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Management of skin necrosis after chemical matrixectomy with sodium hydroxide in ingrown toenail

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ABSTRACT

Ingrown nail (unguis incarnatus) is a common condition associated with discomfort and morbidity. Thoughtful treatment choice and patient care by an experienced center is important for overall success.

A 28 years old female patient presented with symptoms of chronic unguis incarnatus and a skin necrosis on right great toe. Patient history revealed that symptoms has aggravated after a recent treatment chemical matrixectomy into soft tissue with 10% sodium hydroxide following 10% acetate neutralization to the nail root by another center. Physical examination showed 1.8x0.7 cm full-thickness skin necrosis. Our team surgically removed the ingrown nail area with "Winograd" method. After debridement of necrosis, exposed extensor hallucis longus tendon was covered with a local transposition flap. Patient returned to work with full capacity on postop week 3. During 3 years of follow up no recurrence was observed. Treatment significantly improved mean patients foot function index (Preop:6.4±3.1 vs. 12months:1, $p< 0.001$) with high cosmetic satisfaction.

It is not safe nor recommended to perform unproven, subdermal application based operations for unguis incarnatus patients. Well established surgical lateral matrix excision or ablation techniques are safe and successful treatment options. Evidence based care is important to achieve successful results and minimal morbidity and deformity.

Key words: Chemical matrixectomy, Ingrown nail, Skin necrosis, Winograd method, Unguis incarnatus.

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Introduction

The ingrown nail is a common and serious condition that can result in pain, activity limitation, and intense discomfort. It occurs when there is a disruption in the correct fitting of the nail plate within the lateral nail groove. The primary aggravating factors include narrow pointed shoes, tight socks, and hyperhidrosis [1]. Mechanic or chemical lateral matrixectomy are two common treatments. The mechanical approach does not involve the use of any necrotic agents. However, inexperienced surgeons might fail to fully curette the nail bed, potentially leading to recurrences. Chemical cauterization is easier to apply, yet surgeons must be cautious to prevent excessive damage. Liquified phenol and sodium hydroxide are the most common methods [2].

This study focuses on the management of skin necrosis after chemical matrixectomy with sodium hydroxide in an ingrown toenail, presenting the findings and reviewing relevant literature.

Case report

A 28 year old female patient presented pain and discomfort on right great toe, and impaired ambulation. These symptoms have been aggravated after chemical matrixectomy with sodium hydroxide and neutralization with 10% acetic acid for ingrown toenail by another center. On physical examination, the grade 2 ingrown toenail on dextrolateral wall of right great toe and full-thickness skin necrosis in size of 1.8x0.7 cm on the dorsum of proximal phalanx were observed at first application to our clinic ten days after chemical matrixectomy. The circulation, sensation and range of motion of the finger were intact. The pain, disability and activity limitation were evaluated with Foot Function Index (FFI) scale.

Surgical procedures

All necrotic tissues underwent debridement under digital block anesthesia. After debridement, extensor hallucis longus tendon was exposed. A 2 x 1 cm local transposition flap was designed from the first web. The defect was closed with flap and donor area was closed primarily. The ingrown nail was treated with Winograd method[3] including wedge excision of the nail plate, nail lip, nail bed and matrix. Patient was discharged with oral analgesic (paracetamol 500 mg 2x1) and empiric antibiotic (amoxicillin clavulanic acid 1000mg 2x1) on same day. Sutures were removed at day 10. [Figure 1].

No early or late complication was observed. Scar tissue did not cause any functional or cosmetic problem. The mean FFI score was 6.4±3.1 at preoperatively and was significantly improved to 1 at 12 months postoperatively ($p < 0.001$). [Table 1] Patient returned to work at postop three week. She was followed for 36 months after surgery.

