Current Approach to the Evaluation and Management of Hair-Thread Tourniquets

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Abstract: Hair-thread tourniquet syndrome is a rare, painful condition that occurs when a strand of hair or thread becomes wrapped around toes, fingers, or other appendages. This causes focal edema, which eventually reduces arterial blood flow and can lead to ischemia and necrosis. A thorough physical examination and assessment of risk factors are important. Treatment involves depilatory agents or targeted incision at the bedside or in the operating room. Successfully treated cases can be discharged with local wound care. Parents should be advised on prevention strategies and ensure close follow-up for reexamination.

Key Words: hair, thread, tourniquet

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TARGET AUDIENCE

This CME activity is intended for practitioners who care for pediatric patients presenting with hair-thread tourniquets, which may include general pediatricians, pediatric emergency physicians, and general emergency physicians.

LEARNING OBJECTIVES

After completion of this article, the reader should be better able to:

1. Identify the signs and symptoms of hair-thread tourniquet syndrome.
2. Describe three interventions for treating hair-thread tourniquet syndrome in the acute setting.
3. Explain strategies to prevent hair-thread tourniquet syndrome.

Hair-thread tourniquets are an important and potentially dangerous condition, wherein a strand of hair or other long, thin structure (eg, fabric thread) becomes wrapped around an appendage resulting in edema, ischemia, and, in severe cases, autoamputation. The first case was described in 1832 by Dr G[1] who removed a hair tourniquet from the penis of a 4-week-old boy. Since then, there have been numerous reports in the literature.[2–23]

The condition is most commonly found in patients between 2 and 6 months of life, which corresponds to the greatest degree of maternal postpartum hair loss.[11,22,24–26] Postpartum hair loss, referred to as telogen effluvium, is a well-described phenomenon affecting more than 90% of women.[26,27] During peak periods, greater than 100 hairs can be lost daily, significantly increasing the risk of hair tourniquets.[28]

While this condition is most common in infants, it has been described in older children, as well.[9,11,16,19,21] There is no significant sex difference for incidence with relatively equivalent numbers of cases occurring in males and females.[21]

Hair tourniquets occur most commonly in the toes (85%), but can occur in any end organ, including the fingers, labia, clitoris, penis, tongue, uvula, and neck.[2–23] Digital injuries are more common in patients aged 4 days to 19 months, whereas genital injuries are more frequently seen in patients aged 4 months to 6 years.[4]

Anatomy and Pathophysiology

Initially, the affected part will develop diffuse edema due to impaired lymphatic and venous flow from the circumferential compression.[5,24,29,30] Without intervention, the edema will continue to progress and eventually compromise arterial flow, resulting in ischemia and autoamputation in severe cases.[4,5,24,29,30] Occasionally, reactive superficial epithelialization can occur, which can obscure the cause of swelling.[5,11,22,29]

The exact etiology of hair tourniquets is unclear. However, it is thought that the hair becomes entangled when it is wet and therefore more pliable.[5,10,20,24,26,29,31] As the hair dries, it constricts, resulting in the tourniquet effect.[5,10,20,24,26,29,31]

Thread tourniquet syndrome is a similar condition, wherein loose threads from clothing become entangled around the patient's digits or genitalia. Thread tourniquets occur more commonly in the toes than other areas, but can occur in any location and have even been described in relation to the inner mesh of a bathing suit.[4,32,33] Cultural beliefs may also play a part, as some cultures intentionally place thread tourniquets around the penis as a treatment for enuresis or to ward off evil spirits.[4,5,11,34,35]

History and Physical Examination

Occult hair tourniquet must be on the differential for any pediatric patient presenting with a complaint of increased fussiness and may mimic colic, corneal abrasions, or occult infections.[9,24,30,36,37] The patient may present before the edema develops; however, the caregiver will most commonly describe a red or swollen appendage.[4,7,25,37,38] Parents may recall removing a tuft of hair from the area prior to symptom onset.[39] While many cases are accidental, it is important to ask about any potential precipitating factors (eg, autism, trichotillomania, chemotherapy).[9,12,31] Additionally, hair tourniquets have been associated with child abuse, so providers should maintain a high index of suspicion for this, especially with penile tourniquets or when fixed knots are present.[12,29,35,36]

