Abstract

“Nailing” the management of the severely ingrown great toenail, commonly encountered in the adolescent population, is an important tool in the pediatrician’s armamentarium. I have found great toenail removal to be worthwhile, with straightforward indications; and quite rewarding for my patients in terms of time, convenience, and costs. The key to the procedure is to keep it simple. Four basic vital steps are involved: (1) operative permit and explanation; (2) performing a careful complete digital nerve block; (3) removing the entire toenail; and, importantly, (4) performing a partial chemical matricectomy—with readily available silver nitrate sticks—to prevent frequent recurrences. [Pediatr Ann. 2014;43(11):434-439.]

The infected ingrown great toenail is a frequently encountered problem in the adolescent population. Within your substantial adolescent patient population you probably manage two or three severe to moderately severe cases monthly, or nearly 300 cases per decade. It is often triggered by poor foot hygiene, chronic traumatic irritation, too-aggressive clipping of the toenail corner, and too-tight boots or shoes. The infected severely ingrown great toenail is almost never observed in patients younger than age 13 years.

For milder cases of ingrown great toenail (Figure 1), which are more akin to a paronychial infection without granulation tissue, prescribing oral antibiotics that cover for methicillin-susceptible and methicillin-resistant Staphylococcus aureus (MRSA) strains may be sufficient if accompanied by proper hygiene practices. Many clinicians will instruct the patient on how to use a toothpick to insert a tiny wisp of cotton ball underneath the affected side of the nail bed over several days, in order to wedge the nail up and away from the corner of the lateral nail fold. This is less painful to perform at home 24 hours after antibiotic initiation. It will usually prevent the more severe ingrown toenail as seen in the following cases.

Figure 1. A 14-year-old female who has developed painful, reddened skin medial to the right toenail, which also has a slight pus-filled pocket underneath the nail bed.
Deciding which toenails are substantially infected and overgrown enough to require surgical removal is fairly straightforward. As you can see from the patients in Cases 2, 3, and 4 (Figures 1-3), the severely infected ingrown great toenail has nearly all of the following characteristics:

- Copious overgrown granulation tissue of the lateral nail fold, with the lateral toe nail itself buried or hidden into the distal lateral nail fold.
- Marked tenderness and redness of the lateral fold and proximal nail bed.
- Chronic inflammation over several weeks to months.
- Adolescent or older age.
- Other toenails on the patient’s foot almost never require removal for being “ingrown.”

When you encounter cases of this severity (ie, with granulation tissue and/or a buried nail), expecting oral antibiotics to resolve the problem is naïve. However, can you handle the more difficult but necessary management dilemma—the surgical removal of the toenail, or do you need to refer the patient to a podiatrist?

The remainder of this article will provide you with the knowledge about a personally “tried and true” approach to handle this straightforward clinical problem. This procedure should be a part of your armamentarium for providing care to adolescents. You will save the patient a significant amount of time, inconvenience, costs, and painfully waiting for a surgeon. Financial reimbursement for the involved procedures is also worthwhile.

CAVEATS TO GREAT TOENAIL REMOVAL

Four caveats are important to the following discussion. First, preventing recurrences has always been quite elusive for most of these patients—until you add one final step to the toenail removal procedure (see Step 3). Second, in the occasional patient who has a much more extensive cellulitis of the toe that either extends up to your site for the digital nerve block or is extremely reddened and painful, you may prefer to prescribe a few days of oral antibiotics prior to the procedure to lessen the severity of the infection. This prevents more severe pain post-operatively and avoids insertion of a needle through the infected skin site above the bony phalanx. Third, I personally prefer always to perform full toenail removal for this procedure, rather than a partial nail wedge removal. The full nail approach seems to be technically easier—no chance of cutting the skin at the base of the nail, and in my opinion, provides a better cosmetic appearance while healing. The fourth and final caveat is that total anesthesia of the entire distal toe is paramount.

All the following cases are otherwise healthy, afebrile, and without any bone pain or joint swelling.

CASES

Case 1

You observe that the nail itself is not buried under the lateral nail fold, but rather the nail fold skin is reddened and tender with a tiny layer of pus underneath the nail bed (Figure 1). To alleviate the painful pressure from the infection and to potentially ascertain the causative pathogen, you merely prep the lateral nail area with either an alcohol-laced cotton ball or a betadine swab to create a nearly sterile field for culture.

