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PHOTO ROUNDS

Crying infant with painful toes

Our patient's sleepless parents sought care for their infant's mysteriously injured toes.

A WELL-DEVELOPED AND PREVIOUSLY HEALTHY INFANT was brought to our emergency department (ED) by her parents, who said that their child was experiencing significant toe pain. Two reddened, swollen toes (FIGURE) were immediately identifiable on the left foot. The patient's parents denied any trauma or unusual activity involving the infant.

- WHAT IS YOUR DIAGNOSIS?
- HOW WOULD YOU TREAT THIS PATIENT?

FIGURE

Two reddened and swollen toes



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➤ Infantile hair tourniquets may be overlooked because of the fine nature of human hair and the swelling that may hide the tourniquet itself.

Diagnosis: Hair tourniquet

Upon close inspection, we discovered hair thread tourniquets constricting the fourth and fifth toes on the baby's left foot.

Hair tourniquet syndrome primarily affects infants in the first few months of life. The average age of occurrence is 4 months, a time when maternal postpartum hair loss (telogen effluvium) is at its maximum.^{1,2} It is worth noting, however, that this syndrome has also been observed in toddlers and adolescents.³

■ **Toes are most frequently involved**, although cases of hair tourniquets affecting the fingers, penis, labia, clitoris and uvula have been reported.²⁻⁷ Infants may be brought to the office or ED with irritability or crying, or with an erythematous extremity.

Why tourniquets are overlooked

Infantile tourniquets may be overlooked because of the fine nature of human hair, the swelling of the involved appendage (which can hide the tourniquet itself), and the presence of baby booties, footed pajamas, and mittens that may obscure injured digits from view.

These tourniquets can cause significant morbidity if they are not quickly identified and removed. The tensile strength of human hair is quite strong, allowing for strangulation and even amputation of appendages. The repetitive motion of hands and feet inside booties or mittens allows constriction to increase.

As this tightening occurs, the tourniquet may cause constrictive lymphatic obstruction, edema of the involved soft tissues, and secondary vascular obstruction of venous outflow and arterial perfusion.^{5,8,9} Tourniquets can also cut through skin, injuring deeper tissues.

In most instances, the damaged tissue will rapidly reperfuse once the offending tourniquet is unraveled or removed. However, some cases may result in epithelialization over the tourniquet, ischemia, necrosis, and gangrene leading to amputation. Quick recognition of the condition and immediate removal of the constricting tourniquet are key to saving the injured appendage.

How best to remove the tourniquet

Methods of tourniquet removal include unwrapping, cutting, or dissolving the hair with commercial hair removal agents such as Nair (Church & Dwight Co, Inc, Princeton, NJ).^{2,10-12}

■ **Unwrapping.** In cases where the tourniquet is easily visualized and minimal edema is present, simply unwrapping the constricting hair may be successful. This can be accomplished by identifying a loose end of the hair, grasping the free end with a pinching instrument such as a hemostat or forceps, and carefully unwrapping the hair from the appendage^{1,11} (strength of recommendation [SOR]: **B**).

■ **Cutting.** If cutting the hair is necessary due to the presence of mild to moderate edema or failure of the unwrapping technique, a blunt probe may be inserted between the hair and the appendage to protect soft tissues from the cutting implement. Once the probe has been inserted, the tourniquet may be cut using scissors or a #11 scalpel blade applied to the surface of the blunt instrument^{1,11} (SOR: **C**). Alternative instrumentation, including a #12 Bard Parker curved scalpel blade and a Littauer suture-removal scissor, may be useful when the tourniquet is too tightly wound to allow for insertion of a blunt probe instrument (SOR: **C**).

■ **Dissolving.** A commercially available depilatory agent, such as Nair, may be useful for mild cases, but would not be appropriate when a tourniquet has cut into the skin. Calcium thioglycolate, a common depilatory active ingredient, breaks down disulfide bonds in keratin, thereby weakening hair strands. Chemical agents containing calcium thioglycolate should be used with caution, as keratin is also present in the epidermis and use of these agents may cause irritation to the skin.

When an incisional approach is needed

At times, epithelialization over the tourniquet or severe swelling of a digit may necessitate an incisional approach. If there is any doubt about whether you can completely remove all of the strands of the tourniquet, an incision into the digit itself must be made

to disrupt constriction. Historically, a digital nerve block has been the preferred mode of analgesia; however, recent evidence suggests that less invasive pain management strategies, such as a sucrose pacifier, EMLA cream, or ZAP topical analgesia gel may be effective¹³ (SOR: A).

If you must use this approach, you'll need to consider the placement of the digital neurovascular bundles of the fingers and toes, located at approximately the 2, 4, 8, and 10 o'clock positions. Following sterile preparation and draping, a longitudinal incision should be made at either the 3 or 9 o'clock position, thus locating it between neurovascular bundles^{1,11} (SOR: B).

Alternatively, a longitudinal incision can be made directly over the extensor tendon, located dorsally at 12 o'clock. Any resulting tendon laceration would be parallel to the tendon fibers, and could be expected to heal with splinting and wound care^{1,11,14} (SOR: B).

Prior to initiating treatment, parents or caregivers should be warned about the potential for bleeding and pain during the procedure.

Extreme cases may require surgery

Surgical consultation may be required in extreme cases of edema, neurovascular compromise, necrosis, amputation, or failure to completely remove the tourniquet.²

■ **Other factors to keep in mind.** While classically described as consisting of a single

hair, tourniquets may be comprised of multiple hairs. That's why it's important to carefully inspect the area to be sure that all strands have been removed. Thorough treatment should include consideration of child abuse, tetanus immunization, and the need for antibiotics^{1,2,11} (SOR: B).

Relief for our young patient

To remove our patient's hair tourniquets, we carefully cut the fibers with hooked Littauer suture-removal scissors and unwrapped the hair. Damage to the plantar aspect of both toes was significant enough that we had to cut through the soft tissue and into the flexor tendon to completely remove the hair. No sutures were required as the wound edges were well approximated without closure.

We cleaned and dressed the injured toes and arranged for close follow-up. The patient's recovery was uneventful.

■ **To avoid hair tourniquet syndrome,** counsel parents to turn mittens and booties inside out to check for loose hairs. Also, advise parents to make sure there aren't any hairs wrapped around their baby's fingers or toes. Vigilance on the part of health care providers can provide quick recognition and appropriate treatment of this condition. **JFP**

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Tell parents to turn mittens and booties inside out to check for loose hairs and to make sure there aren't any hairs wrapped around the baby's fingers or toes.

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