A 2-Year-Old Girl with a Finger Injury and Ingrown Toenail

Robert Listernick, MD

This 2 ½-year-old girl’s story starts at age 11 months, when she caught the middle finger of her left hand in a door sustaining an avulsion of the nail. She was seen in the emergency department where she received appropriate wound care. She had follow-up with an orthopedic surgeon and her pediatrician. The wound healed and the nail grew back appropriately. She was seen 4 months later, at a 15-month-old well-child appointment, when it was noted that there was mild erythema and swelling of that digit without pain. One month later, she was noted to have tenderness and erythema of the right great toe, which the mother said had been present for 1 month. There was never fever or a change in her gait. The family history is significant for osteosarcoma of the humerus in her older sister. Her physical exam at that time described mild swelling of that toe with erythema of the distal phalanx and tenderness to palpation. The remainder of the physical examination was normal. The diagnosis was a mildly ingrown right great toenail; she was prescribed warm soaks and careful nail trimming.

Robert Tanz, MD, moderator: I’m pretty sure that we’ve never discussed ingrown toenails in this conference.

Jennifer Trainor, MD, pediatric emergency room physician: The fancy name is onychocryptosis. There are several degrees of involvement ranging from minimal erythema and edema to a large, swollen toe with purulent drainage. The etiology is felt to relate to improper growth of the nail penetrating the skin. This may be due to improper nail trimming, which leaves a curved, sharp nail or to an unusual congenital shape of the nail. Tight footwear or a change in the type of footwear can predispose to recurrent swelling and erythema. "Paronychia" is drainage. We have recommended warm soaks to decrease swelling. At its worst, we recommend warm soaks to decrease swelling. At times, we trim the edge of the nail or stick something underneath its lateral edge, such as dental floss, to try to encourage the nail to grow out from the skin. Some studies have shown that placing phenol on the nail bed to deaden it at its edge after trimming actually works better than trimming the nail alone in preventing recurrence. Based on the description of this child, I would have recommended warm soaks.

Ingrid Polcari, MD, pediatric dermatologist: Some children may have congenital malalignment of the great toenail leading to lateral deviation of the nail, which predisposes to recurrent swelling and erythema.

Dr. Tanz: Three months later, at her 18-month well-child visit, the mother complained that there was still slight swelling of the left middle finger, although there were no complaints referable to the toe. It is documented that her gait was normal at that time. Three months later, at 21 months of age, the mother returned with concerns about persistent swelling and redness of the right great toe. She had been soaking the foot twice daily for 15 minutes, but the swelling was getting worse. Whenever her shoes and socks were removed, the girl says “ow”. The toe has always been red and warm to touch without drainage. The mother has not been trimming the toenail, but she reports that it does not seem to be growing. There’s no history of fever or other systemic symptoms. On physical exam, the right great toe was red, mildly swollen and very tender to palpation. The toenail was intact but shorter on its lateral edge. An X-ray was obtained.

Jennifer Nicholas, MD, pediatric radiologist: The lateral X-ray nicely shows cortical erosion and irregularity of the distal phalanx of the great toe. Our biggest concern would be osteomyelitis. Malignancy is a possibility, but this would be a highly unusual location for metastatic disease.

Dr. Tanz: Is osteomyelitis a frequent complication of ingrown toenails?

Julie Stamos, MD, pediatric infectious disease physician: It’s a possibility, particularly if you think the infection is related to “trauma,” but I’ve never seen it.
**Dr. Tanz:** If this is osteomyelitis, is it acute or chronic?

**Larry Kociolek, MD, pediatric infectious diseases physician:** By definition, this would represent chronic osteomyelitis because of the X-ray findings. Osteomyelitis is an evolving process. In acute osteomyelitis, the X-ray is usually normal because bone necrosis hasn’t yet occurred. The inflammatory markers, ESR and CRP, usually are elevated. Several steps occur that allow this to progress to chronic osteomyelitis. The primary step is the development of a sequestrum, a necrotic bony segment that’s devoid of blood supply. Inflammatory cells and antibiotics can’t penetrate this site and bacteria are free to proliferate. It is at this stage where you begin to see X-ray changes.

