

Comparison of Phenol and Bichloroacetic Acid Chemical Matricectomies for the Treatment of Ingrown Toenails

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Abstract

Background: Ingrown toenails is an often painful disorder which usually affects big toenails. Chemical matricectomy is a successful method for the treatment of ingrowing toenails. The objective of this study was to compare the efficacy and postoperative morbidity of phenol and bichloroacetic acid.

Material and Methods: 69 patients with 112 ingrowing nail sides were treated with either phenol or bichloroacetic acid. In the postoperative period, the patients were examined at 48 hours and afterward weekly until full wound healing was achieved for the severity of postoperative complications. All patients were followed up for the recurrence rate and effectiveness of treatment.

Results: The incidence and severity of postoperative pain was found to be equal between phenol and BCA groups. Postoperative observed in three patients (7,6 %) in the phenol group. Postoperative infection did not occur in BCA group. The incidence of drainage and complete healing duration was significantly higher in the phenol group. The overall success rates in the phenol and BCA groups were found to be 84,6 and 96,7 %, respectively.

Conclusion: Both phenol and BCA are effective agents giving high success rates, but BCA causes less postoperative morbidity and provides recovery.

Introduction

Ingrown toenail is an often painful clinical condition which usually affects big toenails. It is a common condition of young adults. Ingrown toenails are three times more common in men than in women. The two most important causes of ingrown toenails are wearing tight shoes and toenails that are not trimmed

properly [1,2]. Other causes include trauma, an imbalance between the nail plate and the nail bed, hyperhidrosis, abnormal walking habits, arthritis, circulatory insufficiency, obesity, onychomycosis treatment and subungual neoplasms [1,2].

Ingrown toenails are reviewed in three stages. Stage 1 ingrown toenails 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 ingrown toenails display magnified symptoms of stage 1 accompanied by lateral wall thickening and granulation tissue. Conservative treatment methods are used in stage 1 ingrown toenails. Surgical treatment methods should be used in recurrent stage 1 ingrown toenails, and in stage 2 and stage 3 cases [3,4,5]. Partial nail avulsion and chemical matricectomy is the most successful management method used for the treatment of ingrown toenails in recent years [2,3,6,7]. Phenol is the most commonly used agent for chemical matricectomy. 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. These adverse effects have brought forward the use of chemical agents such as sodium hydroxide and trichloroacetic acid (TCA) for matricectomy [3,6,7]. BCA is typically used at full strength (100%) in its natural liquid state and has a broad range of indications, including xanthelasma, sebaceous hyperplasia, verrucae, hard and soft corns, seborrheic keratoses, ingrown nails, cysts, chemical peeling and benign erosions of the cervix. BCA causes coagulative necrosis of cells through extensive protein denaturation and resultant structural cell death [7,8]. The objective of this study was to compare the effectiveness and postoperative morbidity of phenol and BCA chemical matricectomy in the treatment of ingrown toenails.

Methods

A total of 69 patients with 112 ingrown toenail edges were included in our study. Clinical findings of the patients are shown in Table 1. There were 39 patients in the group 1 who were treated with 88% phenol matrix cauterization. There were 30 patients in the group 2 who were treated with 90% BCA matrix cauterization. All patients were followed-up at two-day 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 for 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 3-4 mm away from the ingrown portion and extracted. 88% 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 BCA was applied with a cotton tipped applicator to the matrix of extracted part and rubbed into the nail bed in the group 2 patients. 90% BCA application were performed two times for two minutes each (a total 4 min). The site of operation was thereafter flushed with isotonic saline solution in order to neutralize the effect of phenol and BCA. 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-day 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 And Discussions

The mean age of the patients was 35.05 ± 17.48 (1-79). Of the 69 patients, 35 patients (50.7%) were male and 34 (49.3%) female. There were 39 patients (23 male, 16 female) with 54 ingrowing nail sides in group 1 who were treated with phenol and 30 patients (18 female, 12 male) with 58 ingrowing nail sides in group 2 who were treated with BCA. The mean age of group 1 was 36.44 ± 13.74 years (range 14-79 years). The mean age of group 2 was 36.08 ± 12.43 years (range 1-60 years). There was no difference between two groups regarding sex, age and side of ingrowing nail. The mean follow-up duration of patients was 21.18 ± 07.32 months (7-24 months). The mean follow-up duration of group 1 was 23.37 ± 9.45 . The mean follow-up duration of group 2 was $17.29 \pm 06,65$. 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 11 (28,3%) of the group 1 patients had mild pain, 7 (17,9 %) moderate pain, 21 (53,8 %) experienced no pain.

While 10 (33,3 %) of group 2 patients had mild pain, 10 (33,3 %) moderate pain, 10 (33,3 %) 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 27 of the group 1 patients (69.2%), within 21 days in six of the group 1 patients (15,4%) and within one month 6 of the group 1 patients (15,4%). Postoperative drainage improved 10 days in 29 of the group 2 patients (96,7%) and within 15 days in one of the group 2 patients (3,3 %) . The duration of postoperative drainage was significantly higher in the group 1 (phenol group) ($p < 0.001$). 20 patients (51,2 %) in the group 1 (phenol group) completely recovered within 15 days, nine patients (23,2) within 21 days, and 10 patients (25,6%) within one month. All patients of group 2 (BCA group) completely recovered within 21 days. The duration of complete recovery was significantly higher in the group 1 (phenol group) ($p < 0.001$).

