

Original Research Article

Outcome of partial nail avulsion followed by partial matricectomy with 88% phenol in management of ingrown toe nail

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Received: 15 December 2024

Accepted: 09 January 2025

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ABSTRACT

Background: Ingrown toenail (onychocryptosis) is a common and painful condition where the toenail grows into the surrounding skin, often causing inflammation, pain, infection and frequent recurrence. The condition most frequently affects the great toe and is common in adolescents and young adults. The aim of this study was to evaluate the outcomes of partial nail avulsion followed by partial matricectomy with phenol (88%) in the management of ingrown toenails of stage 2 and 3.

Methods: This was an observational study and was conducted in the department of dermatology in Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh during the period from April 2023 to May 2024. In total 30 patients both male and female are included in the study. After surgery patients were followed up at 7th and 14th day for wound inspection and 4th and 6th week for post operative complication and then at 3 months interval for recurrence and late complication. Statistical analysis was done by using SPSS (statistical package for social science) version 23 for windows 10.

Results: In our study we found the mean age was 10±6.24 years. The participants, 36.67% had undergone previous surgery. Our results show, the (VAS) with a mean score of 1.8±1.7 on postoperative day 1, 1.2±1.4 on day 2, and 0.2±0.1 by the second postoperative week and the mean healing time was 12.3±3.1 days. We also found, 29 patients were completely recovered and the recurrence of ingrown toenails occurred in 3.3% of cases.

Conclusions: Partial nail avulsion with phenol matricectomy is an effective treatment for ingrown toenails, offering long-term relief with low recurrence rates.

Keywords: Ingrown toenails, Partial nail avulsion, Matricectomy, Phenol

INTRODUCTION

Onychocryptosis, also known as an "ingrown toenail," is a common and painful condition of the foot that involves inflammation of the tissue around the edges of the toenail. While it can affect any toe, the lateral side of the great toe is most frequently impacted. This condition is particularly prevalent among adolescents and young adults aged 11 to 30 years, leading active lifestyles. An ingrown toenail is associated with significant pain, discomfort, and

functional limitations, which can interfere with daily activities and quality of life.^{1,2} An ingrown toenail progresses through three stages. In stage 1, there is erythema, mild swelling, and localized pain, especially when pressure is applied. Stage 2 involves a worsening of symptoms, with the development of a localized infection, increased drainage from the wound, and more noticeable discomfort. By stage 3, the condition intensifies further, characterized by pronounced signs of infection, granulation tissue formation, and hypertrophy of the lateral

nail wall.³ An ingrown toenail, occurs when the alignment between the nail plate and the lateral nail groove is disrupted, causing the nail to grow into the surrounding skin. This condition is influenced by several factors that contribute to its onset and progression.³ Improper nail trimming is one of the most common causes, where cutting the nail too short or rounding the edges can encourage the nail to grow into the skin. Hyperhidrosis, or excessive sweating, can soften the skin and make it more prone to injury from the nail. Similarly, poor foot hygiene can lead to bacterial or fungal infections, exacerbating the problem.^{3,4} External pressure from factors such as poor posture, abnormal gait, ill-fitting shoes, and repetitive trauma to the toe-common in athletes or individuals with active lifestyles-can further irritate the nail bed. Tight or narrow footwear is particularly problematic, as it forces the nail edges into the surrounding tissue.³⁻⁵ Internal factors also play a critical role. An over-curvature of the nail plate (pincer nail deformity) increases the likelihood of the nail embedding into the skin. Other contributors include arthritis, subungual neoplasms, and skeletal abnormalities, all of which can alter the natural anatomy of the toe and nail bed. Systemic conditions, such as diabetes and obesity, further compound the issue. Diabetes, in particular, predisposes individuals to delayed healing and increased risk of infection, while obesity adds mechanical stress on the feet. Age-related changes in the nail, such as thickening or increased brittleness in elderly individuals, make them more susceptible to ingrown toenails.³⁻⁷

