Loose Anagen Syndrome in a 2-year-old Female: A Case Report and Review of the Literature

Mathew Koehler, DO,* Anne Nguyen, MS,** Navid Nami, DO***

* Dermatology Resident, 2nd year, Opti-West/College Medical Center, Long Beach, CA
** Medical Student, 4th Year, Western University of Health Sciences, College of Osteopathic Medicine, Pomona, CA
*** Dermatology Residency Program Director, Opti-West/College Medical Center, Long Beach, CA

Abstract
Loose anagen syndrome is a rare condition of abnormal hair cornification leading to excessive and painless loss of anagen hairs from the scalp. The condition most commonly affects young females with blonde hair, but males and those with darker hair colors can be affected. Patients are known to have short, sparse hair that does not need cutting, and hairs are easily and painlessly plucked from the scalp. No known treatment exists for this rare disorder, but many patients improve with age.

Case Report
We present the case of a 27-month-old female presenting to the clinic with a chief complaint of diffuse hair loss for the last five months. The mother stated that she began finding large clumps of hair throughout the house, most notably in the child’s play area. She stated that the condition had progressed to where she is afraid to wash or comb her hair and is exceptionally careful changing her clothes, as even minor pulling on the hair will result in additional loss. The mother reports that her once long, curly locks are now short and straight, and no hair will grow past her neck line. The patient had no notable medical history and took no daily medicines. An older brother and sister had no similar findings. She was growing well and meeting all developmental milestones. The mother denied any major traumas, psychologically stressful periods or any major illnesses that the patient or the family experienced in the last year. The mother denied any hair manipulation or hair-pulling behaviors and stated that the daughter is so concerned about her hair being pulled out she is now refusing to play in close proximity to her siblings or friends.

On physical examination, we found a shy white female with sparse blond hair. Her hair reached only to the neck, and the mother stated that she does not need haircuts (Figures 1 and 2). She appeared generally healthy and eventually began playing in the examination room. She had no other skin, dental or nail findings. Her eyebrows, body hair and eye lashes were unaffected.

Laboratory evaluation done by her pediatrician, including complete blood count, renal panels, liver panel, anti-nuclear antibody and thyroid studies, were all within normal limits.

A hair-pull test was done, with more than 10 hairs being pulled without pain. The mom and patient were very upset when this test was done, as it was not fully explained, and refused further hair pulls. They did allow me to pull lightly on individual hairs, which repeatedly were easily pulled from the child’s head without pain. A trichogram was done, which showed a distorted anagen bulb with a “rumpled sock” appearance (Figure 3).

Based on the history and physical examination, a diagnosis of loose anagen syndrome (LAS) was made. The mother and child were advised on the natural history of this condition and were offered a trial of minoxidil 5% hair solution to be applied to her scalp daily. We encouraged her to continue being mindful of and avoid activities that would result in further hair loss such as combing, shampooing and pulling narrow-necked clothing over her head. The patient will continue to follow with us, and although not happy with her condition, they were relieved to have received a diagnosis.

Discussion
Loose anagen syndrome is an uncommon condition characterized by loosely attached hairs of the scalp leading to diffuse thinning with poor growth, thus requiring few haircuts. It was first described in 1984 by Zaun, who called it “syndrome of loosely attached hair in childhood.” A few years later, Price and Gummer along with Hamm and Traupe began describing similar cases in the American literature and coined the current term “loose anagen hair syndrome,” or LAHS. The annual incidence has been estimated at 2.5 cases per million, with 6.37 cases in boys as compared to girls. However, it has been suggested that the condition may be underestimated in boys due to differences in hairstyle. Cases described within families occurring in an autosomal-dominant pattern further suggest a ratio that is probably closer to 1.6–8

The classical clinical picture is that of a young girl with blonde hair that can be easily and painlessly plucked. Even so, cases do occur frequently in boys and adults, as well as in individuals with dark hair. Recent formal reports document cases from Egypt and India. Three phenotypes, types A, B, and C, have been described. In Type A, hair is sparse and does not grow long. In Type B, the individual has unruly hair that is either diffuse or patchy. In Type C, the hair appears normal but has excessive shedding and loose anagen hairs.10 The eyebrows and eyelashes are not affected. A diagnosis relies on the presence of loose anagen

