



## A COMPARATIVE STUDY OF 88% PHENOL VERSUS 90% TRICHLOROACETIC ACID AS CHEMICAL CAUTERANTS AFTER PARTIAL NAIL EXTRACTION IN THE TREATMENT OF INGROWN TOE NAILS.

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### Abstract

**Aim:** To compare the efficacy and safety of 88% phenol and 90% trichloroacetic acid as chemical cauterants in lateral nail matricectomy after partial nail avulsion for the management of ingrown toenails.

**Methods:** This was a prospective randomized clinical study in which 50% of study participants were treated with 88% Phenol and the remaining 50% were treated with 90% TCA as chemical cauterant after partial nail avulsion. Postoperatively patients were followed for 48 hours, 1, 4, 12 weekly up to 3 months and 3 monthly upto one year. Efficacy was defined in term of pain, wound discharge, wound infection, healing and recurrence. Data was collected on self-designed Proforma.

**Results:** A total of 50 patients of ingrown toenails were enrolled in the study. Average age of patients was 26.31±8.74 years. Severity of the pain was statistically insignificant among both groups, p-value 0.472. Wound infection was higher in 88% phenol group in contrast to 90% Trichloroacetic acid group, while statistically insignificant, p-value 0.306. Recurrence was only seen in 1 patient of 90% Trichloroacetic acid group.

### Conclusion:

Both treatment options are equally safe and effective in treating the ingrown toenails with lower rate of postoperative pain, complications and recurrences.

**Keywords:** Matricectomy, 90% Trichloroacetic acid, 88% Phenol, effectiveness

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## **Introduction**

Ingrown toenail or onychocryptosis, is a condition which occurs when the edge of a toenail grows into the surrounding skin, causing pain, inflammation, and potential infection. It is a common condition that affects individuals of all ages, with a higher prevalence in adolescents and adults. It is three times more common in males as compared to females (1). It can occur in any toe, although it is most commonly seen in the big toe.

The exact etiology is not yet well established however there are certain predisposing factors which are implicated. These include: genetic predisposition, male gender, improper nail trimming habits like cutting the nails too short or rounding the corners, wearing tight or ill-fitting footwear, structural abnormalities in the nail shape such as excessively curved nails, subungual neoplasms, circulatory insufficiency, obesity, arthritis or onychomycosis. Certain foot conditions, such as bunions or hammertoes, can alter the alignment of the toes and contribute to ingrown toenails. Also previous injury or trauma to the toenail area can lead to irregular nail growth and subsequent ingrown toenails. Hyperhidrosis also exacerbates any inclination by macerating the skin.

Symptoms include discomfort, pain, redness, swelling, formation of pus and secondary bacterial infections. In stage-1 there is only mild edema or erythema with pain on put pressure; in Stage-2 there is significant edema or erythema with seropurulent drainage from the affected nail fold and in Stage-3 there is significant drainage, granulation tissue formation and hypertrophy of lateral wall (2).

Treatment options include conservative management like soaking the feet in warm water to reduce inflammation, use of topical antibiotics and use of protective padding to provide cushioning and relieving pressure on affected area. However, surgical intervention in form of partial or total nail avulsion is often required in non-responding, severe and recurrent cases. A simple avulsion, however is associated with high likelihood of recurrence (2). Obliteration of the matrix's lateral edge obtained through surgery or, more frequently, a chemical (lateral matricectomy) is an important part in the onychocryptosis management.

Both trichloroacetic acid (TCA) and phenol have been used as chemical cauterants in matricectomy. However, the choice between TCA and phenol depends on various factors, including the severity of the ingrown toenail and the preference of the healthcare professional performing the procedure.

Phenol is a powerful antiseptic and caustic agent that has been used in medicine for various purposes, including chemical matricectomy. Phenol cauterizes in the matrix and adjacent soft tissues by generating a coagulation necrosis. It has local anesthetic and antibacterial effects that provide additional benefit. The disadvantages of carrying out this operation, however, include unexpected tissue damage due to chemical exposure induced by phenol, excessive drainage, constant infection and prolonged healing times. In relation to local side effects, hemoglobinuria, dizziness, abdominal pain, cyanosis and sometimes serious systemic responses like cardiac arrhythmia can appear after phenol application (3). TCA, like phenol, is a caustic chemical compound that works by chemically destroying the portion of the nail matrix responsible for nail growth, thus preventing the nail from growing inwards. It causes both dermal and epidermal necrosis and after that neutralizes itself without severe systemic toxicity. Trichloroacetic is efficacious and safe alternative chemical with less drainage after surgery; though data regarding long-term efficacy is lacking (4). We planned to conduct this study to compare the effectiveness and outcomes of 90% trichloroacetic and 88% phenol application as chemical cauterants in partial matricectomy in the management of onychocryptosis.

