|| Online ISSN: 2589-9139 || Print ISSN: 2589-9120 ||
International Journal of Medical Science and Applied Research (IJMSAR)
Available Online at www.ijmsar.com
NLM - National Library of Medicine ID: 101775327
Volume - 9, Issue - 3; June: 2026; Page No. 24-32

Article Type: Original Research Article

Analysis of Hair Follicle Activity Across Different Hair Cycle Phases in Androgenetic Alopecia, Alopecia Areata, and Telogen Effluvium using Trichogram: A Cross-Sectional Study

[1]Dr Latha. P, Final Year Post Graduate, Department of Dermatology, Venereology and Leprosy, Santhiram Medical College and General Hospital, Nandyal, Andhra Pradesh, India

[2]Dr M. Madhavi Latha, Professor and HOD, Department of Dermatology, Venereology and Leprosy, Santhiram Medical College and General Hospital, Nandyal, Andhra Pradesh, India

[3]Dr T. Praveena, Professor, Department of Dermatology, Venereology and Leprosy, Santhiram Medical College and General Hospital, Nandyal, Andhra Pradesh, India

Corresponding Author: Dr Latha. P, Final Year Post Graduate, Department of Dermatology, Venereology and Leprosy, Santhiram Medical College and General Hospital, Nandyal, Andhra Pradesh, India

Conflict of interest: Nil

Abstract

Background: Trichogram is a semi-invasive diagnostic technique that involves microscopic examination of plucked hairs to assess the distribution of hair follicles in different phases of the hair cycle. It provides valuable information regarding hair follicle dynamics and helps in the diagnosis of various hair disorders, including androgenetic alopecia, alopecia areata, and telogen effluvium.

Aim and Objectives: To evaluate the proportion of hair follicles in anagen and telogen phases among patients with androgenetic alopecia, alopecia areata, and telogen effluvium using trichogram analysis.

Material and Methods: A hospital-based cross-sectional study was conducted in the Department of Dermatology, Venereology and Leprosy from June 2025 to August 2025. Sixty patients were included in the study, comprising 20 patients each with androgenetic alopecia, alopecia areata, and telogen effluvium. Participants were advised not to wash their hair for 3–5 days before the procedure. Approximately 60–80 hairs were plucked using rubber-armed forceps and examined under a light microscope. The proportions of hair follicles in different phases of the hair cycle were recorded and analyzed.

Results: In Androgenetic alopecia , 80% showed 60–70% reduction in anagen hair and 20–40% increase in telogen hair. In Alopecia areata, 85% exhibited 20–50% decrease in anagen hair and 40–80% rise in telogen hair. In Telogen effluvium, 90% had 30–50% increase in telogen hair and 60–70% decrease in anagen hair.

Conclusion: Trichogram analysis is a simple, cost-effective, and valuable diagnostic tool for differentiating various types of alopecia. Androgenetic alopecia is characterized by shortening of the anagen phase,

increased telogen hairs, and follicular miniaturization. Alopecia areata demonstrates dystrophic anagen hairs and characteristic exclamation mark hairs, while telogen effluvium is marked by a significant increase in telogen hairs with a corresponding reduction in anagen hairs. Trichogram remains a useful adjunctive investigation in the evaluation of patients presenting with hair loss.

Keywords: Trichogram, Androgenetic alopecia, Alopecia areata, Telogen effluvium, Hair cycle, Anagen phase, Telogen phase.

Introduction

Hair loss disorders are among the most common conditions encountered in dermatological practice and can significantly affect an individual's psychological well-being and quality of life. Among the various causes of non-scarring alopecia, Androgenetic Alopecia (AGA), Alopecia Areata (AA), and Telogen Effluvium (TE) are the most frequently encountered disorders. Although these conditions differ in etiology and pathogenesis, they are all characterized by alterations in the normal hair growth cycle, resulting in increased hair shedding and reduced hair density.

The human hair follicle undergoes a continuous cycle consisting of three major phases: anagen (growth phase), catagen (transitional phase), and telogen (resting phase). Under normal conditions, approximately 80–90% of scalp hairs are in the anagen phase, 1–2% in the catagen phase, and 10–20% in the telogen phase. Disturbances in the proportion of hairs within these phases can provide valuable information regarding the underlying cause of hair loss.

The trichogram is a simple, semi-invasive, and cost-effective diagnostic technique used to assess hair follicle activity and hair cycle dynamics. The procedure involves plucking approximately 40–60 hairs from selected areas of the scalp and examining the hair roots microscopically to determine the proportion of hairs in different phases of the hair cycle. Morphological evaluation of hair roots enables identification of anagen, catagen, telogen, and dystrophic hairs, thereby providing insight into follicular function and disease activity.

