Acquired Constriction Ring Syndrome

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Acquired constriction ring syndrome is a clinical condition of infancy characterized by circumferential constriction of a toe or another appendage, such as fingers and genitalia. The foot and ankle specialist should be aware of this condition because vascular obstruction of the affected appendage can rapidly lead to gangrene and autoamputation. Treatment consists of prompt identification and removal of the constricting foreign material. Although this condition is uncommon, it can lead to digital loss. Early treatment yields a good prognosis. A case report is presented of a 9-week-old infant who experienced acquired constriction ring syndrome caused by a strand of hair wrapped around the third and fourth toes that was treated by unwinding the hair under loupe magnification. (J Am Podiatr Med Assoc 96(3): 253-255, 2006)

Previously termed toe tourniquet syndrome, hair-thread tourniquet syndrome, and ischemic hair syndrome, acquired constriction ring syndrome is a pathologic condition consisting of the progressive, circumferential constriction of a toe or another appendage by a foreign body such as human hair or fibers and threads from clothing.1-6 This constriction produces predictable disruption of the vascular integrity of affected toes, leading to dry gangrene and autoamputation.1, 2 Blockage of venous and lymphatic drainage can produce dusky discoloration and severe digital edema.1, 2, 7 Acquired constriction ring syndrome typically affects the lesser toes.8

Acquired constriction ring syndrome is thought of as a congenital condition, with 80% of cases occurring in infants younger than 2 months.3, 9 During fetal development, spontaneous shedding of early body hair may occur, or, alternatively, hair may be liberated by fetal movement.9 Hair makes an effective tourniquet because of its unique physical characteristics.10-12 It is thin, has high tensile strength, and has elastic properties that permit it to stretch when wet and then constrict as it dries.6, 12, 13 In some cases, constriction of an appendage occurs after birth owing to exposure to threads, fibers, or hair from the environment. Clothing such as one-piece infant jumpsuits and mittens, which have closed ends and may allow for the accumulation of hair or threads, may be a source of constricting material.3, 7, 10, 14-17 For this reason, such garments should be turned inside out before washing, and any loose threads should be removed before use.6, 15

The common postpartum condition telogen effluvium involves increased maternal hair loss in the months immediately after delivery.5 Mothers who experience this phenomenon should be especially alert to the possibility of acquired constriction ring syndrome.

Although constriction almost always develops accidentally, there are documented cases of child abuse involving intentionally applied tourniquets.3, 5, 7, 11, 13 Klusmann and Lenard18 described cases in which there was no reasonable explanation for the presence of meticulously wrapped constricting bands. They concluded that child abuse should be considered in the differential diagnosis of patients with constric-
tion bands until another etiology can be convincingly proved. Some cultures intentionally create appendage tourniquets in an effort to ward off evil spirits or to treat urinary incontinence and nocturnal emissions.11

Acquired constriction ring syndrome in the lower extremity typically presents as an edematous, discolored toe that may be painful.3, 4, 7 A child may present with prolonged bouts of excessive crying and irritability.3, 5, 17 Depending on the tightness of the foreign material, acquired constriction ring syndrome may progress rapidly.3 With the growth of the infant, a constricting band often becomes tighter and exacerbates tissue injury. Constricted tissues pass through several stages of injury.4 Early tissue changes include edema and dusky discoloration subsequent to lymphatic and venous congestion. This is followed by an erythematous, inflammatory phase leading to arterial obstruction that results in pallor and ischemic changes.

The constricting band may be clearly evident on examination. However, in some instances, the offending band may lacerate the skin and become embedded in deeper tissues as skin reepithelializes.6, 7, 11-13 For this reason, a constricting band may not be readily seen; instead, only a deep circumferential fissure may remain at the site of constriction.7

**Differential Diagnosis**

In addition to the potential for child abuse to be a cause of acquired constriction ring syndrome, several clinical conditions are associated with presentations that can mimic this syndrome. Congenital annular constricting bands, also known as Streeter’s dysplasia, involves multiple congenital constriction bands, presumably amniotic in nature, that are seen clinically in association with talipes equinovarus deformities of the lower extremity.19 A congenital deformity known as septo-optic dysplasia is characterized by limb malformations resembling Streeter’s-type constriction bands in addition to central nervous system and ocular abnormalities.20

Another condition that often mimics acquired constriction ring syndrome is dactylolysis spontanea, or ainhum. Ainhum is a rare, idiopathic, and frequently bilateral condition that most commonly affects the fifth toe. The fourth and third toes are sometimes involved. Ainhum typically presents as a progressive, deepening groove in the skin that begins medially and spreads laterally, most often at the level of the proximal phalanx. Soft-tissue edema distal to the area of constriction ensues. As the condition progresses, well-demarcated resorptive bony changes are seen underlying the area of skin constriction, with more generalized osteopenia seen distal to this level. Autoamputation of the affected digit follows as the condition progresses. Ainhum exclusively affects individuals with dark skin pigmentation rather than fair-skinned populations.21 This phenomenon is believed to be related to the fibrogenic tendency of darker-skinned individuals.

**Case Report**

A 9-week-old girl presented to the pediatric urgent-care center at St. John West Shore Hospital, Westlake, Ohio, shortly after her mother noticed that the infant’s third and fourth toes appeared red and swollen (Fig. 1). The attending pediatrician made the diagnosis of a hair tourniquet and called one of us (R.L.F.) for consultation and treatment.

**Clinical Findings**

Examination revealed a healthy girl whose medical history and review of systems were unremarkable. The fourth toe of her left foot was grossly edematous and erythematous. A strand of hair was tightly wrapped around the toe, constricting the digit mid-shaft of the proximal phalanx. A slight superficial abrasion was present on the dorsal surface of the toe as a result of the mother’s attempt to remove the hair. Her left third toe showed mild edema related to the same strand of hair causing constriction at the distal interphalangeal joint. There was no evidence of drainage or skin necrosis. The capillary return to the digit was less than 1 sec. Despite the constricted toes, the infant did not seem to be in acute distress.

**Figure 1.** The patient’s left foot at initial presentation. Note the constriction rings around the third and fourth toes.
Treatment

Under ×2.5 loupe magnification, the end of the strand of hair was identified and carefully unwound from both toes. Further inspection revealed no additional foreign substance or any full-thickness compromise of the skin integrity. A triple antibiotic ointment was applied to the toes, and when the infant was sent home, a 1-week course of oral antibiotics was prescribed as a precaution. The infant’s mother telephoned the attending podiatric physician 5 days after discharge to report that the edema and erythema had resolved and that the toes appeared normal.

Discussion

In certain instances, the constricting material can be easily identified and removed. However, where there is any suspicion that residual constricting material is present, immediate surgical exploration and decompression is warranted.2, 3, 5, 6, 10, 17 This is especially true where the constricting material has lacerated the skin and become embedded in deeper tissues.

Several researchers2, 7, 9 have recommended using a short, longitudinal incision placed on the midline of the dorsal surface of the affected toe. The incision is made between the medial and lateral digital neurovascular structures. A short incision is made through the skin and is extended to the level of underlying phalangeal bone.2 This ensures complete transection of any constricting material. The extensor tendon will probably be incised longitudinally during this procedure, but because the tendon is not transected, function is not impaired. Serour and Gorenstein2 reported 21 cases of surgical decompression of acquired constriction ring syndrome performed as described previously here and noted no problems with digital function after surgical treatment.

Several researchers5, 6 have advocated the use of depilatory agents to dissolve hair as a noninvasive approach to treatment. This method can be used when the skin is intact, but because depilatory agents are chemical irritants, they must be used with caution.6

References