Original Article

General Insight About Androgenetic Alopecia

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Abstract

Background: Thinning of the hair usually begins between the ages of 12 and 40 years in both genders and approximately half the population expresses this trait to some degree before the age of 50. Ordinary, male pattern baldness as a rule begins with expanded fronto-temporal recession then mid-frontal retreat. A round territory on the vertex much of the time takes after as the thickness of hair diminishments over the lifted vertex hair. Androgenetic alopecia occurs in all populations but the prevelance is highest in Caucasians. Caucasian males are four-times more likely to develop AGA than males of African origin. Approximately 30% of Caucasian men are affected by 30 years of age, and at least 50% by 50 years of age .There is scant published information on frequency of balding in African men. Clinically, hairs from the frontal area to the vertex of the scalp become thin and short vellus hairs, resulting in a receding frontal hairline and hair loss in the vertex. In contrast to telogen effluvium, pattern hair loss is a characteristic of androgenetic alopecia. In men with androgenetic alopecia, the gradual replacement of long, pigmented, terminal hairs on the scalp by short, pale, vellus hairs normally occurs in a relatively precise pattern. Hamilton graded this progression from type 1, pre-pubertal scalp with terminal hair on the forehead and all over the scalp, through gradual regression of the frontal hairline and thinning on the vertex, to type VII where the bald areas became fully coalesced to leave hair only around the back and sides of the head. Norwood modified Hamilton's classification, including variations for the middle grades. In a few occasions, some men create diffuse decreasing of the vertex hair with upkeep of the frontal hairline with an example which looks like the Ludwig pattern of hair loss seen within ladies.

Keywords: androgenetic alopecia

INTRODUCTION

Androgenetic alopecia (AGA) is a hereditary thinning of the hair induced by androgens in genetically susceptible men and women plus decided decreasing of the anagen time of hair advancement. This condition is known as male pattern baldness or common baldness. It is grouped by the Norwood-Hamilton male hair pattern baldness, as well as ludwig female pattern hair loss in women. Thinning of the hair usually begins between the ages of 12 and 40 years in both genders and approximately half the population expresses this trait to some degree before the age of 50. Ordinary, male pattern baldness as a rule begins with expanded fronto-temporal recession then mid-frontal retreat. A round territory on the vertex much of the time takes after as the thickness of hair diminishments over the lifted vertex hair. Miniaturization of the genetically predisposed hair follicles was stimulated by androgen, it causes gradual replacement of terminal hairs by vellus hairs in affected areas**.** Other names include male pattern hair loss (MPHL), male pattern alopecia, androgen dependant alopecia, female pattern hair loss (FPHL) and commen baldness ***(1)*****.**

Incidence

Androgenetic alopecia occurs in all populations but the prevelance is highest in Caucasians. Caucasian males are four-times more likely to develop AGA than males of African origin. Approximately 30% of Caucasian men are affected by 30 years of age, and at least 50% by 50 years of age. There is scant published information on frequency of balding in African men. Most Chinese retain the pre-pubertal hairline after puberty, and baldness is less common, less extensive and starts later. Japanese men also show a lower incidence, beginning balding about 10 years later than Caucasians. The reason for this racial variation is unclear, but is probably genetic. The frequency and severity of AGA increase directly with age, and its high prevelance in older men suggest that this form of hair loss may be normal consequence of aging ***(2)*****.**

Pathogenesis of androgenetic alopecia:

1. **Alteration of Hair Cycle Dynamics;**
2. **Hair Follicle Miniaturization**
3. **Inflammation**.