In Androgenetic Alopecia, progressive shortening of the anagen phase and follicular miniaturization result in an increased proportion of telogen and vellus hairs. Alopecia Areata is characterized by immune-mediated follicular damage, leading to dystrophic anagen hairs and alterations in the normal hair cycle. In Telogen Effluvium, a large number of hair follicles prematurely enter the telogen phase, resulting in excessive hair shedding and an increased telogen count. The characteristic trichogram patterns observed in these disorders can aid in diagnosis and differentiation when clinical findings overlap.

Despite the availability of newer diagnostic modalities such as trichoscopy and phototrichogram, the conventional trichogram remains a valuable tool, particularly in resource-limited settings, because of its simplicity, affordability, and ability to provide direct information regarding hair cycle abnormalities. The present study was undertaken to analyze hair follicle activity across different hair cycle phases in patients with Androgenetic Alopecia, Alopecia Areata, and Telogen Effluvium using trichogram analysis and to evaluate its utility in differentiating these common forms of non-scarring alopecia.

Aims and Objectives: The present study was undertaken to evaluate and compare hair follicle activity during different phases of the hair cycle in patients with Androgenetic Alopecia (AGA), Alopecia Areata (AA), and Telogen Effluvium (TE) using a trichogram. The

study aimed to determine the proportion of anagen and telogen hairs in individuals diagnosed with AGA, AA, and TE and to identify characteristic trichogram features associated with each type of alopecia.

Inclusion Criteria: The study included patients of any gender aged between 18 and 65 years attending the Dermatology, Venereology, and Leprology outpatient department who had a clinical diagnosis of AGA, AA, or TE. Only those patients who were willing to participate, provide written informed consent, and undergo trichogram sampling (typically involving the collection of 40–60 hairs) were enrolled in the study.

Exclusion Criteria: Patients who were unwilling to participate or provide written informed consent were excluded. Individuals receiving topical or systemic treatments known to modify hair growth, such as minoxidil, finasteride, corticosteroids, or anti-androgens, were also excluded. Patients with scarring alopecias, including lichen planopilaris and frontal fibrosing alopecia, were not considered for the study. Additionally, patients with a history of recent major surgery, hair transplantation, or scalp microneedling within the preceding six months were excluded.

Materials and Methods

This hospital-based cross-sectional study was conducted in the Department of Dermatology, Venereology and Leprology (DVL), Santhiram Medical College and General Hospital, Nandyal, Andhra Pradesh, from June 2025 to August 2025. A total of 60 patients presenting with hair loss disorders were enrolled in the study, comprising 20 patients each with Androgenetic Alopecia (AGA), Alopecia Areata (AA), and Telogen Effluvium (TE). Patients attending the DVL outpatient department who fulfilled the diagnostic criteria and provided informed consent were included in the study.

A detailed clinical history, including age, sex, duration of disease, pattern of hair loss, family history, associated systemic illnesses, and treatment history, was obtained. A complete dermatological examination was performed, and the diagnosis was established on clinical grounds.

Trichogram analysis was performed in all participants. Patients were instructed not to wash their hair for 3–5 days prior to the procedure. Hair samples were obtained by epilating approximately 40–60 hairs using a rubber-tipped forceps held about 0.5 cm above the scalp surface. The hairs were plucked with a quick, firm pull in the direction of hair growth to preserve the morphology of the hair roots.

The site of sampling was selected according to the underlying disorder. In patients with androgenetic alopecia, hair samples were collected from both the affected area and a non-affected scalp area serving as control. In alopecia areata, hairs were plucked from the active margin of the patch or from clinically active lesions. In telogen effluvium, samples were obtained from diffusely thinned scalp areas. In female-pattern hair loss, sampling was performed from the vertex region of the scalp.

The plucked hairs were arranged parallel to each other on a clean glass slide with the roots aligned in the same direction and fixed using transparent adhesive tape. The mounted specimens were examined under light microscopy. Hair roots were classified according to their morphological characteristics into different phases of the hair cycle. Anagen hairs were identified by their pigmented, elongated roots exhibiting the characteristic “hockey-stick” or “golf-club” appearance. Telogen hairs were identified by their depigmented, club-shaped roots resembling an “ear-bud” appearance. The numbers of hairs in anagen, catagen, telogen, and dystrophic phases

were counted, and the percentage distribution of each phase was calculated.

