Ciliary Madarosis in the Pediatric Population: A Case Report and Review of the Literature

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Ciliary madarosis (CM) is a form of alopecia commonly associated with more extensive hair loss, which has cosmetic and psychological implications. Among the pediatric population, there are 4 important etiologic considerations: alopecia areata (AA), tinea capitis, trichotillomania (TTM), and telogen effluvium (TE). Recognizing the subtle differences that characterize these forms of alopecia allows for prompt and appropriate treatment. We present the case of a 9-year-old white girl with bilateral CM and no further evidence of alopecia elsewhere on her body. She was diagnosed with TTM and successfully treated with bimatoprost ophthalmic solution 0.03% (Latisse, Allergan, Inc). We also review the other common conditions that result in pediatric alopecia by identifying and comparing clinical, diagnostic, and therapeutic approaches unique to each condition. *Cosmetic Dermatol.* 2011;24:338-343.

Ciliary madarosis (CM) is a form of alopecia that involves the loss of eyelashes. This condition may present as an isolated finding or be accompanied by more diffuse hair loss. There are a variety of clinical presentations, and, on occasion, it may represent the first manifestation of systemic disease.[1,2] Although seen in patients of all ages, CM is especially rare among the pediatric population.[3] Of particular concern is the great cosmetic and psychological burden felt by the child, adolescent, and/or parent.[4] We present a case of CM in a young girl and discuss the diagnostic approach and treatment options.

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CASE REPORT

A 9-year-old white girl presented to the dermatology clinic for evaluation of loss of eyelashes. The patient denied any self-induced pulling and neither parent acknowledged observing such behavior. Loss of hair in other hair-bearing areas was further denied. Her mother reported an incident of itchy eyes with rubbing that may have preceded the hair loss. There was no reported notable medical history or use of medications.

On physical examination, there was bilateral patchy hair loss involving the upper eyelashes. The remaining upper eyelashes were of various lengths with very few long lashes present. There was no evidence of inflammation or atrophy in the affected areas. The lower eyelashes had no sign of hair loss bilaterally, and there was no further involvement of the scalp or eyebrows. After discussing options, the dermatologist decided not to perform a biopsy and made a presumptive

diagnosis of trichotillomania (TTM). Further discussion regarding treatment included referral to a child psychiatrist and starting the patient on bimatoprost ophthalmic solution 0.03% (Latisse, Allergan, Inc) with nightly application to the upper eyelashes.

On a follow-up visit 1 month later, the upper eyelashes had returned to normal growth. Both the patient and the parents were thrilled by these results. She was instructed to gradually taper off the bimatoprost over the next few weeks.

COMMENT

Causes

The 4 major causes of alopecia in the pediatric population include alopecia areata (AA), trauma due to traction or TTM, tinea capitis, and telogen effluvium (TE).[3] When alopecia is limited to a well-demarcated patch or isolated to a specific anatomic location as with CM, there is an assumption that AA is the cause of disease,[5] which may mistakenly lead to delayed diagnosis and worsening of the underlying disease process. Therefore, it is imperative that a diagnostic approach be followed to better serve proper management (Figure).

History

A thorough history is essential to diagnosing the cause of CM. Often challenging in the pediatric population, a reasonable starting point is to ask about self-inflicted eyelash loss as seen in TTM. In many instances, patients deny or are unaware of their hair-pulling tendency, so further inquiry regarding age of onset, duration, and extent of hair loss can be of added benefit.[6] Alopecia areata most commonly presents before the second decade of life, although prevalence peaks between the second and fourth decades.[7,8] It involves the scalp in 90% of cases and can last from months to years.[9] Trichotillomania demonstrates similar characteristics with respect to location and duration but appears to manifest most commonly in prepubescence.[6]

Medications represent another potential cause of CM. Specific reported medications include miotic agents, anticoagulants, anticholesterol agents, hyperthyroid agents, boric acid, bromocriptine, propranolol, valproic acid, and botulinum toxin type A injection. Topical agents also may contribute to CM through contact dermatitis. Cosmetics applied directly to the eyelids or indirectly, as may occur with nail polish, represent possible etiologies.[2] Although oral medications are not frequently taken in the pediatric population, childhood may mark the onset of using makeup or topical products for therapeutically treating or covering up acne and are thus worth investigating.

