

COMPARISON OF EFFICACY OF PHENOL AND SODIUM HYDROXIDE MATRICECTOMIES FOR MANAGEMENT OF INGROWN TOENAILS

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ABSTRACT

Objective: To compare the efficacy of Phenol and Sodium Hydroxide Matricectomies in terms of frequency of pain and wound healing in the management of Ingrown Toenails.

Study Design: Randomized Clinical Trial

Place of Duration of Study: Out Patient Department of Surgery Combined Military Hospital Kharian from Aug 2010 to Feb 2011.

Patients and Methods: A total of 140 cases with Ingrown Toenails were selected and randomly divided into two groups of 70 each. Cases of Group A and B were subjected to Phenol Matricectomy (PMC) and Sodium Hydroxide Matricectomy (SHMC) respectively. Postoperative pain was comparatively and Southampton Wound Grade for wound healing were analyzed at 2nd and 10th postop day.

Results: Mean age of Group A was 28.86 ± 6.423 whereas that of Group B was 28.80 ± 5.997 . Group A had 58 (83%) males and 12 (17%) females. Group B had 48 (69%) males and 22 (31%) females. Postoperative pain was comparatively less in group A with statistical difference between two groups on 2nd day ($p = 0.014$), whereas it was less intense in group B with no statistical significant difference on 10th day ($p=0.662$). Wound healing was better in group B with statistical difference between two groups on 2nd ($p = 0.022$) and 10th day ($p = 0.024$). Group B (91.4%) had more statistically significant efficacy than Group A (71.4%) ($p = 0.004$).

Conclusion: SHMC is superior to PMC in reducing pain and improving wound healing for managing Ingrown Toenails.

Keywords: Ingrown, Nails, Phenol, Sodium hydroxide.

INTRODUCTION

Ingrown toenails occur when piercing of periungual skin by its corresponding nail plate leads to a cascade of foreign body, inflammatory, infectious, and reparative processes. Ultimately, this results in a painful, draining, and foul-smelling lesion, with soft tissue hypertrophy around nail plate. Ingrown toenails are a frequent foot problem, mainly affecting big toes in the young persons. They are generally caused by tight-fitting shoes, improper nail trimming and trauma. They result in great discomfort and result in missed time from school, work, sports and social activities¹⁻³.

Various surgical methods are carried out for ingrown toenail like nail avulsion,

Matricectomy either surgical or chemical by Phenol and Sodium Hydroxide, Electro Surgical Ablation by Electrodesiccation and Carbon Dioxide Laser, and Liquid Nitrogen Cryotherapy^{1,3-5}. Chemical Matricectomy is ablation of nail matrix after the partial or total nail avulsion with the help of Phenol or Sodium Hydroxide (NaOH). Phenol Matricectomy (PMC) has been widely used with high success rates for the treatment of ingrown toenails. However, unpredictable tissue damage and prolonged healing are its disadvantages. In recent years, Sodium Hydroxide Matricectomy (SHMC) has been proved to be as successful as PMC, but with less postoperative drainage, shorter healing periods and a lower risk of local or systemic toxicity⁶⁻¹². The purpose of this study was to compare two matricectomies to find out the optimal procedure which completely, quickly and cost-effectively cures the ingrown toenail, and therefore, enables the person to return to routine activity quickly with little post op discomfort.

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PATIENTS AND METHODS

These Randomized Clinical Trials were carried out in the Outpatient Department of General Surgery of Combined Military Hospital Kharian from 13 Aug 2010 to 12 Feb 2011. Both male and female patients of 18-50 years of age, having ingrown toenail with painful, erythematous swelling of the nail fold of big toe were enrolled by consecutive sampling. All patients having Paronychia, diabetes mellitus, chronic renal failure, bleeding disorders, peripheral vascular disease and hypersensitivity to Phenol and Sodium Hydroxide, and those using immunosuppressive drugs were excluded from study. Sufficient quantities of various chemicals like 88% Phenol solution (Liquefied Phenol) and 10% NaOH solution were obtained from a chemistry lab.