<u>The dynamics of hair follicle cycling in normal and balding scalp</u>

Normally, scalp hair follicles are mainly in anagen phase; the average duration of anagen is 2-3 years compared to 3 months for telogen, and the usual ratio of anagen to telogen hairs is about 9:1. In AGA, with each passage through the hair cycle, the duration of anagen decreases while the telogen phase either remains the same or gets longer, thereby reducing the anagen to telogen ratio 5:1 ***(3).***

		Anagen	Telogen	Net Result
Normal 	Duration:	Years ↓	3 Months ↓	Slow Turnover of Thick, Visible Hairs (No Change in Scalp Coverage)
	Outcome:	Thick, Long Pigmented Hairs	Shedding	
Balding 	Duration:	Months ↓	3 Months ↓	Increased Turnover of Short, Thin, Hypopigmented Hairs (Progressive Loss of Visible Scalp Hair)
	Outcome:	Fine, Short, Miniaturized Hairs	Shedding	

Figure (1): The dynamics of hair follicle cycling in normal and balding scalp ***(4).***

Miniaturisation Processes in AGA

Clinically, hairs from the frontal area to the vertex of the scalp become thin and short vellus hairs, resulting in a receding frontal hairline and hair loss in the vertex. In contrast to telogen effluvium, pattern hair loss is a characteristic of androgenetic alopecia. During the miniaturization process of AGA , the follicles associated arrector pili muscle reduce much more slowly than other follicle, while the androgen dependant sebaceous gland becomes enlarged, often resulting in an oily, greasy scalp. Other changes include a reduced follicular blood supply and nerve networks twisting to form a type of encapsulated end organ below the follicle ***(5).***

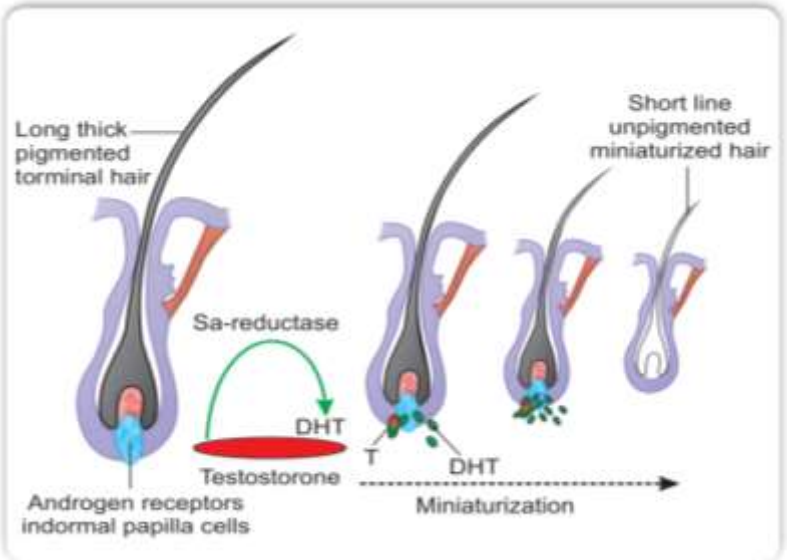


Figure (2): Miniaturization of the hair follicle ***(3).***

Clinical picture and classification

In men with androgenetic alopecia, the gradual replacement of long, pigmented, terminal hairs on the scalp by short, pale, vellus hairs normally occurs in a relatively precise pattern. Hamilton graded this progression from type 1, pre-pubertal scalp with terminal hair on the forehead and all over the scalp, through gradual regression of the frontal hairline and thinning on the vertex, to type VII where the bald areas became fully coalesced to leave hair only around the back and sides of the head. Norwood modified Hamilton's classification, including variations for the middle grades; this scale is used extensively during clinical trials table(1).In a few occasions, some men create diffuse decreasing of the vertex hair with upkeep of the frontal hairline with an example which looks like the Ludwig patternof hair loss seen within ladies ***(5).***