Any diapers, mittens, or socks should be removed for the physical examination.[15] Evaluation must include a thorough inspection of the toes, fingers, and genitalia for the presence of focal edema or a constricting band.[29] Findings can include swelling, erythema, tenderness, or an annular constriction of an isolated appendage.[24] Magnifying loupes may be beneficial in assessing for fine or lighter-colored hairs.[24] Because the presence of a focal

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FIGURE 1. Blunt tip probe.

area of constriction is not always present, many providers may mistake hair tourniquet for a focal skin or soft tissue infection.[21,37,40,41] Therefore, it is essential that any areas of focal edema be thoroughly explored for the presence of constriction, which may be covered by superficial epithelialization.[5,10,11,25]

Management

There have been several different methods for hair tourniquet management outlined in the literature. The use of depilatory creams should be considered first because they are generally painless and are noninvasive.[21,42] These agents work by breaking down the disulfide bonds in keratin fibers and directly dissolving the hair strands.[26] Depilatory creams are applied around the hair tourniquet for 3 minutes and then washed away.[21] A second attempt can be undertaken after 10 to 15 minutes if the first is unsuccessful.[21] There is no need for anesthesia with this technique because application of the cream is painless. Depilatory creams are contraindicated in areas close to mucous membranes. Additionally, they should not be used when the hair has broken through the skin or tissue ischemia is present. Finally, while effective for hair tourniquets, they will not dissolve other materials (eg, fabric threads).[43] Therefore, one must be certain of the material before relying exclusively on this intervention. Adverse effects reported from use of depilatory agents include skin irritation, burning sensation, and skin blistering.[24] One study found that depilatory agents were 51% successful on the first attempt, with an additional 13% successfully treated on the second attempt.[21] Further attempts were unsuccessful and required invasive management.[21]

Bedside mechanical tourniquet release is another approach commonly used at many institutions. This can be performed using forceps, scissors, or a no. 11 scalpel blade. First, local anesthesia (eg, topical lidocaine) should be applied to the area.[32,33] Then, the tourniquet should be directly visualized by the provider. A blunt-tip probe (Fig. 1) should be inserted under the hair tourniquet while using either a small scissors or a no. 11 scalpel blade to cut toward the blunted instrument. If available, a no. 12 curved scalpel may be able to slide underneath the area more easily than a no. 11 scalpel.[15] However, these are not commonly available in most emergency departments. If there is concern that the tourniquet was not adequately excised, the incision may be extended into the patient's skin in a longitudinal fashion (ie, perpendicular to the tourniquet).[15] When performing a skin incision, it is important for providers to be aware of local nerves and vasculature in order to avoid these areas.

Surgical management should be considered if the provider is unable to resolve the condition at the bedside or if there is concern for deeper extension into the muscle or bone.[7,11,30,37,44] Surgical management can be done under sedation or general anesthesia, and multiple techniques have been outlined. These include a dorsal z-plasty or simple perpendicular incision down to the bone.[11,25,45,46] Wounds are often left open, and patients are discharged the following day with oral antibiotics and close outpatient follow-up. One study of 81 patients found that only 6% of patients required operative management, while the remainder were successfully treated with depilatory agents or bedside incision.[21]

Complications

Prompt diagnosis and intervention are essential, as delay in treatment can lead to significant complications. These may include tissue ischemia, flexion deformities, partial necrosis, and autoamputations.[30,45] Hair tourniquets of the external genitalia are at a higher risk of complications and can develop urethrocutaneous fistulae, complete urethral transections, and gangrene or autoamputation of the penis.[14,45] Tendon rupture and bone destruction have also been described.[11,26] Incomplete hair removal can occur, and it is essential to monitor the involved area after the removal attempt to ensure that blood flow improves and edema resolves prior to discharge. Cellulitis is uncommon, occurring in only 2.5% of patients.[21]

Prevention

There have been several prevention techniques outlined in the literature. Most techniques are focused on reducing infant exposure to maternal hair lost in the postpartum period.[26] Techniques can include separating the infant's and mother's clothes when they are washed, washing the infant's clothes inside out, keeping the mother's hair tied back and brushed frequently, regular examinations of the infant's extremities and genitalia for signs of swelling and erythema, and conscious examination and removal of loose strands of hair from clothing and the infant's diaper (Table 1).[11,24,26]

Disposition

Cases that are successfully treated in the emergency department should be observed for resolution of symptoms and then discharged with outpatient follow-up in 1 to 2 days.[21,24] Cases that do not resolve after depilatory agents or bedside incision require surgical consultation for operative management.[21,24] Most wounds can be managed with supportive care and a topical antibiotic.[24] Oral antibiotics are not necessary unless there is an associated cellulitis.[13,24] Parental reassurance, prevention education, and return precautions should be provided prior to discharge.