Figure 1

Figure 2

Figure 3
Table 1. Differential Diagnosis of Pediatric Alopecia

<table>
<thead>
<tr>
<th>Condition</th>
<th>Clinical Findings</th>
<th>Pathology</th>
<th>Hair-pull Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loose Anagen Syndrome</td>
<td>Diffusely thin hair that tends to not grow beyond the shoulders. Bald patches may be present. Hair may be dull, unruly, or matted.</td>
<td>“Rumpled sock” look to anagen bulb on trichogram.</td>
<td>&gt;10 hairs painlessly pulled. Individual hairs easily pulled.</td>
</tr>
<tr>
<td>Lupus</td>
<td>Erythematous papules and plaques with scale. Lesions expand centrifugally. Follicular plugging with atrophy, scarring, and telangiectasia. Dark-skinned individuals may have peripheral hyperpigmentation with central hypopigmentation.</td>
<td>Follicular red dots on trichoscopy. On histology, vacuolar interface change with chronic inflammation of eccrine sweat glands and arrector pill. Increased dermal mucin. IgG and C3 deposition at D-E junction.</td>
<td>Normal</td>
</tr>
<tr>
<td>Alopecia Areata</td>
<td>Non-scarring, round-to-oval patch of hair loss. Totalis, universalis, ophiasis and reticular variants. Nail changes may be present. May be chronic and relapsing.</td>
<td>Yellow dots, exclamation mark appearance, and dystrophic hairs on trichoscopy.</td>
<td>May be positive in the diffuse variant.</td>
</tr>
<tr>
<td>Trichotillomania</td>
<td>Patchy or full alopecia of hair-bearing areas, most commonly the scalp. Patches have bizarre and irregularly shaped borders with hairs of varying lengths. Occiput sparing.</td>
<td>On histology, incomplete, disrupted follicular anatomy, trichomalacia, pigment casts.</td>
<td>Normal</td>
</tr>
<tr>
<td>Tinea Capitis</td>
<td>Most commonly presents as alopecia with or without scale. Presentation can range from a non-inflammatory scaling resembling seborrheic dermatitis to severe pustulosis also known as a kerion.</td>
<td>Comma hair on trichoscopy. Infection with T. tonsurans (&gt;90% of cases in the U.S.) results in the classic black dot appearance.</td>
<td>Normal</td>
</tr>
<tr>
<td>Telogen Effluvium</td>
<td>Thinning involving the entire scalp and other hair-bearing regions.</td>
<td>Mixture of normal anagen and telogen hairs with &gt;20% telogen hairs.</td>
<td>Positive for two or more normal telogen hairs.</td>
</tr>
</tbody>
</table>

hairs that when examined under the microscope display derangements involving the inner and possibly the outer root sheaths.12 A hair-pull test or trichogram can be performed in order to support the diagnosis, although there are several drawbacks. Few controlled studies have been done in order to properly define the parameters for a positive test. Authors have suggested using greater than 10 loose anagen hairs, compared to the usual one or two hairs in normal subjects, as the cutoff for constituting a positive pull test.10 On trichogram, greater than 70% loose anagen hairs compared to the normal 10% is considered positive. To avoid overdiagnosis, one must keep in mind that anagen hairs can be found on normal scalp; their presence is neither pathognomonic nor specific.13 The differential for LAS should include alopecia areata, tinea capitis, trichotillomania, traction alopecia, and secondary syphilis.14 See Table 1 for differential.

Much research has been done, although the precise pathogenesis of this syndrome has yet to be elucidated. The reigning theory is that of inner-root-sheath derangement leading to poor adhesion between the cuticle of the inner root sheath and that of the hair shaft, causing poor anchoring. Normal anagen hair is a complex structure requiring orderly development and maturation in order to achieve the proper hair follicle. Deranged anagen follicles of LAS exhibit characteristic features under both light and electron microscopy.7,12,11 The keratinized cell sheet portion of the Henle layer is abnormally thickened and tortuous. Cells are irregularly shaped and contain nuclear debris. In addition, there is premature keratinization and dyskeratosis with pyknotic nuclei, sparse filaments, and trichohyalin granules, in an edematous cytoplasm. The Huxley layer also exhibits premature keratinization with edema. Lastly, the cuticle cells of the hair shaft and Henle layer contain vacuoles with irregularly arranged cells.12 On gross examination, the hair bulb is long, tapered, and twisted along the long axis. The cuticle appears as a “rumpled sock.”2,12,15

Abnormalities in keratinization have prompted molecular analysis studies. Particular attention has been devoted to identifying the keratins within the inner root sheath, outer root sheath, and companion layer. Of significance, Chaplain et al. identified a G-to-A substitution mutation in the cytokeratin K6hf of the companion layer leading to replacement of glutamic acid by lysine. It is hypothesized that this mutation may lead to instability of the intermediate filament network and thus poor anchoring of the hair shaft to the sheath.1 It was not until recently that keratins of the inner root sheath, K25-28, were described.16,17 Molecular analysis for possible mutation in these genes has yet to be done.

Although the majority of cases have been sporadic, as previously mentioned, there is some evidence of autosomal-dominant inheritance with variable penetrance.6,7 There have been associations with certain conditions such as Noonan’s syndrome,15,18 coloboma,19 hypohidrotic ectodermal dysplasia,20 and woolly hair.21 There is no agreed upon or universally effective treatment for LAS. In some individuals, the condition improves with age, most notably around puberty. However, in some individuals the condition persists into adulthood. A recent case report showed good results using daily therapy with minoxidil without any side effects in a 2-year-old patient.22 While minoxidil is generally safe and inexpensive, there are some considerations when prescribing to pediatric patients. Rare cases of reversible generalized hypertrichosis have been reported in children using excessive amounts of minoxidil for alopecia areata, so caution should be used.23 Another consideration in pediatric patients is excessive systemic absorption, which could potentially cause cardiovascular symptoms such as tachycardia, palpitations and dizziness, so patients and their caregivers should be advised to monitor for side effects.24

Loose anagen syndrome is an uncommon condition that can cause a significant psychosocial impact in patients and families. More research is needed to fully understand the cause of this condition and to improve the limited treatment options available. Patients should be advised that this condition is thought to be benign in nature, and many patients’ hair normalizes with age. We have chosen to recommend minoxidil to our patient while warning the mother of the potential of cardiovascular side effects and hypertrichosis. We will continue to follow her progress.

References


Correspondence: Matthew Michael Koehler, DO; koehlermatt@yahoo.com