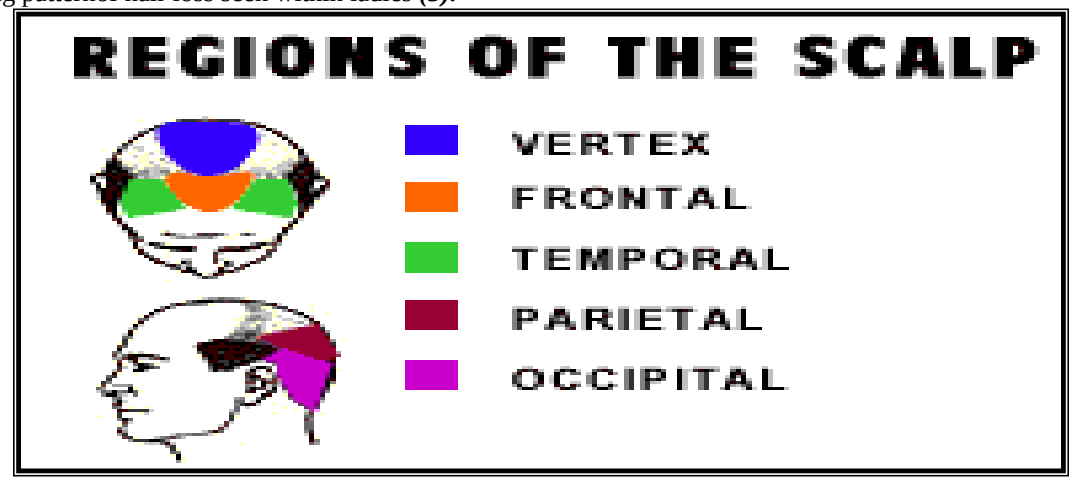
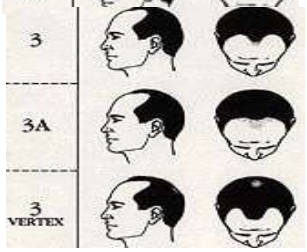
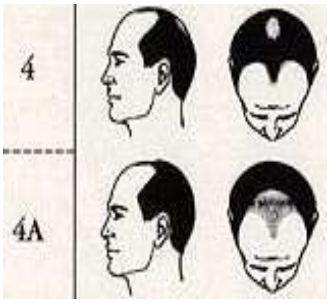
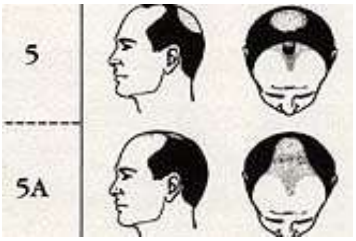
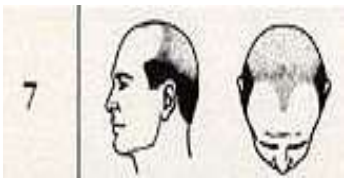


Figure (3): Regions of the scalp. ***(5).***

Hamilton Norwood Scale

Table (1): Hamilton-Norwood classification of male balding ***(12).***

Stage 1	very minor or no recession of the hair line,	
Stage 2	2:Triangular and typically symmetrical areas of recession at the front temporal area 2A: Entire frontal hair line recedes	
Stage 3	3: Most scalps have deep symmetrical recession at the temples that are bare or only sparsely covered by hair. 3A: As 3 and hair line recedes back further 3 vertex: Hair loss is primarily from the vertex with limited recession of the front temporal hairline.	
Stage 4	4: Recession at the front temporal areas is more severe than stage 3. There is a decisive lack of hair on the crown. A band of moderately dense hair extending across the top separates front temporal area from crown. 4A: Hair loss move past mid coronal line.	

Stage 5	5: Hair loss at the vertex is still separated from the front temporal region but by noticeably thinner and narrower band of hair. Hair loss at the vertex and front temporal regions are larger. 5A: Hair loss extends towards the vertex	
Stage 6	6: The front temporal and vertex regions are now joined into one area. Hair loss on the sides has extended further	
Stage 7	7: Only a narrow band of hair in a horseshoe shape survives on the sides and back of the scalp. This hair may be fine and less dense than before.	

Female pattern hair loss may have three different patterns:

1. Diffuse decreasing of the crown locale with protecting of the frontal hairline. There are two scales that describe this sample: the frequently used 3-point Ludwig scale and the 5-point Sinclair scale ***(6).***

The Ludwig classification uses three stages to describe female pattern genetic hair loss: type I (mild), type II (moderate), and type III (extensive). In all three Ludwig stages, there is hair loss on the front and top of the scalp with relative preservation of the frontal hairline. ***(7).***

2. Thinning and stretching out of the central part of the scalp with crack of frontal hairline (Olsen scale: Christmas tree design) ***(7).***
3. Thinning associated with bitemporal recession the same as male hair loss pattern (Hamilton Norwood type) ***(7).***

Fig. (4): Ludwig pattern of hair loss (3-point) ***(7).***

Fig. (5): Sinclair scale (5-point) ***(3).***

Male pattern (Hamilton) Diffuse (Ludwig) Frontal accentuation (Oslen)

Fig. (6): Olsen scale: Christmas tree pattern in female pattern hair loss ***(6).***

Diagnosis

- **History**

A proper history often helps to rule out other causes of the hair loss like telogen effluvium.