TABLE 1. Strategies for Preventing Hair-Thread Tourniquet Syndrome

- Separate the infant's and mother's clothes when they are washed.
- Wash the infant's clothes inside out.
- Keep the mother's hair tied back and brushed frequently.
- Regularly examine the infant's extremities and genitalia for signs of swelling and erythema.
- Examine and remove loose strands of hair from clothing and the infant's diaper.

CONCLUSIONS

Hair-thread tourniquet syndrome is a rare and potentially dangerous condition occurring when a strand of hair or thread becomes wrapped around toes, fingers, or other appendages, leading to focal edema, followed by ischemia and necrosis. This article reviews the pathophysiology, historical and physical examination findings, treatment options, and strategies for prevention. Knowledge of these components can assist providers in effectively identifying and managing this condition.

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CME EXAMINATION

May 2019

Please mark your answers on the ANSWER SHEET.

Current Approach to the Evaluation and Management of Hair-Thread Tourniquets, *Gottlieb et al*

1. Where is the most common location for a hair-thread tourniquet to occur?
   A. clitoris
   B. fingers
   C. penis
   D. toes
   E. uvula

2. Which of the following has not been associated with hair-thread tourniquet syndrome?
   A. autism
   B. cold weather
   C. maternal hair loss
   D. physical abuse
   E. trichotillomania

3. What is the recommended first-line treatment for uncomplicated hair tourniquets?
   A. bedside incision
   B. depilatory agents
   C. operative vertical incision
   D. warm soaks
   E. z-plasty

4. Which of the following is a contraindication to the use of a depilatory agent?
   A. age <2 years
   B. diffuse edema
   C. intact skin
   D. mucus membrane involvement
   E. presence of hair tourniquet for >6 hours

5. Which of the following is not a recommended technique for preventing hair-thread tourniquets?
   A. keeping the mother's hair tied back
   B. prophylactic use of depilatory agents every month
   C. regular examinations of the infant's skin and extremities
   D. separating the mother's and infant's clothes when they are washed
   E. washing the infant's clothes inside out

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Please answer the questions on page 380 by filling in the appropriate circles on the answer sheet below. Please mark the one best answer and fill in the circle until the letter is no longer visible. To process your exam, you must also provide the following information:

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1. (A) (B) (C) (D) (E)
2. (A) (B) (C) (D) (E)
3. (A) (B) (C) (D) (E)
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5. (A) (B) (C) (D) (E)

Your completion of this activity includes evaluating them. Please respond to the following questions below.

Please rate this activity (1 - minimally, 5 - completely)	1	2	3	4	5
Was effective in meeting the educational objectives	○	○	○	○	○
Was appropriately evidence-based	○	○	○	○	○
Was relevant to my practice	○	○	○	○	○

Please rate your ability to achieve the following objectives, both before this activity and after it:
1 (minimally) to 5 (completely)

	Pre					Post				
	1	2	3	4	5	1	2	3	4	5
1. Identify the signs and symptoms of hair-thread tourniquet syndrome.	○	○	○	○	○	○	○	○	○	○
2. Describe three interventions for treating hair-thread tourniquet syndrome in the acute setting.	○	○	○	○	○	○	○	○	○	○
3. Explain strategies to prevent hair-thread tourniquet syndrome.	○	○	○	○	○	○	○	○	○	○

How many of your patients are likely to be impacted by what you learned from these activities?

○ <20% ○ 20%–40% ○ 40%–60% ○ 60%–80% ○ >80%

Do you expect that these activities will help you improve your skill or judgment within the next 6 months? (1 - definitely will not change, 5 - definitely will change)	1	2	3	4	5
	○	○	○	○	○

How will you apply what you learned from these activities (mark all that apply):

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- In making treatment decisions ○
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Other _____

Please list at least one strategy you learned from this activity that you will apply in practice:
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