Permission from hospital ethical committee was obtained. After explaining the procedure and associated complications in detail, a written informed consent was taken from every patient included in the study. It included a total of 140 cases which were randomly divided into two equal groups of 70 each by means of lottery method. In group A, the patients underwent PMC whereas in group B, the patients underwent SHMC. All the patients underwent partial nail avulsion in the Minor OT of CMH Kharian as outdoor patients, under local anesthesia (Digit ring block) and asepsis, after application of tourniquet at the base of toe. Any hypertrophied granulation tissue was curetted away. Proximal Nail Fold was reflected back to allow full visualization of the nail matrix. The surrounding soft tissues were liberally covered with petroleum jelly to protect against chemical damage.

In group A, the patients underwent matrix cauterization with 1-minute application of a sterile cotton bud dipped in 88% Phenol solution. The effectiveness of Phenol was confirmed by observing the change of colour of tissue from white to a bluish hue. Excess Phenol was neutralized with 70% isopropyl alcohol. Whereas in group B, the patients underwent cauterization with 1-minute application of a

sterile cotton bud dipped in 10% NaOH solution. The endpoint of this procedure was the visible white blanching of the capillaries. Then excess NaOH was neutralized with 5% acetic acid.

At this point, the tourniquet was removed after repositioning Proximal Nail Fold to its original site. Bleeding was controlled with pressure. The wound was irrigated with sterile saline, brushed with pyodine and packed with Paraffin gauze. A bulky cotton dressing or cling was applied. Patients were given Tab Brufen 400mg for managing pain as required and Tab Augmentin 1 gram twice daily for three days as antibiotic cover. The wound was allowed to heal by secondary intention and was managed by daily dressing till complete healing.

All patients were reviewed on 2nd and 10th day postoperatively to establish the degree of pain and the state of wound. Each patient was asked to rate the Postoperative pain perception on a Visual Analogue Pain Scale of 1-10 and was graded as Mild (1-3), Moderate (4-6) and Severe (7-10). The state of wound was assessed as per Southampton Wound Grading System and was graded as 0 (normal), I (mild erythema), II (erythema and other signs of inflammation), III (clear or serosanguinous discharge) and IV (pus). Data for each patient was recorded on a follow up performa.

All collected data was analyzed using SPSS v14.0. Mean and standard deviation (SD) were calculated for quantitative variables like age. The qualitative variables like gender, post-operative pain, wound healing and efficacy of both groups were presented in terms of percentages and frequencies. Both groups were compared for qualitative values by applying Chi-Square test. *p* value < 0.05 was considered statistically significant.

RESULTS

A total of 140 cases. 70 in each group were analyzed statistically. None of the subjects dropped out, or lost at any point during the study. The age distribution ranged from 18-44 years in the study. Mean age was 28.86 ± 6.423 and 28.80 ± 5.997 in group A and B respectively. Out of total 140 patients, 106 (76%) patients were males and 34 (24%) were females. Group

A had 58 (83%) males and 12 (17%) females. Group B had 48 (69%) males and 22 (31%)

easy to perform and cheap outpatient procedure, to result in rapid healing with no

Table-1: Comparison of study groups for age and gender distribution.

| | Group A (n = 70) | Group B (n = 70) | p value |
|-------------------|------------------|------------------|---------|
| Mean Age | 28.86 ± 6.423 | 28.80 ± 5.997 | 0.241 |
| Male/female ratio | 4.8:1 | 2.2:1 | 0.049 |

Table-2: Comparison of study groups for pain on day 2 and 10.

| Pain Score | Group A (n = 70) | Group B (n = 70) | p value |
|------------|------------------|------------------|---------|
| Day 2 | | | 0.014 |
| No Pain | 48 (68.6%) | 30 (42.9%) | |
| Pain | 22 (31.4%) | 40(57.1%) | |
| Day 10 | | | 0.662 |
| No Pain | 68 (97.1%) | 69 (98.6%) | |
| Pain | 2 (2.9%) | 1 (1.4%) | |

Table-3: Comparison of study groups for wound healing on day 2 and 10.

| SWG | Group A (n = 70) | Group B (n = 70) | p value |
|-----------|------------------|------------------|---------|
| Day 2 | | | |
| Grade I | 5 (7.1%) | 11 (15.7%) | 0.022 |
| Grade II | 11 (15.7%) | 22 (31.4%) | |
| Grade III | 47 (67.2%) | 34 (48.6%) | |
| Grade IV | 7 (10 %) | 3 (4.3 %) | |
| Day 10 | | | |
| Grade I | 22 (31.4%) | 26 (37.1%) | 0.024 |
| Grade II | 28 (40 %) | 38 (54.3%) | |
| Grade III | 17 (24.3%) | 5 (7.2%) | |
| Grade IV | 3 (4.3 %) | 1 (1.4 %) | |

females. (Table-1)