There are various treatment options for ingrown toenails, ranging from basic conservative methods to more complex surgical procedures that require significant surgical experience.⁴ Conservative treatment approaches include soaking the foot in warm water, applying topical or oral antibiotics, using silver nitrate to cauterize granulation tissue, and practicing proper nail trimming techniques. Other approaches involve lifting the nail corner with gauze or a plastic gutter, enhancing foot hygiene, and filing or clipping a notch in the central part of thick nails.^{4,5,7-10} This management approach is time-intensive, requiring significant patient cooperation and patience from both the doctor and the patient. Due to the extensive support needed, it is not an inexpensive treatment option. However, conservative treatment for ingrown toenails can be effective, particularly in patients with stage 1 of the condition.^{3,7-9,11,12} Stage 2 ingrown toenails can be managed conservatively, but recurrences are frequently seen.^{8,9} However, stages 2 and 3 are most effectively treated through surgical intervention.^{3,4,8,9} Treatment options for ingrown toenails vary depending on the disease stage, ranging from conservative approaches to more invasive procedures. One of the most effective surgical treatments is partial nail avulsion with matricectomy using phenol, a procedure introduced by Boll.¹³ This method has demonstrated highly satisfactory therapeutic outcomes. The study aims to investigate the outcome of partial nail avulsion followed by partial matricectomy with 88% phenol in the management of ingrown toenail.

Objectives

The main objective was to investigate the outcome of partial nail avulsion followed by partial matricectomy with 88% phenol in the management of ingrown toenail of stage 2 and 3.

METHODS

This was an observational study and was conducted in the department of dermatology in Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh during the period from April 2023 to May 2024. This study was done with the consent of authority of dermatology and venereology department of Bangabandhu Sheikh Mujib medical university, Dhaka, Bangladesh. Confidentiality of the patient was strictly maintained.

A total of 30 patients, encompassing both male and female who were included in the study. We included all patients with ingrown toenail referred to our department and describe subsequent follow up by the same surgeon. Patients treated with lateral partial nail avulsion followed by partial matricectomy achieved by phenol 88% under local anesthesia as a day case surgery and patient were followed up at day 7, day 14 for wound inspection and 4th and 6th week for post operative complication and at three months interval for recurrence and late complication. Patient those who had a contraindication to local anesthesia and having diabetes mellitus and peripheral vascular diseases were excluded from the study.

Measures of variables

Demographic variables were age, gender, BMI, affected side, previous surgery.

Outcome measures

Visual analogue scale shown in Figure below.

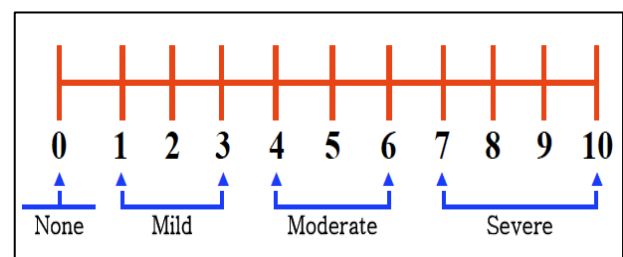


Figure 1: VAS scale.

A standardized semi-structured data collection sheet was used to collect necessary information and face to face interview. The data collected on a standardized sheet for each patient included: age, gender, length of evolution, history of ingrown toenail, and previous treatment modalities. The risk factors, such as hyperhidrosis, abnormal nail shape, obesity, poor or tight-fitting shoes,

and abnormally sized nails were also described. Our physical examination at the time of the surgery highlighted the position of the ingrown toenail and the presence of any infection necessary information was collected by reviewing related medical reports. A semi structured questionnaire was developed in English. The questionnaire was developed using the selected variables according to the specific objectives. A checklist was also developed to record desired variables from admission record, history sheet and related medical records. Data were checked immediately after completing interview and review of necessary investigation reports. All relevant data were collected from each respondent by use of an interview schedule, measured parameters, and investigations in a predesigned format. Patients who were fulfilled the inclusion criteria and willing to enroll in the study were included in the study after receiving the informed written consent.

Statistical analysis

All data were recorded systematically in preformed data collection form and quantitative data was expressed as mean and standard deviation and qualitative data was expressed as frequency distribution and percentage. Statistical analysis was carried out by using Statistical analysis was done by using SPSS (Statistical package for social science) version 23 for windows 10. $P < 0.05$ was considered as statistically significant. Confidentiality was strictly maintained.

RESULTS

Figure 1 showed that majority (56.67.64%) of our patients were aged 15-24 years old, followed by 26.67% aged 25-34 years old and 16.67% aged 35-44 years old respectively. The mean age was 10 ± 6.24 years.