The trichogram findings were analyzed and compared among patients with androgenetic alopecia, alopecia areata, and telogen effluvium to evaluate differences in hair follicle activity across various phases of the hair growth cycle. Data were entered into Microsoft Excel and analyzed using appropriate statistical methods. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages. Statistical significance was considered at a p-value of less than 0.05.

The study was conducted after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants prior to enrollment, and confidentiality of patient information was maintained throughout the study.

Figure 1: Hair collection in

Figure 2: Hair collection in AA

Figure 3: Hair collection in TE

Figure 4: Microscope

Figure 5: Anagen root

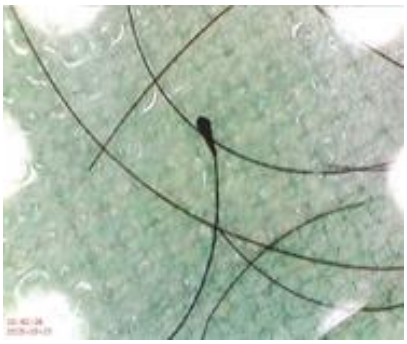


Figure 6: Telogen root

Results

A total of 60 patients were included in the study, comprising 20 patients each with Androgenetic Alopecia (AGA), Alopecia Areata (AA), and Telogen Effluvium

(TE). Trichogram analysis was performed in all cases, and the proportions of hairs in different phases of the hair cycle were recorded.

Among the 20 patients with Androgenetic Alopecia, 18 (90%) demonstrated a reduction in anagen hairs to 60–70% with a corresponding increase in telogen hairs to 20–40%. The remaining 2 (10%) patients exhibited a further reduction in anagen hairs to 50–60% and an increase in telogen hairs to 30–50%. Progressive follicular miniaturization and an increased proportion of vellus hairs were observed in the majority of patients, consistent with the characteristic trichogram findings of androgenetic alopecia.

In the Alopecia Areata group, 17 (85%) patients showed a marked decrease in anagen hairs to 20–50% with a concomitant increase in telogen hairs to 40–80%. The remaining 3 (15%) patients demonstrated anagen hair percentages ranging from 30–60% and telogen hair percentages ranging from 30–70%. A notable finding was the presence of dystrophic hairs, which constituted more than 10% of the reduced anagen hair population in most cases. These dystrophic hairs were indicative of active follicular insult and disease activity.

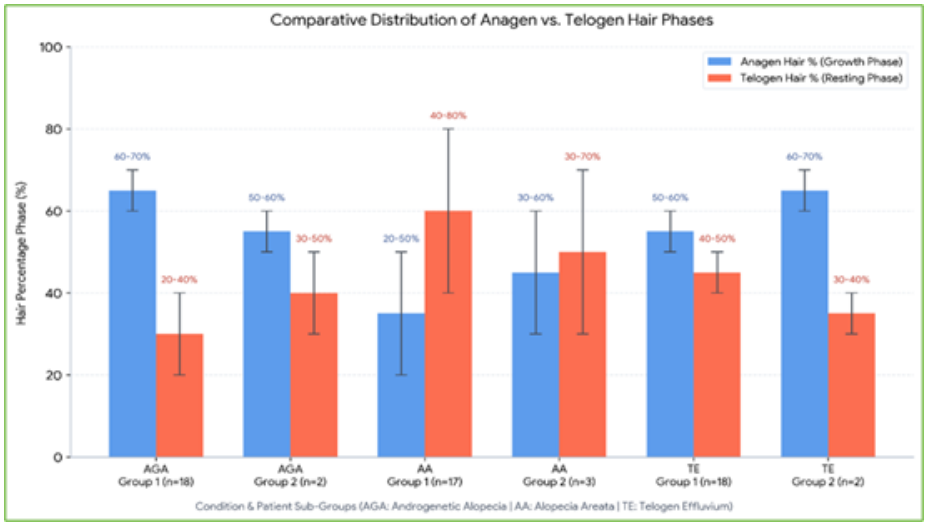
Among the 20 patients with Telogen Effluvium, 18 (90%) exhibited a reduction in anagen hairs to 50–60% accompanied by an increase in telogen hairs to 40–50%. The remaining 2 (10%) patients showed anagen hair percentages of 60–70% and telogen hair percentages of 30–40%. The predominant trichogram finding in this group was a significant shift from the anagen to the telogen phase without evidence of follicular miniaturization or increased dystrophic hairs.