While analyzing pain (table-2), Group A (31.4%) had less intense pain as compared to the Group B (57.1%) on day 2 ($p=0.014$), whereas two patients (2.9%) of Group A had mild pain as compared to only one (1.4%) of Group B on day 10 ($p=0.662$). While analyzing wound healing (Table 3), 54 (77.2%) had SWG >II in Group A, as compared to 37 (52.9%) in Group B on 2nd day ($p=0.022$), whereas 20 (28.6%) had SWG >II in Group A, as compared to 6 (8.6%) in Group B on 10th day ($p=0.024$). Efficacy was defined as no pain (0 score) and SWG ≤II at 10th post op day. Group B (91.4%) had more efficacy than Group A (71.4%) ($p=0.004$).

DISCUSSION

Ingrown toenails are common problem, causing pain, disability and absence from work. An ideal surgical technique for managing ingrown toenails is expected to be technically

serious postoperative complication, to have minimal recurrence and to be cosmetically acceptable with high success rate and early return to normal activities^{6,13}.

Chemical matricectomy is such an ideal method fulfilling all these criteria and producing excellent results in all stages and even in recurrent ingrown toenails¹⁴. PMC has been widely used and reported having high success rate in permanently destroying the nail matrix and cosmetically satisfactory with less postoperative pain^{15,16}, but unpredictable extensive tissue damage, and associated excessive drainage, postoperative infections and prolonged healing as well as the hazard of systemic toxicity are main shortcomings of this procedure^{6,9,14}. Severe chemical burn, excessive extravasation, and insufficient lymphatic drainage caused by Phenol are suggested to be the possible responsible factors for delayed healing¹⁷. In recent years, several authors reported similar high success rates of SHMC,

with less morbidity and quick healing⁶⁻⁹. It is due to the fact that it produces a liquefaction necrosis, which heal more rapidly than coagulation necrosis caused by phenol and it is truly neutralized by acetic acid, whereas phenol is only diluted by alcohol but not neutralized¹⁸.

There are few studies in international literature comparing PMC with SHMC but no study has been done yet in Pakistan. The data review deducts that the most important difference about the outcome of these procedures is related with the postoperative morbidity in terms of pain and wound healing^{19,20}. Therefore this RCT has compared these most important outcomes after SHMC and PMC in 140 patients until 10th postop day. It reveals that the frequency of postoperative pain was significantly less with PMC on 2nd day. However nearly all the patients were insignificantly painless on 10th day. Wound drainage (SWG >II) was significantly more with PMC on both days. Thus SHMC has more efficacy with statistical difference between two matricectomies and is superior to PMC in reducing pain and improving wound healing for managing ingrown toenails.

A detailed comparative RCT by Bostanci and colleagues⁶ in 2007 revealed that success rates in SHMC and PMC were 95.1% and 95.8% respectively. The postoperative pain was significantly less with PMC (28%) than SHMC (52%) on 2nd day and all patients were pain-free on 10th day. The wound drainage was present in 71% and 23% after SHMC, and 94% and 71% after PMC at 2nd and 10th post op day respectively. Gem and Sykes²¹ compared application of 10% NaOH for 2 minutes, for one minute and 80% phenol for 3 minutes. They stated no significant difference among three methods considering the success rates, time to become pain free (average of 3.6 days), or time needed for complete healing (average of 40 days). In a study by Ozdemir and colleagues⁷, matricectomy with 10% NaOH either applied for 2 minutes or 1 minute was 100% successful. It was also cured 10 patients who had recurrence after PMC. Kocyigit et al⁸ found similar results with 30-second, 1-minute, and 2-minute applications of NAOH, but less

postoperative pain and drainage was the advantages of the 1-minute application.

Various studies have shown that PMC is associated with more postoperative wound drainage and infection, leading to slow wound healing⁶⁻⁹. Similarly in this study wound drainage and infection rates were significantly lower and wound healing was significantly better after SHMC. Thus this study when analysed in context of these studies, implies that SHMC is superior to PMC in reducing pain and improving wound healing for managing ingrown toenails. However the long term variables like complete healing periods, recurrence, cosmesis and overall success rate bring out the need for further prospective controlled trials giving detailed information about postoperative follow-up findings and recovery periods of patients after two matricectomies.