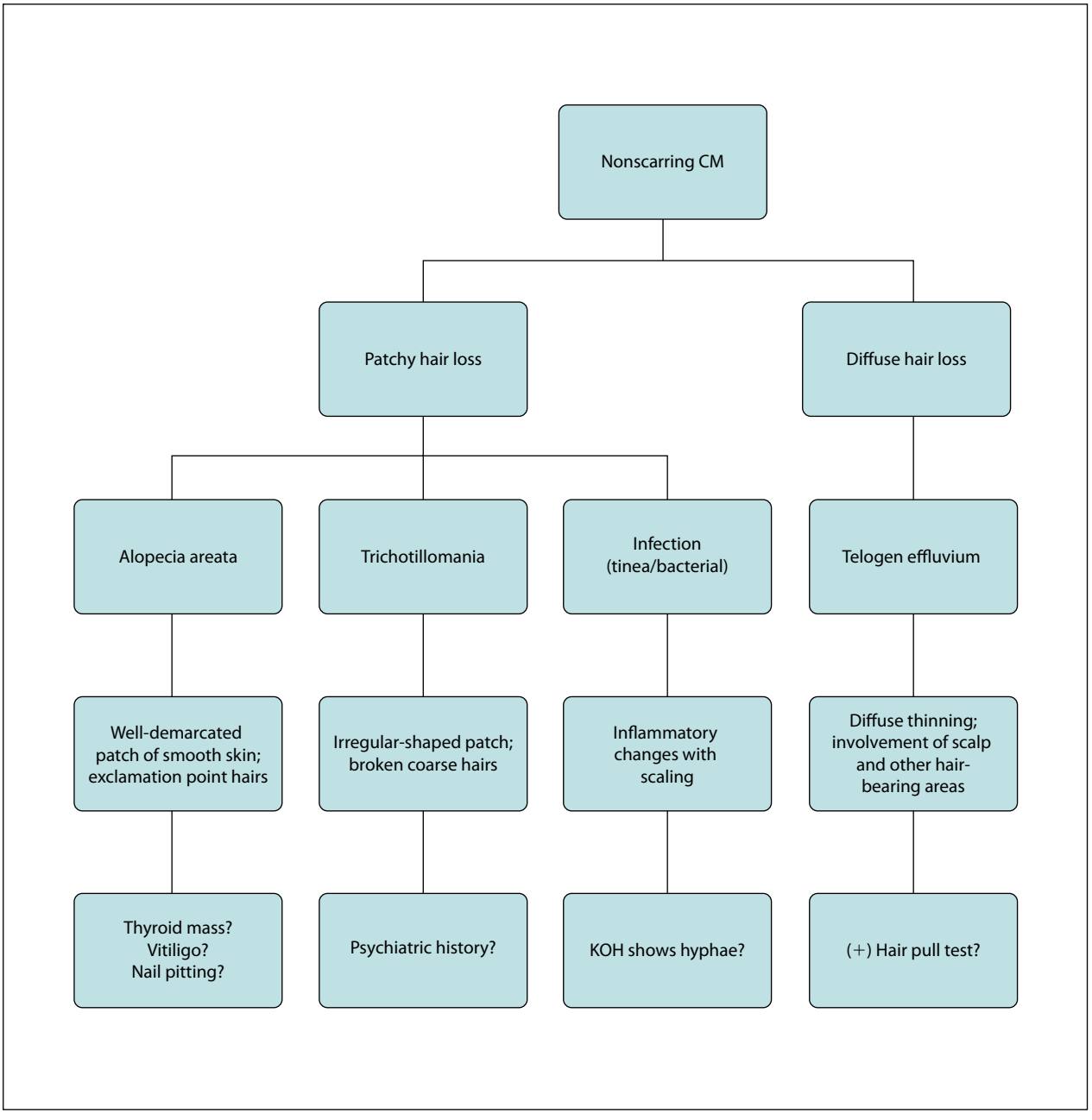
A history of recent infection also may contribute to CM. Significant illness 2 to 5 months prior to hair loss has been known to trigger TE, though involvement of many hair-bearing areas is expected. Conversely, localized infection such as blepharitis may be the most common cause of CM. It is often associated with a history of seborrhea and a propensity toward *Staphylococcus aureus* infections.[2] Although not as common, dermatophytic blepharitis also deserves consideration because of the increased prevalence of dermatophyte infections among children. A history of tinea capitis or systemic fungal infection may be a contributing factor toward CM.[3]

