

INGROWN TOENAIL MANAGEMENT

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ABSTRACT:

Ingrown toenails are a common condition in general medicine and dermatology, and they occur when the nail curves inward and pierces the nail fold. Symptoms include pain in the affected toe, erythema and edema. The diagnosis is made clinically and, if left untreated, ingrown toenails can lead to infections and even cellulitis and osteomyelitis. Conservative treatments involve clipping on the spicule and topical antibiotics. However, the mainstay of treatment is matricectomy to reduce the recurrence rate. The risk of ingrown toenail development can be reduced by wearing proper footwear, keeping toenails cut straight and overall foot hygiene. Ingrown toenails can affect various patient populations but are more prevalent in males, young adolescents and pregnant patients. Risk factors include obesity, diabetes, improper toenail clipping and improper footwear. This review explores the clinical manifestations of ingrown toenails, along with their diagnosis and treatment, providing a concise review for physicians to accurately identify and effectively treat patients with ingrown toenails or their resultant complications.

INTRODUCTION

Ingrown toenail, also known as onychocryptosis or unguis incarnatus, is the most common nail problem in general medical practice and nail dermatology settings. It occurs when a spicule on the side of the nail curves inward and pierces into the nail folds. This causes an inflammatory response and can lead to a secondary infection. The nail's lateral side is usually affected and it occurs most commonly in the hallux toenail. Reports indicate ingrown toenails have a prevalence of 2.5-5%, which has increased in recent years, possibly due to lifestyle factors and increased awareness of health among patients.¹ Ingrown toenails are more prevalent in young adolescents and pregnant women; however, generally, men are more commonly affected than women. Furthermore, preexisting conditions like diabetes and vascular conditions can negatively affect presentation.² This review provides insight into the pathophysiology, clinical manifestations, diagnosis, complications, treatment, recurrence and prevention of ingrown toenails.

PATHOPHYSIOLOGY

Ingrown toenails occur when the edge of a toenail penetrates the skin. The edge of the toenail will curve into the nailbed, and if penetration occurs, it will cause an inflammatory cascade and secondary bacterial infections. One of the more common causes is irregular nail trimming. This occurs when the nail is trimmed unevenly and the patient might tear off a piece of the nail. Other factors include poor footwear, poor foot hygiene, anatomical deformities, trauma and genetic predisposition.¹ Obesity, diabetes and thyroid, renal or cardiac disorders can cause lower extremity edema, increasing the risk of development of an ingrown toenail. Adolescents are prone to hyperhidrosis, which can cause nails to become soft and split easily. Toenails become thicker and more challenging to maintain as patients age.³ Some medications can increase the risk of developing an ingrown toenail, including isotretinoin and epidermal growth factor receptor inhibitors like gefitinib and cetuximab (albeit rarely).^{1,4}

SYMPTOMS

Common symptoms of patients presenting with an ingrown toenail include a painful affected toe, erythema and edema. The pain can vary in severity and may affect the patient's ability to walk. An ingrown toenail can present as mild (Stage 1), moderate (Stage 2) or severe (Stage 3). Symptoms of a mild ingrown toenail are erythema, edema and minimal pain. Moderate ingrown toenails present with more severe pain, along with ulceration and drainage. Severe cases usually present with the formation of granulation tissue and hypertrophy of the nail fold.¹

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DIAGNOSIS

An ingrown toenail diagnosis is almost always clinical, based on the presenting symptoms and a physical examination of the toenail and the surrounding skin. This includes inspection of the nail's lateral edge and determining if the nail is growing underneath the skin. The penetration of the nail bed can be visualized in some cases. Inflammation and redness of the area are usually present and infection is denoted by apparent drainage. Testing is usually unnecessary, but potassium hydroxide treatment and fungal culture may be performed when a fungal infection is suspected.⁵ Other conditions that can mimic this presentation include cellulitis, osteomyelitis, tumors, exostosis and foreign bodies. X-rays, cultures and failure of treatment can help rule out these other conditions.⁶

COMPLICATIONS

Untreated or improperly treated ingrown toenails can cause a variety of complications. Paronychia is possible and is usually caused by staphylococcus, pseudomonas, candida or superficial