You first try firm but gentle pressure on the nail to see if you can express the pus. If that does not work, then you can use a short 27-gauge or 30-gauge needle to scratch the surface of the pus pocket as you gently lift the nail bed with your sterile glove fingertip. In this case, if neither technique provides a specimen for culture, or if it is too painful, then you should proceed with just the oral antibiotic coverage for MRSA, using either oral clindamy-

Figure 2. A 13-year-old female whose entire great toe is mildly reddened and painful up to the toe base of the nail bed. She also has some worrisome overgrown granulation tissue on the medial aspect of the nail bed. Should you treat with antibiotics or surgery, or both?

Figure 3. A 16-year-old male who, over a period of 2 weeks, has developed a reddened, painful, and medially swollen left great toe mostly along its edge. Note the scabbed and overgrown medial granulation tissue along the edge of the nail bed. Should you treat with antibiotics or surgery, or both?
cin or trimethoprim-sulfamethoxazole (TMP-SMX) for 5 days.

**Cases 2, 3, and 4**

These three adolescents presented to your office with a buried and painful ingrown great toenail of several months duration (Figures 2, 3, and 4). Significant granulation tissue overlies the lateral edge, and a mild reddened painful cellulitis of the lateral and proximal nail area is obvious on clinical examination and when you palpate the area. The toe pain is important to document prior to your digital block anesthesia.

**INFORMED CONSENT**

You obtain signed informed consent from the patient and family, explaining the details of how and why you are going to proceed with a digital nerve block and great toenail removal.

You tell them that the procedure is needed in order to prevent months or years of further chronic painful infection that, over time, has the potential to spread to the underlying bone. Antibiotics alone will not remedy the problem. You will perform a digital nerve block that involves injecting a small amount of lidocaine on either side of the proximal phalanx to make the procedure completely pain free while you are performing it. About an hour or so after the procedure, moderate toenail-area pain can be expected for a few days. The following very rare risks may be involved: (1) passing out from the procedure, which can be prevented by waiting while seated for at least 15 minutes after the procedure; (2) nerve irritation and permanent numbness of the toe tip, which is nearly unheard of for this procedure and which almost no one has ever witnessed; (3) secondary bleeding, which is easily managed; and (4) worsening infection, which is most likely due to an antibiotic-resistant bacteria.

**NAILING THE GREAT TOENAIL REMOVAL PROCEDURE**

- Arrange for the illustrated supplies and instruments preoperatively, as shown in Figure 5.
  - The patient should always be recumbent with the foot firmly placed flat on the examination table with some absorbent gauze or pads placed underneath it. Otherwise, the potential for a dramatic patient vasovagal syncopal response is too risky here. Occasionally, a nurse or parent may be needed to help stabilize the overly anxious patient’s knee and foot to prevent unnecessary jerking. You will need to calmly explain to the patient each step of the procedure as you proceed. Some clinicians prefer to wrap a rubber band around the base of the toe while performing the procedure, to prevent the mild bleeding from obscuring the matrix field. The rubber band should be removed as rapidly as possible once the procedure is accomplished. (You can cut it with your scissors rather than unwrapping it.)
  - The proximal phalanx area (Figure 4A) should be prepped with either betadine or chlorhexidine for at least 45 seconds to make the area sterile. Try to prep and gently scrub the entire lateral nail bed areas and toe copiously with these cleansers at the same time if the tissue is not too tender; otherwise, wait until after the nerve block. Some clinicians have the patient soak the entire toe area in betadine or chlorhexidine for several minutes prior to the procedure.

**Step 1: Digital Nerve Block of the Great Toe (3-Ring Injection)**

- Stabilize the foot, which should be flat on the table, with your other hand.1
  - Use a 0.5-inch, 27-gauge needle attached to a 10 mL syringe filled with
Healthy Baby

6 to 8 mL of 1% lidocaine (do not use epinephrine). Slowly insert the needle perpendicular to the plane of the phalanx about 0.75 to 1 cm lateral to the midline. For the bulk of your lidocaine injection, you are trying to advance the needle to your digital nerve block target area, which is just lateral and inferior to the proximal phalanx, usually about 1.5 to 2 cm deep on average-size toes (Figure 4B), and about 2.0 to 2.5 cm deep on a toe of a larger male.