Medical history and family history can be especially revealing with regard to congenital, endocrine, autoimmune, infectious, or psychiatric conditions. Ichthyosis is known to cause congenital ocular abnormalities such as eyelash loss.[10] Alopecia areata has a significant relationship to autoimmune disorders often intertwined with endocrine abnormalities, most commonly thyroid disease and diabetes.[11] Autoimmune thyroid disease has a reported incidence of 8% to 28% with respect to AA.[8,12] A history of syphilis is an important consideration of eyelash loss, especially when AA is suspected because they are clinically similar.[11] Finally, TTM has an important relationship with psychiatric conditions such as obsessive-compulsive disorder, generalized anxiety disorder, and disorders of impulse control.[5,6] Often, the pediatric patient has no psychiatric diagnosis, but a family history may suggest a predisposition. An observed impairment in parent-child relationship through neglect or controlled and rigid parenting may raise further suspicion for TTM.[5]

Physical Examination

A thorough physical examination is important because biopsy rarely is a reasonable option considering the location of CM, especially in children. An appropriate first step is classification on the basis of scarring versus nonscarring alopecia. This important distinction helps in managing therapeutic options.[13] Scarring involves destruction of hair follicles and renders them incapable of regenerating. Close inspection would reveal loss of follicular openings and evidence of tissue damage in the form of inflammation or atrophy. The permanent damage from scarring is untreatable. Nonscarring processes have preserved hair follicles with no signs of inflammation and atrophy, resulting in possible treatment options.

Identifying the pattern of hair loss can provide further information. Two important patterns to consider in CM include diffuse thinning and patchy hair loss. Diffuse CM should raise suspicion for TE, especially when associated with diffuse thinning of the scalp.[14]



The most common causes of nonscarring ciliary madarosis in the pediatric population. CM indicates ciliary madarosis; KOH, potassium hydroxide.

An identified trigger along with a positive hair pull test increases the likelihood.[15] On the other hand, the most likely causes of patchy CM include AA, TTM, and localized infection. Inflammatory changes accompanied by mild scaling with or without pruritus are characteristic of tinea or bacterial infections.[8] This presentation is in contrast to AA, which demonstrates well-demarcated patches with smooth, normal-appearing skin. On occasion, the skin may show subtle erythema or a peach-colored quality but not to the extent observed with infection.[16] The hair loss in AA is often more sudden and involves both the upper and the lower eyelashes. A characteristic finding is exclamation point hairs that represent short hairs on the periphery of patches that are narrow proximally and widened distally.[8] However, exclamation point hairs are not exclusive to AA and also have been demonstrated in

syphilis.[11] Patchy CM associated with TTM is more often irregularly shaped as a result of broken and coarse hairs of various lengths that are misaligned. Typically, the patchy hair loss is isolated only to the upper eyelids and spares the shorter lower eyelashes.[5] Trichotillomania does not demonstrate prevalent erythema as in tinea infections, though subtle perifollicular erythema can be present because of trauma.[6] Hair pulling often can be biased toward a certain side, resulting in a unilateral appearance. This presentation likely corresponds to the dominant hand, and such lack of symmetry can help differentiate TTM from AA.[6]