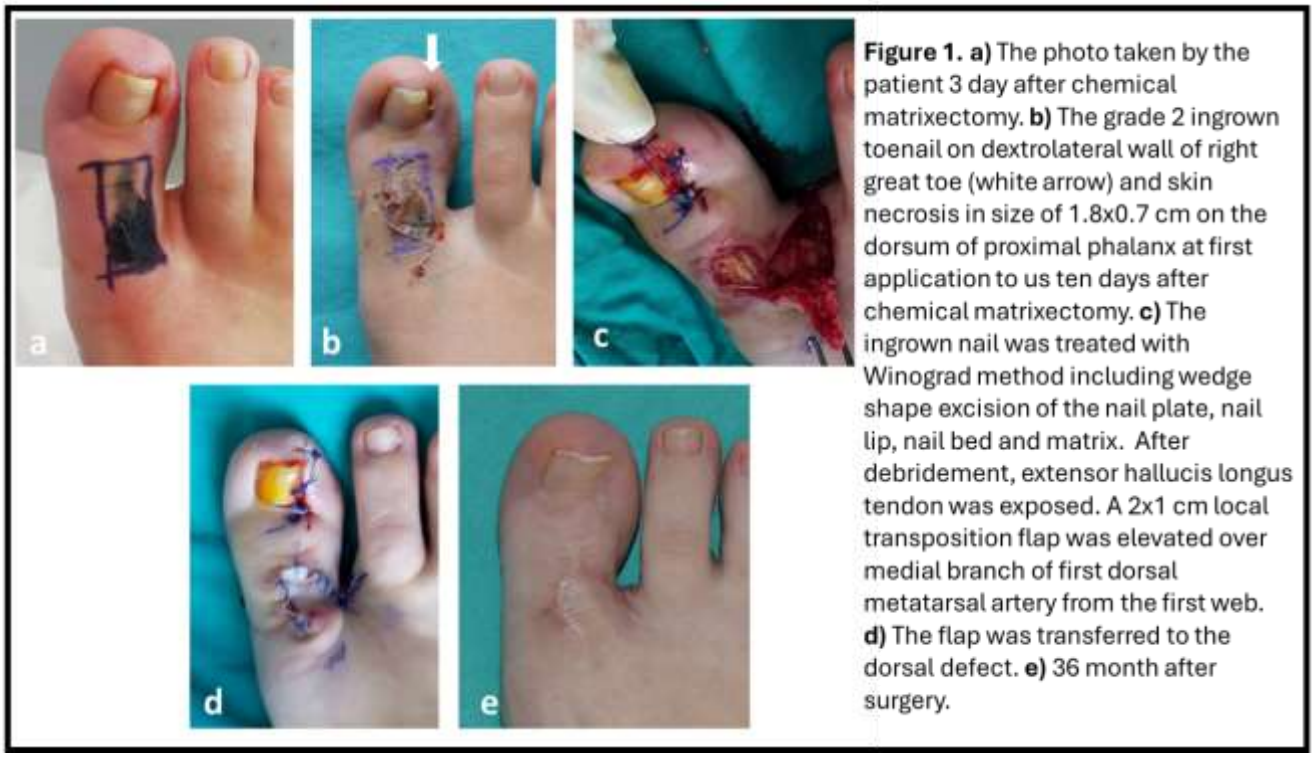

Figure 1. a) The photo taken by the patient 3 day after chemical matrixectomy. **b)** The grade 2 ingrown toenail on dextrolateral wall of right great toe (white arrow) and skin necrosis in size of 1.8x0.7 cm on the dorsum of proximal phalanx at first application to us ten days after chemical matrixectomy. **c)** The ingrown nail was treated with Winograd method including wedge shape excision of the nail plate, nail lip, nail bed and matrix. After debridement, extensor hallucis longus tendon was exposed. A 2x1 cm local transposition flap was elevated over medial branch of first dorsal metatarsal artery from the first web. **d)** The flap was transferred to the dorsal defect. **e)** 36 month after surgery.

Table 1. The pain, disability and activity limitation scores of the patient.