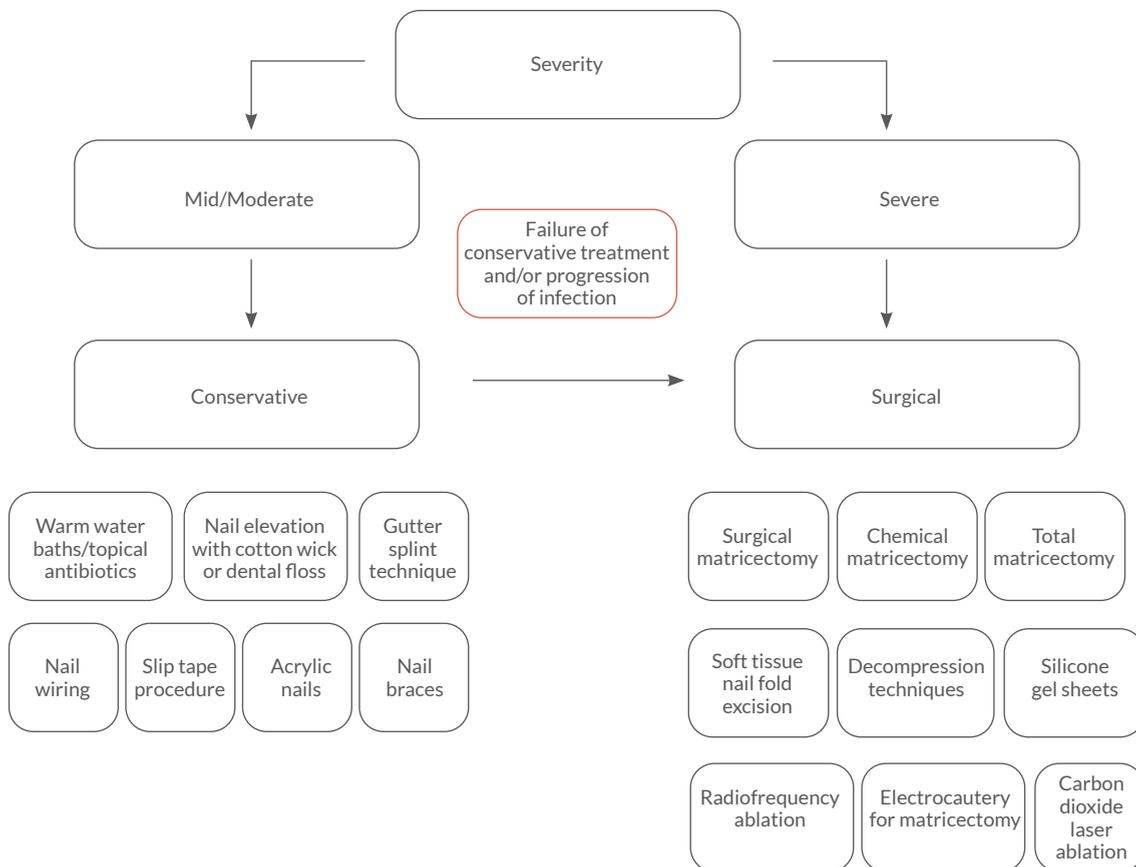
dermatophytes. There can also be scarring of the skin surrounding the nail and nail fold. More severe infections can lead to cellulitis and osteomyelitis. If diabetes is also present, there is a notable risk of severe infection and amputation. Other complications include foot ulcers, sores, loss of blood flow to the foot, tissue damage and tissue death.⁶ Dadaci *et al.* reported a 17-year-old boy who noticed an ingrown toenail lasting three years. The delay in treatment was due to the patient's phobia of needles, which likely worsened his condition. It was left untreated, resulting in extensive hypertrophy. The excess skin growth epithelialized and moved past the midline on the nail, further enveloping it.⁷ Patients may be genetically predisposed to recurrent ingrown toenails, lowering their quality of life due to pain, recurrent infections and other foot complications. In these cases, matricectomy may be recommended, as it can decrease the rate of recurrence.

TREATMENT

Management of an ingrown toenail depends on the presentation's stage and severity, as shown in Figure 1.

FIGURE 1:

Approach to ingrown toenail treatment.^{6,8}



Stages 1 and 2 usually involve conservative management, while a Stage 3 ingrown toenail will require surgical intervention. The first step in treatment is providing symptomatic relief. This includes removing the spicule that is growing into the skin. It is essential to clean the area with an iodine or hydrogen peroxide solution to reduce infection risk. Patients can massage the area of inflammation as well. Silver nitrate can be used to reduce granulation tissue formation; however, it is recommended that physicians remove any granulation tissue during surgery.⁹

Underlying conditions that add to disease burden (i.e., hyperhidrosis, onychomycosis) should be treated. Gupta *et al.* conducted a meta-analysis of 28 studies on onychomycosis treatments. They found that topical amorolfine, ciclopirox, tavaborole and efinaconazole were common treatments for mild and moderate toenail onychomycosis efinaconazole showing the highest rate of improvement. Treatments lasted for approximately 24–48 weeks and the antibiotics were applied topically daily. More prolonged treatment and follow-up monitoring demonstrated better results.¹⁰ Warm water baths followed by topical antibiotics can offer relief. This method can also reduce inflammation.