## **Material and methods**

This was a prospective randomized clinical study, conducted in Northern Railway Central Hospital, Delhi from 2018 to 2019. Written informed consent was taken from all the patients before enrolling into the study. The demographic profile of patients and epidemiological data was recorded in pre-designed proforma. Inclusion criteria for the study were:

1. Clinically diagnosed cases of ingrown toe nail involving greater toenail.
2. Patients planned to undergo partial nail avulsion followed by lateral nail matricectomy as decided by operating surgeon
3. Age more than 18 years.

The exclusion criteria were:

1. Patients with known allergy to the agents used or those who had a contraindication to local anesthesia
2. Pregnant and lactating women
3. Patients with concurrent onychomycosis
4. Patients with significant peripheral arterial disorder or severe systemic disease
5. Patients with diabetes mellitus were also excluded.

Patients were divided into two groups by simple randomization (flipping a coin). Group A patients were treated with phenol (88%) and group "B" subjects underwent application of 90% Trichloroacetic (TCA) as chemical cauterant for lateral nail matricectomy following partial nail avulsion.

Systemic antibiotic therapy was given for 5 days prior to the surgery if nail was suspected to be secondarily infected. After cleaning the operative site with povidone-iodine solution, tourniquet (elastic catheter) was attached around the largest part of the great toe to reduce bleeding in the operative site. Proximal digital block was carried out with 2% plain Xylocaine. Partial nail avulsion was done by experienced orthopedic surgeon. The nail plate was separated from the nail bed at the affected side, followed by splitting of the lateral nail plate and avulsion. This was followed by curettage of the lateral horns of the matrix and application of chemical cauterants. In group A, phenol 88% was applied for 3 min and in group B, 90% TCA was used for 3 minutes. After application of cauterants, the tourniquet was removed and a bulky dressing with antiseptic ointment was applied and patients were advised to keep their foot in rest and at an elevated position for the remaining part of the day. In addition, they were suggested to avoid tight fitting shoes and to apply antiseptic solutions locally for the wound. Oral antibiotics were given for a period of 7 days and non-steroidal anti-inflammatory drugs were added for 2 days.

Patients were followed for 48 hours; at 1, 4 and 12 weeks or until complete healing was achieved. After that patient was followed every 3 months upto one year. For the initial 2 weeks, the site of operation was cleaned and the re-dressing was done by the surgeon. Then, patients were suggested to re-dress the site in case of continuous

drainage. Effectiveness and safety of chemical cauterants was assessed in terms of postoperative pain (using the visual analog scale), wound discharge, wound infection, healing and recurrences. Data was collected on self-designed performa and analyzed by SPSS version 20.

## Results

Total 50 patients of ingrown toenails were selected for this study and 6 patients were lost to follow-up. Though out of remaining 44 patients, the sex ratio of male female was almost equal having 21 male and 23 female. The average age of patients in years was  $26.31 \pm 8.74$ . The site of disease was recorded 25 in right and 19 in left.

Severity of the pain was statistically insignificant among both groups, p-value 0.472, as mild pain was in 12 patients of 88% phenol group and 10 were in 90% TCA group, moderate pain was equal quantity of patients in both groups while severe pain was only among 1 patient in 88% phenol group. Wound infection was higher in 88% Phenol group in 7 patients and 4 patients of 90% TCA group, which was statistically insignificant, p-value 0.306. Wound discharge was higher in 88% phenol group among 3 patents as compared to 90% TCA group only 1 patients, while recurrence was only among 1 patient of 90% TCA group. The recurrence was seen at 8 months. All above findings were statistically insignificant with p values 0.472, 0.306, 0.436 and 0.495 respectively (Table 2).

**Table 1.** Descriptive analysis of demographic variables n=44

Variable	Categories	Frequency %
Gender	Male	21 (47.8)
	Female	23 (52.2)
Site	Right	25 (56.9)
	Left	19 (43.2)

**Table 2:** Comparison of post treatment infection, pain and recurrences n=44

Variable	Categories	88% Phenol	90% Trichloroacetic acid	P value
Pain	No pain	8	9	0.472
	Mild pain	12	10	
	Moderate pain	2	2	
	Severe pain	1	0	
Wound infection	Yes	7	4	0.306
	No	16	17	
Wound discharge	Yes	3	1	0.436
	No	20	20	
Recurrence	Yes	0	1	0.495
	No	23	20	

## Discussion

Onychocryptosis chiefly affects adolescents and young adults (5). The mean age of patients in our study was  $26.31 \pm 8.74$  years. Similar results were reported in a study by Barreiros H *et al.* (6) as patients' mean age was 27 years (range, 11-80 years). In our study both genders were almost equally affected. This is in contrast to studies done by Khunger *et al.* (7) and Sharma N *et al.* (5) who observed males to be predominantly involved.