Foot Function Index Questionnaire		
Questions*	Pre-op Scores (1-10)	Post-op 12th month Scores (1-10)
Foot pain at worst	5	1
Foot pain in morning	4	1
Pain walking barefoot	6	1
Pain standing barefoot	4	1
Pain walking with shoes	9	1
Pain standing with shoes	9	1
Pain walking with orthotics	N/A	N/A
Pain standing with orthotics	N/A	N/A
Foot pain end of day	5	1
Difficulty walking in house	5	1
Difficulty walking outside	8	1
Difficulty walking 4 blocks	9	1
Difficulty climbing stairs	9	1
Difficulty descending stairs	9	1
Difficulty standing tip toe	10	1
Difficulty getting up from chair	9	1
Difficulty climbing curbs	9	1
Difficulty walking fast	10	1
Stay inside all day because of feet	4	1
Stay in bed all day because of feet	1	1
Limit activities because of feet	8	1
Use assistive device indoors	1	1
Use assistive device outdoors	1	1

*1 score: no, 10 score: worst; **Since the patient did not use orthoses, questions about orthoses were ignored.

Discussion

The treatment of ingrown nails has been a focus for physicians for centuries, with various approaches described. However, no universal consensus exists, emphasizing the importance of selecting evidence-based treatment methods to enhance patient care [2,4].

There are proposed conservative treatments which mainly focus on elevation of the nail fold. Medical tapes, cotton pieces and nail braces are most common non-invasive options. Gutter treatment, the use of a sterile plastic tube to elevate the full length of the lateral nail

margin under local anesthesia. While mild cases can be successfully treated with conservative approaches, infected and deformed unguis incarnatus cases require advanced treatment [2].

Nail avulsion posses' high recurrence rate and morbidity risk [2]. Wedge excision has high morbidity delayed and distorted healing and mutilation of the lateral nail folds [2].[2] Complications such as infection is highly common even fungal septicemia is observed [2]. Reduction and removal of lateral nail fold is designed to pull away the overgrown soft tissue from the nail lateral matrix. A modified version of this method is a common choice and named as lateral foldplasty a modification of Howard operation [2]. Excision of the nail bed is deem as radical and suboptimal [2] and has high recurrence rate [6].

Winograd method[3] is well accepted, and evidence based method with high success rate.[3] It is far less radical and successfully addresses the main cause in the etiopathogenesis by completely removing the specific segment that grows into the soft tissue. False grown nail is elevated, and plate is cut straight to the cuticle and segment is relieved. The lateral matrix segment is carefully curetted completely of the bone [2].

Segmental matrix horn chemical cauterization is the most commonly used method at the moment. It is fast, has a high cure rate, a minimal risk profile, and is easy to perform. The approach is similar to that described in surgical segmental matrix excision. Instead of surgically clearing the lateral segment of the matrix, this method involves cauterization. A chemical agent, most commonly liquified phenol, is applied to the matrix to prevent regrowth and recurrency [2]. Some centers follow the chemical application with alcohol irrigation to dilute the agent and prevent excessive cauterization [7]. However there are some center that prefer the use of trichloroacetic or 10-20% sodium hydroxide for cauterization [2].

A systematic review and meta-analysis investigated 31 studies found that chemical and surgical matrixectomy has comparable rates of recurrency. Furthermore, statistically indifferent recurrence was reported when other methods of matrixectomy (CO_2 laser, electrocautery) compared to surgical or chemical approach [4].

Although chemical ablation is mostly safe, common side effects include, tissue damage, prolonged drainage, infection, periostitis and poor cosmetic results [8]. Moreover, there are reports of complications such as nail dystrophy, allodynia, and hyperalgesia after sodium hydroxide treatment [9]. However, skin necrosis has not been reported before. Our study is the first reported case of skin necrosis after chemical matrixectomy with sodium hydroxide.

Chemical and surgical segmental matrixectomy is a proven and successful method for treating ingrown nails. Both have comparable reported success and complication rates as well as use of laser or electrode for cauterization. Chemical agent used to topically treat the matrix should not be used subcutaneously. Even though, followed with neutralization it can compromise the soft tissue without offering a remedy.

Our patient reported receiving a procedure that is not support by evidence based medicine which further aggravated the complaints and created a new wound site. It is important for all physicians who are legally allowed to treat ingrown nail to be well-trained. This would allow the prevention of absolute or harmful techniques, reducing morbidity and increasing patient satisfaction.

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Consent: *Patient confidentiality has been maintained and written consent for the publication of patient details and clinical pictures have been obtained from the patient's father and can be furnished when required.*

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