**Dr. Tanz:** Is there a difference in treatment between acute and chronic osteomyelitis?

**Dr. Kociolek:** The treatment of chronic osteomyelitis is quite problematic. First, a biofilm develops in the extracellular matrix, further protecting bacteria from antibiotic therapy. Secondly, a subpopulation of *Staphylococcus aureus*, the most common organism causing osteomyelitis, may form small colony variants. The small colony variants are less metabolically active and may persist intracellularly in the osteoblasts for years, making them less susceptible to antibiotic therapy. These factors lead to a blunting of the inflammatory response and normalization of the CRP and ESR. In addition, these account for occasional relapses seen in patients who were thought to have been “cured” of chronic osteomyelitis.

**Dr. Tanz:** How often are you able to isolate an organism?

**Dr. Kociolek:** Only 30% to 60% of the time. The chances of isolating an organism are somewhat higher if we have performed a bone biopsy and culture and the patient hasn’t been treated with antibiotics prior to obtaining these cultures.

**Dr. Tanz:** What about antibiotic choice and duration of treatment?

**Dr. Kociolek:** The beta-lactams are available to use if the organism is methicillin sensitive. Clindamycin is best for community-associated methicillin-resistant *S. aureus* (CA-MRSA), and it has excellent bone penetration. We may add rifampin to the regimen for particularly severe MRSA infections. Typically we recommend 3 to 4 weeks of intravenous therapy for acute osteomyelitis. Optimal duration of treatment of chronic osteomyelitis is poorly defined and highly variable among institutions. We typically treat with 6 weeks of initial intravenous antibiotic therapy, followed by an additional 4.5 months of PO therapy. Surgical intervention with removal of sequestrum serves an integral role in the treatment of chronic osteomyelitis.

**Dr. Tanz:** Back to the patient: Is there any role for further imaging at this point?

**Dr. Nicholas:** Magnetic resonance imaging (MRI) is the procedure of choice in diagnosing osteomyelitis. Since the X-ray is abnormal in this patient, if you were happy with your diagnosis, I suppose you could defer further imaging unless her symptoms didn’t improve.

**Dr. Stamos:** It was felt that the X-ray was consistent with the diagnosis of chronic osteomyelitis. It was recommended that she be treated with 6 weeks of intravenous clindamycin followed by 4.5 months of oral clindamycin.

**Dr. Tanz:** Her CBC, ESR, and CRP were all normal. She received the 6 weeks of intravenous clindamycin followed by 2 weeks of oral clindamycin. The parents had a very hard time administering the oral clindamycin and she was switched to levofloxacin. Four months later she returned for a well-child visit. The mother stated that the child had been walking on her heels and on the outside of her left foot. In addition, the mother stated that she complained of swelling and tenderness of the left great toe and of the right ankle, although there was no pain in the right ankle. There was no history of fever, rash, diarrhea, or weight loss. On examination, the left great toe had decreased range of motion and the left first metatarsophalangeal joint was quite swollen. The left second toe was also swollen without erythema or increased warmth. The medial aspect of the right ankle was swollen without erythema or tenderness. The remainder of the physical examination was normal. This time the CBC and CRP were normal but the ESR was 45 mm/hour. MRI scan of both feet and ankles was performed.

**Dr. Nicholas:** The T2 weighted series showed more fluid than expected physiologically in the right ankle anterior and posterior joint spaces. Bone marrow signal was normal. There is diffuse enhancement on the post-contrast images suggesting inflammation. These findings are consistent with either inflammatory or infectious etiologies.

**Dr. Stamos:** The fact that she’s running around with minimal pain is strongly against the possibility of septic arthritis.