In our study the sites of disease were recorded in right toenail in 25 (56.9%) patients and left toenail in 19 (43.2%) patients. Almost similar results were observed in studies conducted by Tabowei I *et al.* (8) and Ahsan MF *et al.* (9).

In our study both chemical cauterants showed almost equal efficacy as mild pain was seen in 12 patients of 88% phenol group and in 10 patients in 90% TCA group, moderate pain was equal in both groups while severe pain was only seen in one patient of 88% phenol group. This is consistent with results observed by Ahsan MF *et al.* (9). In a study conducted by Barreiros H *et al.* (6) TCA (80%) was applied in 133 cases with a success rate of 94%. They showed that side effects like postoperative pain, infection and drainage were mild, generally postoperative drainage subsiding within 10 to 15 days (10). Similar results were observed in a study conducted by Terzi *et al.*, who carried out chemical matrixectomy with TCA (90%) in 39 patients (11). In our study, one patient (2.3%) observed recurrence of ingrown toe nail in 90% TCA group at 8 months while no patient presented with recurrence in 88% phenol group at 1 year follow up. Similar results were observed by Terzi E *et al.* (6) at 14 months follow-up ( $P < 0.001$ ) and Ahsan MF *et al.* (9). Bostanci S *et al.* (4), however, reported 95.8% of success rates with phenol matrixectomy and recurrence in 10 months following treatment (3).

## Conclusion

We conclude that both 90% TCA and 88% phenol matrixectomies are nearly equally effective in treating the ingrown toenails subjected to postoperative pain, inflammation of surgical site and recurrences. Systemic side effects of phenol and TCA should be taken into consideration before usage and the selection of the appropriate chemical agent should be taken by a healthcare professional based on an individual's specific condition and medical history. Also long term follow up are required for observation of recurrences.

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## Conflict of Interest

The authors declare that there is no conflict of interest.

## References

1. Park DH, Sigh D. The management of ingrowing toenails. *Bmj* Apr 2012.
2. Byrne DS, Caldwell D. Phenol cauterization for ingrowing toenails: A review of five years' experience. *Br J Surg* 1989; 76:598-9.
3. Terzi E, Guvenc U, Tursen B, Kaya TI, Erdem T, Tursen U. The effectiveness of matrix cauterization with trichloroacetic acid in the treatment of ingrown toenails. *Ind Dermatol Online J*. 2015; 6: 4-8.
4. Bostanci S, Kocyigit P, Gürgey E. Comparison of phenol and sodium hydroxide chemical matrixectomies for the treatment of ingrowing toenails. *Dermatol Surg*. 2007; 33:680-5.
5. Sharma N and Sharma N. A clinicoepidemiological study of ingrown toenails. *IJSR*. Volume 7, Issue 6, June 2018: 226-228.
6. Barreiros H, Matos D, Goulao J, Serrano P, Loao A, Brandao FM. Using 80% trichloroacetic acid in the treatment of ingrown toenails. *An Bras Dermatol*. 2013; 88: 889-893.
7. Niti k, Rajat K. Ingrown toenails. *IDJVL*; 3,78, 2012: 279-289.
8. Tabowei I. Benjamin, Amaefula Temple Ejike. Ingrown toe nail as seen in Bayelsa state Nigeria. *International Journal of Advances in Medicine Benjamin TI et al. Int J Adv Med*. 2017 Jun;4(3):614-619.
9. Ahsan MF, Irshad A, Asif M, Zafar M, Shah SA. Comparison of trichloroacetic acid and phenol application after partial nail extraction in the treatment of ingrown toenails. *PJMHS*. Vol.13, No.4, Oct-Dec 2019: 982-984.
10. Ceren E, Gokdemir G, Arikan Y, Purisa S. Comparison of Phenol Matrixectomy and Nail-Splinting With a Flexible Tube for the Treatment of Ingrown Toenails. *Dermatologic Surgery*. 2013;39(8):1264-9.
11. Akkus A, Demirseren DD, Demirseren ME, Aktas A. The treatment of ingrown nail: Chemical Matrixectomy with NaOH versus wedge resection. *Dermatologic Therapy*. 2018;31(5).