- To minimize the pain, insert the needle only a few millimeters at a time subcutaneously, while simultaneously gently administering about 0.5 mL of lidocaine underneath the skin first. Then slowly advance the needle in 0.5-cm increments, injecting about 0.25 mL and waiting 5 seconds between each advance. Occasionally you may encounter the phalangeal bone—if that happens, retract your needle about 1 cm and insert it more laterally by about 0.5 cm.
- Your goal is to slowly inject about 2.5 to 3 mL of lidocaine into the inferior lateral space of the proximal phalanx, where the digital nerve resides. Aspirating as you inject lidocaine is the most conservative approach. As seen in Figure 4B, you will usually need to press down firmly on the skin to get this shorter needle into the correct deeper lateral spot of the toe.

Optional: You may remove the needle until about 0.5 cm remains underneath the skin, then track the needle across the toe medially in a parallel plane to the phalanx just underneath the skin, injecting small amounts of lidocaine as you proceed to the future injection site on the contralateral side of the toe. This can ablate the initial sting of the injection of lidocaine on the contralateral side.

Repeat the same 4-step procedure on the contralateral side.

Step 2: Removing the Toenail (Nail Avulsion)

With your fingers, begin to gently and then more firmly and then very firmly squeeze the toe over the previously painful lateral fold of the toenail to ensure that your nerve block has been totally successful. Next, take your straight Kelly forceps and insert it underneath the nail bed slowly at first and for only a tiny distance to ensure that no residual perception of pain remains (Figure 6A). If at any point the patient claims to actually be feeling any pain (very rare)—and not just “pressure”—you should inject another 1 mL of lidocaine deep into the inferior lateral phalangeal area again on both sides. I have never observed the nerve block to fail at this point.

Longitudinally insert the forceps fully under the nail bed centrally and then on both sides until you reach the normal skin at the base of the nail matrix (Figure 6A). This should almost fully separate the nail from the nail bed. Now, clamp down fully onto the nail with the forceps and lock them. Lift the nail upwards fully (Figure 6B) so that it is fully detached from the skin. Next, you must firmly tug the nail from the matrix bed, sometimes using a lateral back and forth motion to dislodge it.

Once you have pulled the nail off completely, you will often be amazed at how deeply the nail was imbedded into the lateral nail fold. You may need to lightly trim some extraneous tissue (Figure 6C) or to pare back some extensive granulation tissue. My preference
is to use iris scissors (and not a scalpel) to have more control over this skin removal portion. However, in my opinion, the more tissue you remove, the greater the bleeding and the postoperative pain. If you can predict that you will not need to remove any excess skin or granulation tissue, the initial rubber band tourniquet is not necessary, as bleeding is otherwise usually minimal.

**Step 3: Chemical Partial Matricectomy**

Chemical matricectomy is the “chemical ablation of all or part of the nail matrix. The rationale for chemical matricectomy is to destroy the matrix to prevent the nail from growing [back].”

I now uniformly perform this additional technique on all my patients during this nail avulsion procedure—even the very first time. I recommend this as the optimal way to approach this nail avulsion procedure. The rate of recurrence for an ingrown great toenail following a simple nail avulsion only is alarmingly high. Similar to my own personal experience, recurrence is reported as approaching nearly 75%. Using chemical matricectomy, the recurrence rates are reported as less than 5%. The matricectomy procedure is quite easy to perform, creates no bleeding, is not disfiguring, and seems to add only slightly more pain to the avulsion.

Some clinicians recommend using 88% phenol dipped on a cotton swab as the chemical cauterizer. However, nearly all pediatricians stock a supply of silver nitrate sticks (Figure 4), and are familiar with their use in chemical cautery of weeping umbilical cords in the office. You can also tell exactly where you have cauterized the corner of the nail matrix due to the black stain from the silver nitrate stick. (Be sure to inform your patient about this black stain, as it will last for about 1 week.)