When AA is suspected, examination beyond hair-bearing areas is of additional importance because of autoimmune associations. Examination of the neck for tenderness or the presence of a nodular or goiterlike mass can raise suspicion for thyroid disease. Meanwhile, vitiligo is another notable finding in AA with a prevalence reported as high as 8%.[17] Nail pathology in the form of pitting and longitudinal ridging demonstrates other potential associations. Nail pits occur in 20% to 50% of patients with AA and tend to be small, uniform, and arranged in a geometric pattern.[18] These features help differentiate AA from other forms of patchy alopecia.

Investigatory Biopsy and Laboratory Tests

Full-thickness punch biopsy of the eyelid should be reserved for the possibility of scarring alopecia or when the diagnosis is in question and CM remains unresolved.[3] On occasion, biopsy has helped differentiate TTM from AA. Pathologic analysis of TTM shows a mixture of traumatized and normal hair bulbs in the catagen or anagen states with pigment casts.[5] In acute AA, there is a peribulbar lymphocytic infiltration targeting the anagen-stage hair follicles described as a swarm of bees.[8] Diagnosis of suspected dermatophyte infections can be supported by potassium hydroxide preparations looking for hyphae or confirmed by fungal culture. Because of the increased likelihood of *Trichophyton tonsurans*, Wood lamp is of limited use owing to the decreased presence of pteridine.

Blood work can provide an adjunct to certain diagnoses. All suspected cases of AA require a thyroid workup including thyroxine, thyroid-stimulating hormone (thyrotropin), and antithyroid antibody panel for the increased likelihood of autoimmune thyroid disease.[19] Telogen effluvium has a wide variety of known triggers, and generalized blood tests can help in identifying a specific cause. Appropriate tests include complete blood cell count, chemical screen, thyroid-stimulating hormone levels, thyroxine levels, erythrocyte sedimentation rate, antinuclear antibodies test, syphilis serology, and iron studies as an initial screen.[20]

Treatment

Treatment options vary depending on the causes of CM, and the focus may not always be on treating the alopecia (Table). In TE, therapy is directed toward the identified trigger, whereas adjunctive treatment such as topical minoxidil is an optional treatment for hair loss. Providing assurance that hair loss is self-limited and usually resolves within 3 to 6 months can provide added relief.[20] In TTM, nonpharmocologic treatment in the form of psychiatric counseling represents first-line therapy. When TTM is triggered by anxiety and impulse disorders, behavioral therapy is important because many motivated patients have tried to stop pulling unsuccessfully. Family counseling is crucial, especially if the parent-child dynamic is the identified trigger. Parental support and assurance is a vital step in management.[6] Pharmocologic treatment of TTM has traditionally involved selective serotonin reuptake inhibitors, but a new study indicates that *N*-acetylcysteine may be of benefit. A double-blind, placebo-controlled trial showed improvement in 56% of patients given 1200 to 2400 mg of *N*-acetylcysteine per day for 6 weeks. *N*-acetylcysteine appears to act on the glutamatergic pathway and to modify dysfunction that is thought to contribute to TTM.[21,22]