When used, oral antibiotics have not been shown to improve healing times significantly. Reyzelman *et al.* conducted a study amongst 45 individuals with no preexisting conditions. Individuals were divided into three groups. Group 1 received one week of antibiotics concurrently with a chemical matricectomy, Group 2 received one week of antibiotics followed with a chemical matricectomy and Group 3 only had a chemical matricectomy done. While Group 1 healed faster than Group 2, there was no significant difference in the healing times of Groups 1 and 3.¹¹ The most common organisms for an ingrown toenail infection are staphylococcus, pseudomonas and streptococcus species.⁵

Conservative measures

For mild or moderate cases, there are several different types of conservative treatment modalities available. A cotton wick or dental floss can be inserted into the corner of the affected nail will elevate the nail to alleviate the pressure and prevent further curving. Another technique involves splinting the nail's lateral edge with a vinyl intravenous infusion tube and then securing it with tape, known as the gutter splint technique. The taping procedure simply involves taping the ingrown toenail under and around to the other side of the nail, which lifts the affected region and relieves pressure, restricting the nail's inward curve. This can also allow any pus to drain so the wound can dry. Nail wiring is another conservative method where two holes are placed at the distal end of the nail and wires are inserted to cover the deformity. Less common modalities include slip tape-strap procedure, acrylic nails and nail braces.¹

Surgical interventions

Severe cases of ingrown toenail require surgical intervention. Matricectomy is the partial or complete ablation of the nail matrix and it can be done surgically (mechanically) or chemically. Chemical matricectomy is preferred over surgical matricectomy, given it is a simple procedure with little blood loss, is cosmetically appealing and can be performed in a short time.⁸ Most chemical

matricectomies are done using phenol, which yields a low recurrence rate and favorable cosmetic outcomes.² However, phenol can cause tissue destruction and drainage, which can result in delayed healing time. Other chemicals have been explored, such as sodium hydroxide and trichloroacetic acid, due to these adverse effects. Tersi *et al.* conducted a study of 30 patients with ingrown toenails treated with chemical matricectomy using 90% bichloroacetic acid. They reported minimal pain and drainage postoperatively. After 12 months, 29 of the 30 patients had no recurrence, demonstrating that bichloroacetic acid is a viable alternative to phenol.¹²

Matricectomies can be combined with spicule excision or wedge resections of the toenail, depending on the presentation. Excising the entire affected toenail with a total matricectomy is reserved for advanced-stage presentation, onychogryphosis and onychodystrophy.¹ A soft-tissue nail fold incision is preferred when the soft tissue surrounding the nail is the ingrown toenail's causative agent. Therefore, wide excision of the soft tissue surrounding the ingrown toenail is needed. Some other modalities that are not commonly used include electrocautery, radiofrequency ablation, carbon dioxide laser ablation, decompression techniques and silicone gel sheets.⁶

Singal *et al.* conducted a study on eight adult patients with Stage 2 ingrown toenails who failed to find relief with conservative procedures using radiofrequency ablation. Radiofrequency ablation first involves a partial nail avulsion. A nail elevator is used to elevate the nail plate on the affected side and a spicule of the nail is removed. Then, an electrode is placed on the matrix over the lateral horn of the nail for approximately 3–5 seconds and repeated 2–3 times. The mean postoperative healing time was 7.5 days. By day four, oozing was absent and erythema, pain and edema had significantly improved. No postoperative complications were observed and no recurrences were noted at 3-to-6-month follow-up evaluations.¹³

Uygun *et al.* investigated placing the skin under the ingrown toenail during surgery due to the pathophysiology involving the lateral edge of toenail curving inward and invading the nail fold's skin. Two groups were studied, one with the traditional suturing technique and the other with the new suturing technique. Both groups used the Winograd procedure (i.e., partial plate excision followed by the nail matrix's destruction) as the initial treatment.¹⁴ For patients receiving the new technique where skin was placed under the nail, the recurrence rate was significantly reduced (p-value = 0.011).¹⁴

RECURRENT INFECTIONS

Recurrence can occur from a variety of factors. These include genetic predispositions, preexisting conditions, immunosuppression, advanced age, untreated infection, lack of foot hygiene, poor footwear and trauma. Recurrence can be caused by a lack of fungal infection clearance, which can lead to reinfection.¹⁵ Regardless of the type of fungal infection treatment used, there has been a reported rate of recurrence ranging from 10–53%.¹⁶ Surgical interventions have lower recurrence rates than nonsurgical treatments.¹ This includes surgical

excision with chemical matricectomy. Eekhof *et al.* conducted a meta-analysis that concluded that nail avulsion combined with chemical matricectomy reduced the recurrence of ingrown toenails by 75–91% compared to surgical matricectomy.¹⁷

PREVENTATIVE MEASURES

There are several preventative measures to help reduce the risk of developing ingrown toenails. One method is the use of proper footwear that does not constrict around the toes. Another preventative measure is trimming toenail edges in a straight line instead of curved through proper toenail clipping. Good foot hygiene, including cleaning under the toenails, can also reduce the risk.⁶

CONCLUSION

Ingrown toenails are common nail pathology. This review explored the clinical manifestations of ingrown toenails along with their diagnosis and treatment, providing a concise review for physicians to accurately identify and effectively treat patients with ingrown toenails or their resultant complications. Prompt diagnosis and appropriate treatment can mitigate the risks of infection or other complications and foster optimal patient outcomes.

AUTHOR DISCLOSURES:

No relevant financial affiliations or conflicts of interest. If the authors used any personal details or images of patients or research subjects, written permission or consent from the patient has been obtained. This work was not supported by any outside funding.

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