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**Key Learning Points**

1. Onychocryptosis, an ingrown toenail, is due to improper nail trimming which leaves a curved, sharp nail or to an unusual congenital shape of the nail. Treatment primarily consists of warm soaks to decrease swelling.
2. Inflammatory markers are generally normal in chronic osteomyelitis.
3. Magnetic resonance imaging is the procedure of choice in diagnosing osteomyelitis.
4. Forty percent of young female patients with oligoarticular juvenile idiopathic arthritis and positive antinuclear antibodies (ANAs) have uveitis that is generally “silent”.
5. Young children generally do not complain of subacute vision loss, even when severe.
**Dr. Tanz:** The possibility of chronic recurrent multifocal osteomyelitis (CRMO) was raised.

**Marisa Klein-Gitelman, MD, pediatric rheumatologist:** CRMO is a rare inflammatory bone disorder which usually presents in the first decades of life. It presents as recurrent bone pain and fever with multiple radiographic foci of sterile osteomyelitis with both osteolytic and sclerotic lesions. A subset of patients develops a pustular skin rash. The etiology is unknown but there are several rare genetic disorders which exhibit these symptoms. The lack of involvement of the metaphyses of the long bones or clavicles would be unusual.

**Dr. Tanz:** So what now?

**Dr. Klein-Gitelman:** Rheumatologists hear this story a number of times each year — persistent swelling of a joint after trauma. If the joint doesn’t heal over a reasonable period of time we are concerned about the possibility of arthritis. This is even more magnified when we hear a story of multiple joint involvement. Juvenile idiopathic arthritis (JIA) needs to be suspected in this child.

**Dr. Tanz:** At this point, it was discovered that she had an antinuclear antibody (ANA) titer of 1:2560, markedly elevated.

**Dr. Klein-Gitelman:** With this information, oligoarticular JIA rises high on the differential diagnosis. In addition, 40% of young female patients with oligoarticular JIA and positive ANAs have uveitis.

**Jordana Smith, MD, pediatric ophthalmologist:** Her vision in the right eye was 20/400 and in the left eye 20/60. Slit lamp examination revealed diffuse posterior synechial formation in both eyes. Neither pupil was reactive to light due to this scarring. In addition, there was a small cataract in the right lens.

**Dr. Tanz:** How long did it take this scarring to develop?

**Dr. Smith:** I’ve seen patients who have had bad flares of JIA develop synechiae over a few weeks. However, I’d guess that it took several months for this degree of scarring to develop.

**Dr. Tanz:** What about the lack of pain or inflammation in the eye?

**Dr. Smith:** The lack of symptoms is classic in uveitis associated with JIA. There are numerous complications including band keratopathy (calcification of the cornea), posterior synechiae, cataract formation, glaucoma, vitreous debris, and macular edema.

**Robert Listerneck, MD, general academic pediatrician:** It’s worth noting that, as in this child, young children do not complain of subacute vision loss, even to this degree.

**Dr. Tanz:** What’s her visual prognosis?

**Dr. Smith:** These changes are not reversible. We’ll extract the cataract. Cataract surgery in JIA patients can be quite difficult because of the scar formation. Lens replacement is tricky because of the propensity for postoperative inflammation. This child was started on methotrexate for JIA which can help mitigate this inflammatory process. In addition, we place these children on preoperative corticosteroids for the same reason.

**Dr. Klein-Gitelman:** We recommend that ANA-positive children with oligoarticular JIA undergo detailed ophthalmologic examination every 3 months for at least 4 years following diagnosis. We recommend that ANA-negative children undergo every-4-month eye exams for the first 2 years followed by every-6-month exams.

**Dr. Tanz:** What about the cortical erosion and irregularity of the distal phalanx of the great toe that started all of this?

**Dr. Klein-Gitelman:** That’s unclear. Some rheumatologists make a distinction between dactylitis and arthritis. They believe that dactylitis is more associated with an enthesitis-related arthritis or psoriatic arthritis. Perhaps she’ll evolve into one of these forms of arthritis. Time will tell.

**Dr. Tanz:** Thank you everyone.