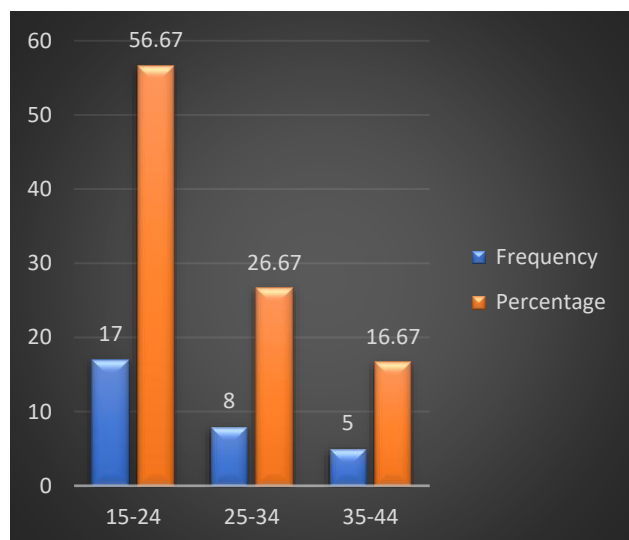


Figure 1: Age distribution of our study subjects (n=30).

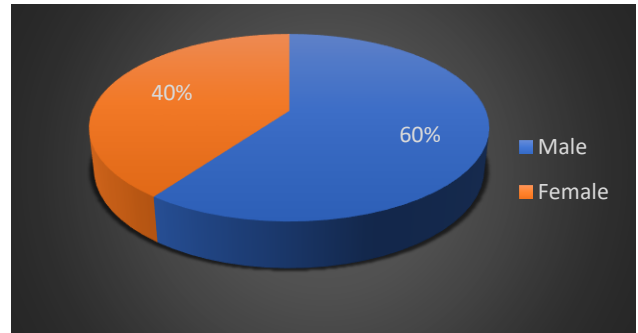


Figure 2: Gender distribution of our study subjects (n=30).

Figure 2 showed that majority (60%) of our patients were male and 40% patients were female.

Table 1: Baseline characteristics of the study population.

Characteristics	N	Percentage (%)
BMI (kg/m²)		
Mean±SD	42.9±5.0	
Affected side		
Right	20	66.67
Left	10	33.33
Previous surgery		
Yes	11	36.67
No	19	63.33

In Table 1 we showed the baseline characteristics of the respondents. The study included 30 patients with a mean BMI of 42.9 ± 5.0 . Regarding the affected side, the majority had right-sided involvement (66.67%), while 33.33% had left-sided involvement. Among the participants, 36.67% had undergone previous surgery, whereas 63.33% had no history of surgical intervention.

Table 2: Postoperative outcome measure of the respondents.

Outcome	Mean±SD
Post-surgical pain (VAS)	
POD D ₁	1.8±1.7
POD D ₂	1.2±1.4
POD W ₂	0.2±0.1
Healing time (days)	
Mean±SD	12.3±3.1
Recurrence (after 3 month)	1 (3.33%)

Table 2 shows the postoperative outcome of the respondents. The VAS, with a mean score of 1.8 ± 1.7 on postoperative day 1, 1.2 ± 1.4 on day 2, and 0.2 ± 0.1 by the second postoperative week. The mean healing time was 12.3 ± 3.1 days. Recurrence of ingrown toenails occurred in one patient 3.33% of cases was observed at three month follow up.