Your goal here is to cauterize or ablate the troublesome ingrown side of the nail matrix by deeply inserting the nitrate stick (Figures 6D and 6E) into the same corner base as shown in Figure 6E. Touch about 3 to 4 mm of the nail bed base corner. This will nearly always prevent the otherwise very common recurrence of the ingrown toenail. You can also use the silver nitrate stick to paint some of the granulation tissue with scissors or a scalpel creates a larger and more painful recovery.

**Step 4: Postoperative Care**

Vaseline gauze or a similar antibiotic lubricant or emollient should be applied to the nail bed after removal of the nail. Wrap the nail bed with cotton gauze or bandage. No shoes should be placed over the toe. Crutches are helpful. Advise the patient to wear only open-toed sandals or socks for a few days afterwards.
All patients should be placed on home bed rest for 24 hours, with the foot elevated as much as possible and with an ice pack resting on the dorsum of the foot for 10-minute intervals several times throughout the day. This helps alleviate some of the swelling and pressure on the toe. In my experience, nearly all these patients will require several doses of an oral narcotic, such as hydrocodone, in some fashion for about 24 to 36 hours after the procedure.

Because cellulitis is typically present in nearly all previously untreated patients with ingrown great toenail, I think that an oral antibiotic (clindamycin, TMP-SMX) with MRSA coverage should be prescribed (similar to Case 1). This will also ameliorate some of the pain from the cellulitis itself.

Although a follow-up visit is usually not necessary, patients should be cautioned to return if there are any signs of worsening cellulitis, fever, purulent discharge, or persistent severe pain.2

CASE 5

This preadolescent girl presents with a hypertrophic, thickened, and scaly entire great toe nail (Figure 7). This is both a cosmetic and painful problem. Note that the underlying nail skin and tip of the toe is somewhat reddened and tender as well. This child’s toenail is afflicted by a fungal infection, known as distal subungual onychomycosis. Although other dermatophytes may be recovered, the causative pathogen in healthy adolescent patients is nearly always Trichophyton rubrum, which is often resistant to oral griseofulvin. Bacterial superinfection is unusual, so the reddened skin on the inferior toe area in this young girl is due to the inflammation from the fungal infection.

Occasionally, this clinical appearance may overlap with nail psoriasis, eczema, or lichen planus. Before initiating a somewhat longer-term, oral antifungal treatment, some clinicians prefer confirmation diagnosis, usually by microscopic examination (of hyphae) via potassium hydroxide of under-nail scraping (fairly rapid). Some prefer a more expensive and time-consuming routine fungal culture (which can take up to 4–6 weeks) or using dermatophyte test medium (1 week).

Onychomycosis Treatment

Nail removal is not recommended for onychomycosis.4 Topical therapies are usually ineffective, and even lengthy oral therapeutic courses are associated with treatment failures and recurrences. In randomized controlled trials, terbinafine, itraconazole (pulsed or continuous), and fluconazole have demonstrated cure rates of approximately 75%, 60%, and 50%, respectively. The dosing for each is as follows: terbinafine—250 mg daily for 12 weeks; itraconazole—200 mg daily for 12 weeks or “pulsed” at 200 mg twice daily for 1 week per month for 3 months; fluconazole—3 to 6 mg/kg one dose per week for 18 weeks.

Although side effects are uncommon, liver function tests should be performed initially and midway through therapy only for daily terbinafine and daily itraconazole.4 Serious drug interactions with certain other medications may be common, so carefully check for these in a drug reference book. If you have any reservations about management of toenail onychomycosis, your friendly dermatologist would be happy to manage therapy for you.

CONCLUSION

“Nailing” the management of the severely ingrown great toenail, a commonly encountered problem in the adolescent population, is an important tool in the pediatrician’s armamentarium. I have found great toenail removal to be worthwhile, with straightforward indications, and quite rewarding for my patients in terms of time, convenience, and costs.

The keys to the procedure are to keep it simple for the clinician. Four basic vital steps are involved: (1) operative permit and explanation; (2) performing a careful complete digital nerve block; (3) removing the entire toenail; and, importantly, (4) employing a partial chemical matricectomy— with readily available silver nitrate sticks—to prevent otherwise very frequent recurrences. My preference postoperatively is to prescribe a course of 24-hour foot elevation with intermittent ice packs, and a course of antibiotics for MRSA coverage and enough doses of narcotics for 2 days of pain relief.

REFERENCES