- **General scalp and hair examination**

The scalp is usually normal in AGA, but look for factors which can aggravate AGA like seborrheic dermatitis and photo-damage. The main aim of clinical examination is to identify whether or not the hair loss is patterned ***(8).***

- **Laboratory investigations**

Laboratory investigations are not usually indicated for patients with AGA and diagnosis is made on clinical grounds. However, in females who have features of hyperandrogenism, appropriate investigations include FSH, LH, prolactin, serum androgen and oestrogen levels, fasting lipids and triglyceride levels ***(9).***

Treatment of AGA:

1- Medical Treatment:

- **Minoxidil:** Minoxidil acts by shortening the telogen phase, causing the quiescent hair follicles to enter prematurely into the anagen phase. Also, minoxidil extends the duration of the anagen phase, but it has side effects like:
    - resistance
    - Minoxidil-induced telogen effluvium: Minoxidil causes the shortening of the telogen phase, subsequently leading to marked shedding.
    - Skin irritation: Erythema, discomfort, and a burning sensation
    - Scaly changes of the scalp: Irritation or exacerbation of seborrheic dermatitis
    - Isolated pruritus
    - Allergic contact dermatitis ***(10).***
- **Oral Finasteride:** It is an antiandrogen agent which cause inhibition of DHT formation, thereby reducing serum and scalp DHT levels and slowing the progression of androgenic alopecia, but it has side effects in male :

include loss of libido, erectile dysfunction (2% to 4%), decreased ejaculatory volume, and gynecomastia. It also correlates with orthostatic hypotension ***(11).***

2. Botulinum toxin injection

3.Platelet Rich Plasma injection

4.Surgical Treatment (hair transplantation) but it is so expencive.

REFERENCES

1. **Mei-Dan O, Laver L, Nyska M, et al., (2011):** Platelet rich plasma—a new biotechnology for treatment of sports injuries, Harefuah, 150(5); 453-457.
2. **Liang B., Yang C., Zuo X., et al. (2013):** Genetic variants at 20p11 confer risk to androgenetic alopecia in the chinese han population.PloS one, 8 (8): e71771.
3. **Sinclair R.,Patel M.,Dawson J.R. et al. (2011):** Hair loss in women : medical and cosmetic approaches to increase scalp hair fullness. British Association of Dermatologists; 165(3):12-18.
4. **Kaufman KD (2002):** Androgens and alopecia. Mol Cell Endocrinol.; 198: 89-95.
5. **Randall VA (2010):** Molecular Basis of Androgenetic Alopecia. © Springer-Verlag Berlin Heidelberg.
6. **Blume-Peytavi U, Blumeyer A, Tosti A, et al.,(2011):** S1 guideline for diagnostic evaluation in androgenetic alopecia in men, women and adolescents. Br J Dermatol; 164(1): 5-15.
7. **Olsen EA.** Current and novel methods for assessing efficacy of hair growth promoters in pattern hair loss. J Am Acad Dermatol. 2003;48(2):253-62.
8. **Trüeb R.M. (2003):** Is androgenetic alopecia a photoaggravated Dermatosis. Dermatology; 207: 343-438.
9. **Perera E. and Sinclair R. (2014):** Androgenetic Alopecia.Textbook of Trichology, Chapter-11.indd 5; 19: 23-27.
10. **Suchonwanit P, Thammarucha S, Leerunyakul K.** Minoxidil and its use in hair disorders: a review. Drug Des Devel Ther. 2019;13:2777-2786.
11. **Kishimoto J. , Nakazawa Y. , in Cosmetic Science and Technology, 2017**. chapter 48 Pages 767-780.
12. **Norwood OT (1975):** Male pattern baldness: Classification and incidence. South Med J; 68:1359-65.