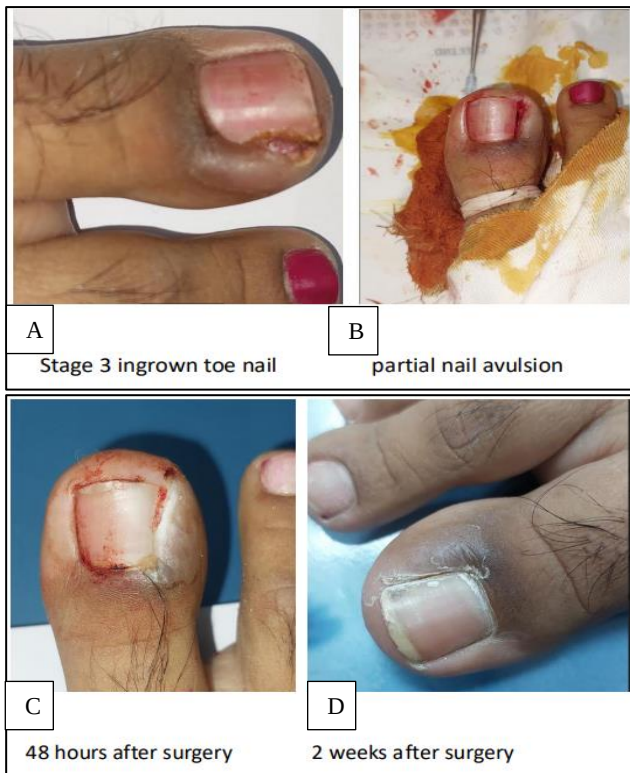


Figure 3 (A-D): Postoperative outcome of the respondents

DISCUSSION

Ingrown toenails are commonly attributed to improper nail trimming practices or repetitive, inadvertent trauma.¹ Various genetic and behavioral factors are considered predisposing risk factors.¹⁴ Wider nail folds and thicker nails significantly increase the likelihood of developing this condition. Additionally, a genetic predisposition, a family history of the condition, hyperhidrosis, and inadequate foot hygiene further contribute to the development of ingrown toenails.² Chronic conditions such as diabetes, obesity, thyroid disorders, and cardiac, and renal issues significantly elevate the risk of developing ingrown toenails.¹⁴ Infections in the lateral nail fold are most commonly caused by *Staphylococcus aureus*, with less frequent involvement of Gram-negative bacteria like *Pseudomonas* and *Streptococcus*.¹⁵ While oral antibiotics are often prescribed before or after matricectomy, several studies suggest that localized infections typically resolve after removing the ingrown nail and matricectomy, eliminating the need for antibiotics in many cases.¹⁶ Surgical management is the cornerstone of treating ingrown toenails, as conservative methods often yield limited long-term success.¹⁷ The standard surgical approach involves nail plate avulsion combined with selective destruction of the nail matrix to minimize damage to surrounding tissues while ensuring complete and reliable matrix removal to prevent recurrence.¹⁸⁻²⁰ Phenol is the most commonly used agent for matricectomy, acting as a protein denaturant that induces coagulation necrosis in the matrix and adjacent soft

tissues.^{21,22} Studies have shown phenol to be highly effective in reducing symptomatic recurrences, with rates between 1% and 9.6%, compared to 42-83% with nail avulsion alone.^{16,23} However, its use is associated with prolonged healing due to tissue necrosis, increasing the risk of postoperative infection.¹⁶ Postoperative discharge typically lasts 2-4 weeks but can extend to 6 weeks.²⁴ Phenol is contraindicated in individuals with moderate or severe vascular disease of the foot, conditions that delay wound healing, allergies to the chemical, and pregnancy.^{25,26} This observational study was to investigate the outcome of partial nail avulsion followed by partial matricectomy with 88% phenol in the management of ingrown toenail. So, the appropriate treatment can be given. The number of respondents 30 who were male and female. In our study we found among the participants, 36.67% had undergone previous surgery, whereas 63.33% had no history of surgical intervention. Our results show, the (VAS) with a mean score of 1.8 ± 1.7 on postoperative day 1, 1.2 ± 1.4 on day 2, and 0.2 ± 0.1 by the second postoperative week and the mean healing time was 12.3 ± 3.1 days. We also found, 29 patients were completely recovered and the recurrence of ingrown toenails occurred in 3.3% of cases at three month follow up. Vaccari et al reported a healing time of 14-28 days for partial phenolization.²⁷ Another study indicated a shorter healing time of around 7 days in the chemical matricectomy group, where the criteria for healing were symptom relief and the resumption of daily activities.²⁸ However, a comparative clinical trial involving wedge resections with partial phenolization showed an increased healing time of approximately 2.1 weeks.²⁹ A clinical study on partial matricectomy with electrocautery noted prolonged pain, inflammation, and a recurrence rate of 4% at three months.³⁰ Bos et al evaluated various surgical techniques for ingrown toenails and concluded that partial nail avulsion with phenolization yielded superior outcomes to partial avulsion with matrix excision.³¹ Additionally, the use of phenol did not increase infection rates compared to matrix excision, and local antibiotics were found ineffective in reducing infection signs or recurrence.³²

Limitations

Since our study was conducted at a single center. The study may have been limited by a relatively small sample size, which could affect the generalizability of the findings to a larger population. A short follow-up period may not adequately capture long-term outcomes, including recurrence rates and late complications.

CONCLUSION

Partial nail avulsion followed by partial matricectomy with 88% phenol is an effective, and minimally invasive option for managing ingrown toenails, particularly in recurrent or severe cases. While prolonged healing and minor risks exist, its high success rates and low recurrence make it a preferred treatment for many clinicians and patients.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Khan MA, Chowdhury MAH, Khondker L, Siddiquie RU, Afroze D, Alauddin M. Outcome of partial nail avulsion followed by partial matricectomy with 88% phenol in management of ingrown toe nail. Int J Res Med Sci 2025;13:657-61.