Effectiveness of standard lavage with supplemental chlorhexidine in patients undergoing chemical matricectomy for ingrown toenails: A clinical trial

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Background: Phenolization is often used to treat ingrown toenails. Alcohol lavage with or without supplemental chlorhexidine may be used to remove residual phenol, which can contribute to side effects such as persistent oozing or drainage.

Objective: We sought to compare the effectiveness in removing residual phenol of lavage with alcohol plus chlorhexidine versus alcohol alone.

Methods: We studied 80 patients who underwent unilateral phenol matricectomy: 40 who received irrigation with alcohol alone and 40 who received irrigation with alcohol plus chlorhexidine. Phenol levels were measured after each of 5 rounds of 3-mL irrigations.

Results: After the first irrigation, an average of 44.92% and 38.35% of the phenol remained in the nailfold in the alcohol and the alcohol/chlorhexidine groups, respectively ($P < .05$). After all 5 irrigations, no difference in efficacy between the 2 solutions was found ($P > .005$).

Limitations: It was not possible to calculate the quantity of phenol initially introduced into the nail bed. The percentage remaining was calculated from the total amount of phenol recovered.

Conclusion: When a single irrigation step is performed after phenolization, alcohol plus chlorhexidine is more effective than alcohol alone for removing residual phenol. When multiple irrigations are performed, the 2 solutions are equally effective. (J Am Acad Dermatol 2014;70:1092-5.)

Key words: alcohol; chlorhexidine; ingrown toenail; phenol.

In high-risk patients, an ingrown toenail can be a painful and potentially morbid condition.[1] Various causative factors including abnormal nail structure, inadequately trimmed nails, hyperhidrosis, pressures and irritation from improperly fitting shoes, and poor foot hygiene have all been ascribed to cause this condition.[2] The operative methods vary from simple avulsion of the affected nail to more radical surgical procedures, such as partial or complete matrix excision. The application of phenol to the nail matrix is another method used alone or in combination for appropriate treatment.[3] Phenol cauterization is the chemical equivalent of surgical ablation and can be used to ablate part, or all, of the nail matrix.[4,5] Most practitioners[6-18] use concentrations of 80% to 89% phenol solution applied for various periods of time.

Many reports describe an intraoperative irrigation, or lavage, of the ingrown toenail wound with alcohol to inactivate or neutralize any remaining phenol

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Funding sources: None.
Conflicts of interest: None declared.
Accepted for publication February 5, 2014.
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Published online March 28, 2014.
0190-9622/$36.00

http://dx.doi.org/10.1016/j.jaad.2014.02.013

from the treatment procedure.[6,16,19-29] However, some clinicians do not lavage the wound in this manner because they claim that the alcohol does not adequately remove the phenol.[30,31] Further, the phenol evaporates after its application, thus many believe the lavage step to be unnecessary. One report, however, describes the use of alcohol plus chlorhexidine to neutralize the action of phenol.[24]

The aim of our study was to assess the suitability and effectiveness of a 70% alcohol lavage with or without 0.5% chlorhexidine supplementation for phenol-based chemical matricectomy in an in vivo setting. The study objectives included determining which intra-operative irrigation solution removed more phenol, and measuring the amount of phenol that remained in the wound. We hypothesized that alcohol lavage plus chlorhexidine would eliminate more phenol relative to alcohol alone.

CAPSULE SUMMARY

- Various clinical approaches are used to remove residual phenol after chemical matricectomy for treatment of ingrown toenails.
- After single-step lavage, alcohol plus chlorhexidine removed significantly more residual phenol than alcohol alone.
- When single-step alcohol lavage is performed after phenolization, the solution should be supplemented with chlorhexidine.

METHODS

Institutional review approval for the study was obtained from the research committee of the Rey Juan Carlos University (Madrid, Spain) and written informed consent was obtained from all participants. We enrolled 60 patients (>18 years old) in each arm of the study, and 40 patients completed the study. Exclusion criteria included infection, a history of tinea pedis, onychomycosis, paronychia, nail trauma or subungual hematoma, nail deformities and disorders, peripheral vascular disease or diabetes, cardiac disease, a history of rheumatic fever, recent antibiotic use or current antimicrobial therapy, a history of steroid use, and recent nail polish use. No patient received preoperative antibiotic prophylaxis.

Eighty patients presented with unilateral ingrown toenails and underwent chemical partial nail matricectomy of the hallux using an 88% phenol solution. Patients were divided randomly into 2 treatment groups: alcohol lavage or alcohol/chlorhexidine lavage (Table I). After the phenol procedure, 40 patients (36 women and 4 men) were treated with 70% alcohol washes and the remaining 40 patients (34 women and 6 men) were given alcohol washes supplemented with 0.5% chlorhexidine.

Surgical procedure

A standard chemical phenolization procedure was performed on 1 nail border (medial or lateral), never in 2 borders at the same time.[32,33] Once the nail matrix was exposed, sterile petrolatum was applied to the surrounding soft tissue to prevent the phenol from cauterizing the adjacent nailfold. Next, using a gauze technique,[34] phenol was applied to the region.

Both experimental groups were given 3 applications of 1-minute phenol causing the nail bed to appear white because of phenol-associated tissue coagulation. After the treatment, 5 rounds of a 3-mL wash of 70% alcohol with or without 0.5% chlorhexidine was used to irrigate the exposed area and neutralize any residual effects of phenol. This neutralization has been reported to occur by termination of its chemical action.[30,34]

After the irrigations steps, a dry, sterile, rayon, mini-tip swab class IIa (Surgically Invasive Transient Use, Copan Italia S.p.A., Brescia, Italy) was introduced into the phenolized nail matrix to recover any residual phenol. The swab was then placed in a sterile tube with 3 mL of 70% alcohol and submitted to the chemical laboratory for blind analysis.

Analytical method

The amount of phenol from the swab samples were quantified by high-performance liquid chromatography, using previously validated methods.[35-37] Briefly, modular high-performance liquid chromatography (Jasco International Co Ltd, Hachioji, Tokyo, Japan) equipped with an LG-2080-04 quaternary low-gradient unit, a PU-2080 pump, a DG-2080-54 degasser, an AS-2050-plus autosampler, and a UV-2070 plus UV/Vis detector were used (Jasco International Co Ltd, Hachioji, Tokyo, Japan). A C18 column Luna (particle size 3 μm, 150 3 4.6 mm) (Phenomenex, Torrance, CA) was selected for the chromatographic separation of the components, with a column temperature of 30°C (LC Ni-II/ADC oven).

The composition of the mobile phase was a mixture of MilliQ water and acetonitrile 50:50 (vol/vol). Solvents were vacuum-filtered through 0.45-μm nylon Millipore membranes (Millipore, Bedford, MA), and degassed by ultrasonication for 20 minutes before use. The flow rate was set at