Chapter 4
Androgenetic Alopecia

Yolanda M. Lenzy and Alfreda F. Batts

Case History

A 36-year old Latina female presented with a 5 year history of progressive thinning of the vertex scalp. She previously tried over the counter hair growth preparations and biotin, without any improvements.

Physical Examination

On examination, diffuse thinning was noted over the frontoparietal scalp with preservation of the frontal hairline (Fig. 4.1a). There was no scalp erythema or scaling and the pull test was negative. Variability in the diameter of the hairs

Y.M. Lenzy, MD, MPH (✉)
Department of Dermatology, Lenzy Dermatology & Hair Loss Center & University of Connecticut, Chicopee, MA, USA
e-mail: Yolanda_lenzy@yahoo.com
A.F. Batts, BS
University of Texas Medical Branch at Galveston, 12255 West Marsham Circle, Houston, TX 77066, USA
e-mail: ms.alfredabatts@gmail.com

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FIGURE 4.1 Androgenetic alopecia and treatment with minoxidil 5 % foam. Diffuse thinning is noted over the fronto-parietal scalp with preservation of the frontal hairline (**a**). After 6 months of topical minoxidil 5 % foam, there was significant re-growth in the fronto-parietal scalp (**b**)

and miniaturization were noted on dermoscopy. In addition, a horse-shoe shaped linear band of hair loss was noted extending from the frontal to occipital scalp, corresponding to the location of the adhesive attachment of the patient's hair replacement unit.

Clinical Differential Diagnosis

The clinical differential diagnosis included androgenic alopecia, central centrifugal cicatricial alopecia (CCCA), chronic telogen effluvium and alopecia areata (Callender et al. 2004). CCCA and traction alopecia are the most common causes of hair loss in African American females (Rogers and Callender 2014). Diagnostic clues in differentiating the different causes of hair loss include the pattern of hair loss, symptomatology, and dermoscopy findings.

Histopathology

Histologically, miniaturization of terminal hairs into vellus hairs, a decreased anagen-to-telogen ratio, decreased follicular density in long-standing cases, and an absence of inflammation was noted. It is important to indicate the patient ethnicity on the scalp biopsy requisition as African-American patients have been noted to have a lower normal follicular density compared to Caucasians (22 vs 36 follicles) on a 4 mm punch biopsy (Blumeyer et al. 2011).

Diagnosis

Androgenetic Alopecia

Case Treatment

The nature of the condition was discussed with the patient, and emphasis was placed on the importance of initiating treatment early. Treatment options discussed include topical minoxidil 2 % solution or foam bid, minoxidil 5 % solution or foam once daily and oral spironolactone. Risks and benefits were discussed regarding each. The patient decided to begin with topical minoxidil 5 % foam daily for a trial of 6 months. The patient noticed significant regrowth at her 6 month follow up (Fig. 4.1b) and has continued it for the past 2 years, without further clinical progression of the miniaturization.

Discussion

Hair loss is a common problem that challenges patients from all cultural backgrounds, especially in females of color. In fact, Halder et al. reported that alopecia is the fifth most

common condition seen in a dermatologic private practice that treats mainly African-American patients (Halder et al. 1983). Androgenic alopecia (AGA), also known as androgenetic alopecia, alopecia androgenetica, female pattern hair loss (FPHL), and male pattern hair loss (MPHL), is the most common form of hair loss (McElwee and Shapiro 2012); although the exact prevalence in black males and females is not known.

The pathogenesis of androgenic alopecia is multifactorial with both hormonal and hereditary mechanisms involved. Elevated levels of 5α reductase type-2 (5αR-II) are located in the hair follicles of patients with AGA (Cowper and Knopp 2012). Dihydrotestosterone, formed from the action of 5αR-II on testosterone, binds to the androgen receptor (AR) and the hormone-receptor complex then activates genes responsible for the gradual transformation of large, terminal follicles to small, miniaturized ones (Cowper and Knopp 2012). Although the biochemical composition of hair is similar among racial and ethnic groups, hair in people of African descent is known to have an elliptical, curly morphology with lower total hair density, total number of terminal follicles, and terminal anagen hairs making management of this process in skin of color more challenging (Rogers and Callender 2014).

