recently, Terzi et al. performed chemical matricectomy with 90% TCA in 39 patients with 56 ingrowing toenail edges and reported that success rate was 98,2% [4]. They observed that side effects such as postoperative pain, postoperative infection and drainage were mild, that postoperative drainage usually decrease within 10 days and did not last more than 2 weeks [4]. In another study, Barreiros et al used 80 % TCA in 133 patients with unguis inkarinatus and presented that the success rate was 94% [6]. They presented that side effects such as postoperative pain, drainage and infection were mild, postoperative drainage usually subsides within 10 days and did not last more than 15 days [6]. In a report by Aksakal et al. the mean duration of pain after phenol matricectomy was approximately 1 week and the duration of postoperative drainage ranged from 11 to 42 days [11].

Bostancı et al. followed their patients for a mean period of 14 months and observed approximately similar success rates in sodium hydroxide (95,1%) and phenol matricectomies (95,8%). In this study, recurrences occurred within 10 months [5].

The severity of pain was mild or moderate between two groups in our study. None of the patients experienced severe pain. While 9(25%) of the group 1 patients (phenol group) had mild pain, 7(19,4%) moderate pain, 20(55%) experienced no pain. While 12(30,8%) of group 2 patients (TCA patients) had mild pain, 5(12,8%) moderate pain, 22(56,4%) experienced no pain. There was no statistically significant difference between two groups regarding the incidence and severity of pain.

Postoperative drainage improved within 15 days in 25 of the group 1 patients(phenol group) (69,4%), within 21 days in 6 of the group 1 patients (16,7%) and within one month 5 of the group 1 patients (13,9%). Postoperative drainage improved 10 days in 36 of the group 2 patients (TCA group) (92,3%) and within 15 days in 3 of the group 2 patients (7,7%). The duration of postoperative drainage was significantly higher in the group 1(phenol group). 20 patients in the group 1(phenol group) completely recovered within 15 days, 7 patients within 21 days and 9 patients within 1 month. All patients of group 2(TCA group) completely recovered within 21 days. The duration of complete recovery was significantly higher in the group 1(phenol group).

One patient who underwent TCA matricectomy had recurrence in a single nail edge (1,8%) at 12 months follow-up. No recurrence was observed among 38 patients in the group 2(TCA group) during the

follow-up period. Six patients who underwent phenol matricectomy had recurrence in six nail edges (11,8%) during follow-up period. There was no statistically significant difference between the recurrence rates and overall success rates of the two groups ($p > 0.05$).

Conclusions

We conclude that both phenol and TCA matricectomies are effective in the treatment of ingrowing toenails, but TCA matricectomy seems to offer superior results by providing faster recovery on the basis of cessation of drainage and complete healing of periungual tissue damage when compared with phenol matricectomy. Therefore, we suggest that TCA can be used in place of phenol for chemical matricectomy.

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