There are a number of pharmacologic treatments for AA involving the eyelashes. Intralesional corticosteroids are the treatment of choice in adults, whereas topical corticosteroids are the treatment of choice in pediatrics due to the comfort and safety profile. Increased efficacy has been shown by using betamethasone valerate 0.1% in a foam versus a lotion vehicle.[23] Midstrength corticosteroids in a petrolatum base applied to the lid margin also may be effective.[11] In adults with AA involving the scalp, triamcinolone acetonide 5 mg/mL is preferred intralesionally every 4 to 6 weeks when less than 50% of the scalp area is involved, whereas diphenylcyclopropenone is used when more than 50% of the scalp is involved. Adult AA affecting facial hair requires intralesional triamcinolone acetonide 2.5 mg/mL every 4 to 6 weeks.[23] Patients should be advised not to use topical corticosteroids for an extended amount of time to prevent cataract formation and glaucoma.[11] Other topical therapies include minoxidil and calcineurin inhibitors among others whose efficacy is not well supported.[24]

Tinea infections are treated with first-line griseofulvin at a dosage of 20 to 25 mg/kg daily for 6 weeks. Griseofulvin has shown great efficacy, and treatment failure has

Pediatric Treatment Options for Ciliary Madarosis

Cause	First-Line Treatment	Second-Line Treatment
Alopecia areata	Topical midstrength corticosteroid (pediatric)	Calcineurin inhibitors
Trichotillomania	Psychotherapy	SSRIs; *N*-acetylcysteine; bimatoprost
Tinea infection	Griseofulvin	Triazole drugs; terbinafine
Telogen effluvium	Identify trigger	Minoxidil (adjunctive)

Abbreviation: SSRI, selective serotonin reuptake inhibitor.

been attributed to either poor compliance or inadequate dosing. If treatment is unresponsive after 6 weeks, second-line therapy with either terbinafine, itraconazole, fluconazole, or ketoconazole can be initiated, or a repeat fungal culture can be taken.[3] Topical antifungal agents lack efficacy and may be more difficult to apply to the eyelids.

Bimatoprost is a topical medication indicated for the treatment of hypotrichosis. The mechanism of action remains unknown, but as a prostaglandin $F_{2\alpha}$ analog, bimatoprost is thought to promote eyelash growth by binding prostaglandin receptors located in the dermal sheath and papillae of eyelashes. Daily application to the base of the upper eye will promote gradual hair growth witnessed within 2 months.[25,26] The most common side effects include eye pruritus and conjunctival hyperemia as observed in 3% of the US Food and Drug Administration's study participants. After treatment with bimatoprost is stopped, eyelashes return to their prior baseline growth.[26] Although bimatoprost has shown great promise in the cosmetic treatment of hypotrichosis, its efficacy in alopecia-related conditions has shown mixed results. With respect to AA, bimatoprost has been found ineffective in recent trials.[27,28] Roseborough et al[27] did not find eyelash growth in a blinded, randomized, controlled trial involving 11 patients with AA who had greater than 50% eyelash loss bilaterally. Meanwhile, Zaheri and Hughes[29] described the case of a 16-year-old girl who demonstrated eyelash regrowth after treatment with bimatoprost in a suspected case of AA. However, it remains the only case in the literature describing successful use of a prostaglandin analog for treatment of AA. Further investigation involving concentration, duration, and vehicle use are needed to understand the true efficacy of bimatoprost in the treatment of AA.[23] To our knowledge, there is no prior case reporting the use of bimatoprost in the treatment of TTM.

CONCLUSION

Ciliary madarosis is observed in a variety of clinical conditions and requires prudent treatment from both a medical and cosmetic standpoint. A thorough investigation is essential to identify a cause and prescribe an appropriate treatment. Our case demonstrates the successful use of bimatoprost in the treatment of CM in a 9-year-old patient. Of the common causes discussed, TTM was the most reasonable diagnosis based on physical examination and response to treatment, though definitive diagnosis required biopsy. In any case, the presentation was atypical because TTM is very commonly accompanied by scalp involvement. The same is true of AA, but exclusive eyelash involvement rarely spreads to other hair-bearing areas.[30] It is of interest that our patient did not demonstrate hair-pulling tendencies

during treatment with bimatoprost. Whether this was a result of increased eyelash awareness or a direct therapeutic effect of bimatoprost remains to be seen.

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