There is a paucity of data on the genetics of this type of hair loss, yet proposed theories on the inheritance pattern include autosomal dominance with incomplete penetrance and polygenic inheritance. This is suggested by twin studies identifying genetics for an estimated 80 % of the predisposition to pattern baldness and the clinical observations of patients' families that are diagnosed with AGA (Cowper and Knopp 2012).

The clinical manifestations are the same across all ethnic groups with noticeable differences between genders. MPHL in men tends to start in the bitemporal scalp, then progresses to involve the vertex and frontal hairline. FPHL in females shows diffuse thinning over the crown and frontal scalp with preservation of the anterior hairline (Fig. 4.2) referred to as the "Christmas tree" pattern (Blumeyer et al. 2011).

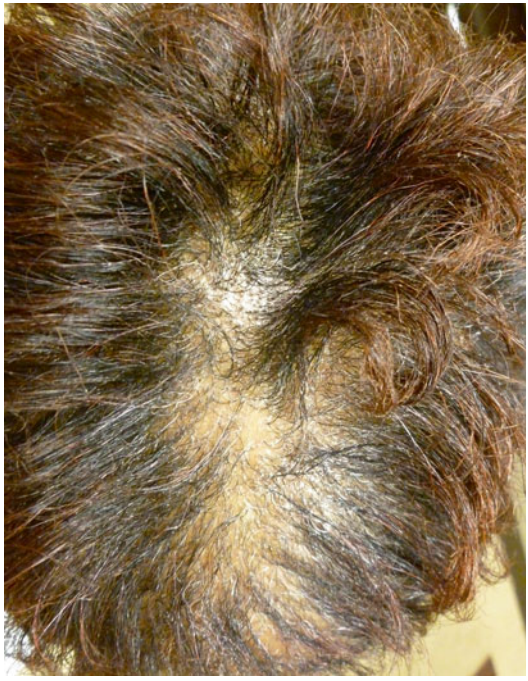

FIGURE 4.2 Androgenetic alopecia and the Christmas tree pattern. Female pattern hair loss in females shows diffuse thinning over the crown and frontal scalp with preservation of the anterior hairline, referred to as the "Christmas tree" pattern

It is important to note that AGA is not only a cosmetic issue, but it may entail many psychological and medical issues in its process. Many affected patients develop negative self-esteem and experience social problems causing major effects in their quality of life (QoL) (Callender et al. 2004). Chen et al. reported that the most common concerns of African-American females with alopecia are everyday functioning (i.e. hairstyling), emotional issues, and concerns with the appearance of the scalp (Callender et al. 2004). Therefore, early diagnosis and initiation of therapies in patients of African descent are essential in minimizing the overall effects on the patient.

There are several disorders that have been linked to androgenic alopecia including: polycystic ovary syndrome, postmenopausal ovarian hyperthecosis, administration of adrenocorticotropic hormone, and prostate cancer (Cowper and Knopp 2012). These disorders are linked to overproduction of androgens and should be further worked up based on the clinical decision of the provider.

Treatment

Androgenetic alopecia has several therapeutic options, both surgical and medical. The morphological structure of African-American hair presents specific challenges and special considerations when choosing an effective treatment plan for AGA. The elliptical, curly morphology, lower total hair density, total number of terminal follicles, and terminal anagen hairs are all factors that must be considered when treating African-American patients with hair loss (Rogers and Callender 2014).

Across all ethnicities topical minoxidil (5 % BID in males and 2 % BID or 5 % daily in females) is the mainstay medical therapy for treatment of AGA (Callender et al. 2004; Blumeyer et al. 2011). Its exact mechanism of promoting hair growth is unclear but it is known to convert miniaturized hairs into terminal hairs with a near normal morphology. In addition, minoxidil has Level 1 evidence of high rates of efficacy in preventing progression of hair loss and improving hair growth with high safety profiles and practicability for the patient (Blumeyer et al. 2011). Topical minoxidil is commercially available as a solution and foam and can be compounded into a gel or ointment. The solution or foam formulations may cause hair to return to its natural curly state in the black female patient with thermally straightened hair. To decrease this effect, the ointment formulation can be used as an alternative (Callender et al. 2004).