CONCLUSION

The study presents a tendency for faster postoperative recovery and lower postoperative morbidity in patients treated with SHMC. Thus SHMC is superior to PMC in reducing pain and improving wound healing for managing ingrown toenails. However long term complications, like complete healing time, recurrence and cosmetics should be evaluated and compared to get better evidence based results.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

REFERENCES

1. Heidelbaugh JJ, Lee H. Management of Ingrown Toenail. *Am Fam Physician* 2009;79:303-8.
2. Rounding C, Bloomfield S. Surgical treatments for ingrowing toenails. *Cochrane Database Syst Rev* 2005;(2):CD001541.
3. Asahraf MS. Ingrowing toe nail. *Pak J Med Sci* 2007;23:150-1.
4. O zdil B, Eray IC. New method alternative to surgery for ingrown nail: angle correction technique. *Dermatol Surg* 2009;35:990-2.
5. Bos AM, van Tilburg MW, van Sorge AA, Klinkenbijn JH. Randomized clinical trial of surgical technique and local antibiotics for ingrowing toenail. *Br J Surg* 2007; 94:292-6.
6. Bostanci S, Kocyigit P, Gurgey E. Comparison of Phenol and Sodium Hydroxide Chemical Matricectomies for the Treatment of Ingrowing Toenails. *Dermatol Surg* 2007; 33: 680-5.
7. 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.
8. Kocyigit P, Bostanci S, O'zdemir E, Gurgey E. Sodium hydroxide chemical matricectomy for the treatment of ingrown toenails: comparison of three different application periods. *Dermatol Surg* 2005; 31: 744-7.

9. Espensen EH, Nixon BP, Armstrong DG. Chemical matricectomy for ingrown toenails: is there an evidence basis to guide therapy? *J Am Podiatr Med Assoc* 2002; 92: 287-95.
 10. Bostanci S, Ekmekci P, Gurgey E. Chemical matricectomy with phenol for the treatment of ingrowing toenail: a review of the literature and follow-up of 172 treated patients. *Acta Derm Venereol* 2001; 81:181-3.
 11. Krull EA. Toenail surgery. In: Krull EA, Zook EG, Baran R, Haneke E. *Nail Surgery: A Text and Atlas*. Philadelphia: Lippincott Williams & Wilkins; 2001:86-7.
 12. Reyzelman. Current Concepts In Performing Matrixectomies. *Podiatry Today* 2005; 18: 44-50.
 13. Thommasen H V, Johnston C S, Thommasen A. The occasional removal of an ingrowing toenail. *CJRM* 2005; 10: 173-80.
 14. Kim S, Ko H, Oh C, Kwon K, Kim M. Trichloroacetic Acid Matricectomy in the Treatment of Ingrowing Toenails. *Dermatol Surg* 2009; 35: 973-979.
 15. Andreassi A, Grimaldi L, D'Aniello C. Segmental phenolization for the treatment of ingrowing toenails: a review of 6 years experience. *J Dermatolog Treat* 2004; 15: 179-81.
 16. Islam S, Lin EM, Drongowski R, Teitelbaum DH, Coran AG, Geiger JD et al. The effect of phenol on ingrown toenail excision in children. *J Pediatr Surg* 2005; 40: 290-2.
 17. Boberg JS, Frederiksen MS, Harton FM. Scientific analysis of phenol nail surgery. *J Am Podiatr Med Assoc* 2002; 92: 575-9.
 18. Travers GR, Ammon RG. The sodium hydroxide chemical matricectomy procedure. *J Am Podiatr Assoc* 1980; 70: 476-8.
 19. Richert B. Basic nail surgery. *Dermatol Clin* 2006; 24: 313-22.
 20. Zaborszky Z, Fekete L, Tauzin F, Orgovan G. Treatment of ingrowing toenail with segmental chemical ablation. *Acta Chir Hung* 1997; 36: 398-400.
 21. Gem MA, Sykes PA. Ingrowing toenails: Studies of chemical ablation. *Br J Clin Pract* 1990; 44: 562-3.
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