Postoperative Infection: Postoperative infection was occurred in three patients (7,6%) in the group 1 (phenol group). Postoperative infection did not occur in group 1 (BCA group).

Success Rates: One patient who underwent BCA matricectomy had recurrence in a single nail edge (3,3%) at 12 months follow-up. No recurrence was observed among 29 patients in the group 2 (BCA group) during the follow-up period. Six patients who underwent phenol matricectomy had recurrence in six nail edges (15,4%) during follow-up period.

Table 1. Clinical Findings of the Patients

	Group 1 (Phenol)	Group 2 (BCA)
NUMBER OF PATIENTS	39	30
GENDER		
Male	23	12
Female	16	18
AGE	$36,44 \pm 13,74$	$36,08 \pm 12,43$
DURATION OF FOLLOW-UP	$23,37 \pm 9,45$	$17,29 \pm 06,65$
STAGE		
Stage 1	13	11
Stage 2	34	40
Stage 3	7	7
AFFECTED NAIL EDGE		
Lateral	29	14
Medial	25	44

Phenol group showed signs of recurrence within mean period of 10.8 ± 2.35 months. The overall success rates in the phenol and BCA groups were found to be 84.6% and 96,7%. There was no statistically significant difference between the recurrence rates and overall success rates of the two groups ($p > 0.05$).

Chemical matricectomy is known as a successful and safe surgical treatment options for the ingrown toenails. Chemical matricectomy was first introduced in 1945 by *Boll* and it is a widely used method since then. 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. 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. Phenol matricectomy has been the choice of treatment for many investigators with high success rates (91-100 %) for years. 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. 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.

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. 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.

BCA is typically used at full strength (100%) in its natural liquid state and has a broad range of indications, including xanthelasma, sebaceous hyperplasia, verrucae, hard and soft corns, seborrheic keratoses, ingrown nails, cysts, chemical peeling and benign erosions of the cervix [8]. BCA causes coagulative necrosis of cells through extensive protein denaturation and resultant structural cell death [7,8].

Bostanci 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 [9].

The severity of pain was mild or moderate between two groups in our study. None of the patients experienced severe pain. While 11(28,3%) of the group 1 patients(phenol group) had mild pain, 7

(17,9 %) moderate pain, 21 (53,8 %) experienced no pain. While 10 (33,3 %) of group 2 patients(BCA patients) had mild pain, 10 (33,3 %) moderate pain, 10 (33,3 %) 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 27 of the group 1 patients(phenol group) (69.2%), within 21 days in six of the group 1 patients (15.4%) and within one month six of the group 1 patients (15.4%). Postoperative drainage improved 10 days in 29 of the group 2 patients (BCA group) (96.7%) and within 15 days in one of the group 2 patients (3,3 %). The duration of postoperative drainage was significantly higher in the group 1 (phenol group) . 20 patients(51,2%) in the group 1 (phenol group) completely recovered within 15 days, nine patients(23,2 %) within 21 days, and 10 patients(25,6%) within one month. All patients of group 2 (BCA group) completely recovered within 21 days. The duration of complete recovery was significantly higher in the group 1 (phenol group).

One patient who underwent BCA matricectomy had recurrence in a single nail edge (3,3%) at 12 months follow-up. No recurrence was observed among 29 patients in the group 2(BCA group) during the follow-up period. Six patients who underwent phenol matricectomy had recurrence in six nail edges (15,4%) 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 BCA matricectomies are effective in the treatment of ingrowing toenails, but BCA 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 BCA can be used in place of phenol for chemical matricectomy.

References

1. Aksakal B. Conservative treatment of ingrown toenails. *T Klin J Int Med Sci* 2005; 1: 56-59.
2. Altinyazar C. Surgical treatment of ingrown toenails *T Klin J Int Med Sci* 2005; 1: 60-62.
3. Ozdemir E, Bostanci S, Ekmekci P, Gurgey E. Chemical matricectomy with 10% sodium hydroxide for the treatment of ingrowing toenails. *Dermatol Surg* 2004; 30: 26-31. PMID: 14692922
4. Erdogan FG. A simple, pain-free treatment for ingrown toenails complicated with granulation tissue. *Dermatol Surg* 2006; 32: 1388-1390. PMID: 17083593

5. Siegle RJ, Stewart R. Recalcitrant ingrowing nails. Surgical approaches. *J Dermatol Surg Oncol* 1992; 18: 744-752.
6. Kocyigit P, Bostanci S, Ozdemir E, Gurgey E. Sodium hydroxide chemical matricectomy for the treatment of ingrowing toenails: comparison of three different application periods. *Dermatol Surg* 2005; 31: 744-747. PMID: 16029698
7. Kim SH, Ko HC, Oh CK, Kwon HS, Kim MB. Trichloroacetic acid matricectomy in the treatment of ingrowing toenails. *Dermatologic Surg* 2009; 35: 973-979. PMID: 19397660
8. Haygood LJ, Bennett JD, Brodell RT. Treatment of Xanthelasma Palpebrarum with Bichloroacetic Acid.” *Dermatologic Surg* 1998; 24: 1027-1031. PMID: 9754092
9. Seher Bostanci, Pelin Kocyigit, Erbak Gurgey. Comparison of phenol and sodium hydroxide chemical matricectomy for the treatment of ingrowing toenails. *Dermatol Surg* 2007; 33: 680-685. PMID: 17550444