Anti-androgens are the second most popular treatment for AGA. Finasteride, a potent and highly selective synthetic 5α reductase type-2 inhibitor, prevents the conversion of testosterone into dihydrotestosterone (DHT), the hormone responsible for the miniaturization seen in AGA. Double blinded, placebo-controlled trials examined the 1 mg dose in patients. While a significant increase in hair counts were noted in men with AGA after 6–12 months, there were no differences in the terminal to miniaturized hair ratio in females. Camacho and colleagues reported significant hair growth using finasteride 2.5 mg/day in 41 females with AGA and SAHA (seborrhea, acne, hirsutism and alopecia) (Camacho 2001). Some studies have shown greater efficacy in the treatment of AGA with dutasteride, a 5α reductase type-1 inhibitor. However, dutasteride is not FDA approved in the treatment of AGA and Phase III clinical trials are currently ongoing. Spironolactone, a competitive aldosterone antagonist, has mild antiandrogenic effects by blocking the androgen receptor and preventing its interaction with DHT. Spironolactone may have a preventative effect in FPHL and may reduce shedding in females without hyperandrogenism. It is not FDA approved in the treatment of AGA and should not be used in men due to its anti-androgen effects. It requires concurrent contraception in fertile females and monitoring for menstrual disturbances and hyperkalemia (Blumeyer et al. 2011).

Hair transplantation as an option in black patients is increasing in popularity. The surgical correction of hair loss in patients of African descent poses many considerations and challenges when compared to patients of other ethnicities. Black patients have curved hair follicles, a lower hair density, lower number of follicular units with a higher number of hairs within each unit and a higher risk of keloid formation when compared to others (Callender et al. 2004). Therefore, the use of larger punch grafts (minigrafts and micrografts), donor harvesting with a bended Personna blade or flexible Dermablades, and transplanting hairs from the frontal area

caudally is a better option for this population (Rogers and Callender 2014). Patients with a known medical or family history of keloids can benefit from test transplantation to observe for thick scar formation. Therefore, in black patients with AGA refractory to medical treatment, transplantation can be a safe and a long-term therapeutic option.

Low-level light/laser therapy and platelet-rich plasma (PRP) are innovative hair loss therapies that are gaining popularity (Gkini et al. 2014). Paradoxical hair growth occurred has occurred in patients undergoing laser hair removal when relatively low fluences were used (Nusbaum et al. 2013). The mechanism of action of this phenomenon is unknown but one theory includes the absorption of photons by cytochrome oxidase, modulating gene regulation to decrease apoptosis and prolongation of the anagen phase (Nusbaum et al. 2013). Improvement in terminal hair density was observed with treatment with low-level laser device versus a sham device on the entire scalp three times weekly for 26 weeks in both males and females (Jimenez et al. 2014). Over the counter home-use handheld devices include HairMax LaserComb®, Sunetics Laser Hair Brush®, and the X5 Hair Laser®. LaserCap® is also a home-use system that must be prescribed. The in-office systems include the Sunetics Model G® and MEP90® system. PRP therapy includes injecting autologous platelets into the scalp that are known to release growth factors. There is insufficient evidence to support direct stimulation of hair growth but one clinical trial noted that PRP showed an increase in target hair counts compared with control (Nusbaum et al. 2013). If PRP is administered with dalteparin and protamine microparticles as carriers, hair shaft diameter and target hair counts are proposed to increase (Nusbaum et al. 2013). Further studies are needed to evaluate PRP as a FDA approved hair loss therapy.

Scalp protheses are practical for patients with extensive hair loss without significant improvement with medical therapies who are not candidates for surgical hair restoration therapy.

Key Points

- Androgenic alopecia is the most common cause of hair loss.
- It is characterized by non-scarring hair loss under the influence of androgens, miniaturization of terminal hairs into vellus hairs, a decreased anagen-to-telogen ratio, decreased follicular density in long-standing cases, and an absence of inflammation.
- There are several therapies to choose from when managing AGA with the most popular being topical minoxidil, oral finasteride, low-level laser/light therapies, and hair transplantation.
- More research is needed to effectively guide the treatment of AGA in patients with skin of color.

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