Table 1:

Condition	No. of Patients	% of Anagen Hair (↓)	% of Telogen Hair (↑)
Androgenetic Alopecia(N=20)	18	60–70%	20-40%
	2	50-60%	30-50%
Alopecia Areata (N=20)	17	20–50%	40-80%
	3	30-60%	30-70%
Telogen Effluvium(N=20)	18	50-60%	40-50%
	2	60-70%	30-40 %

Anagen, Telogen hair ratio in AGA,AA,

Graph 1:

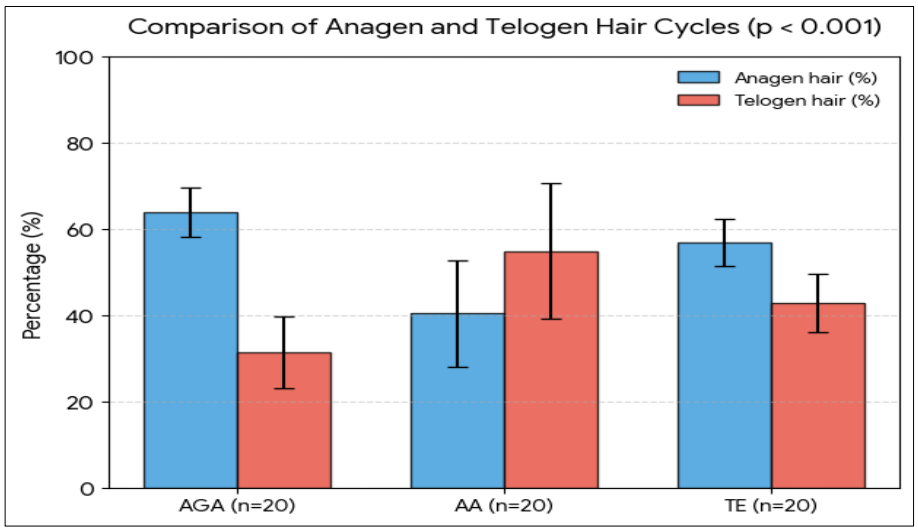


Comparison of trichogram findings among the three disorders revealed distinct patterns of hair-cycle alterations. Patients with Androgenetic Alopecia demonstrated reduced anagen hairs associated with follicular miniaturization and vellus transformation. Alopecia Areata showed the most pronounced reduction in anagen hairs along with a significant proportion of dystrophic hairs, reflecting active follicular damage. In contrast, Telogen Effluvium was characterized predominantly by an increased proportion of telogen hairs resulting from premature transition of follicles from the anagen to telogen phase. These observations highlight the diagnostic utility of trichogram analysis in differentiating common non-scarring alopecias.

Table 2:

Parameter	AGA (n=20)	AA (n=20)	TE (n=20)	p-value†
Anagen hair (%)	64.0 ± 5.8	40.5 ± 12.4	57.0 ± 5.5	<0.001
Telogen hair (%)	31.5 ± 8.2	55.0 ± 15.6	43.0 ± 6.8	<0.001

Graph 2:



Data Summary

The graph demonstrates statistically significant differences in hair cycle distribution among patients with Androgenetic Alopecia (AGA), Alopecia Areata (AA), and Telogen Effluvium (TE) ($p < 0.001$). The percentage of anagen hairs was highest in AGA patients (64.0%), followed by TE patients (57.0%), while AA patients showed the lowest anagen hair percentage (40.5%). In contrast, the percentage of telogen hairs was highest in AA patients (55.0%), followed by TE patients (43.0%), and lowest in AGA patients (31.5%). These findings indicate a marked reduction in actively growing (anagen) hairs and a corresponding increase in resting (telogen) hairs in AA and TE compared to AGA, reflecting distinct alterations in the hair growth cycle among these alopecias.

Trichogram analysis revealed a significant reduction in anagen hairs and a corresponding increase in telogen hairs across all study groups. The reduction in anagen hair percentage was most pronounced in patients with Alopecia Areata, followed by Telogen Effluvium and Androgenetic Alopecia. Conversely, the telogen hair percentage was highest in Alopecia Areata, indicating marked disruption of normal hair cycle dynamics. Comparative analysis demonstrated statistically significant differences in hair cycle phase distribution among the three disorders ($p < 0.001$).

Discussion

The present study evaluated hair follicle activity across different phases of the hair cycle using trichogram analysis in patients with Androgenetic Alopecia (AGA), Alopecia Areata (AA), and Telogen Effluvium (TE). The findings demonstrated characteristic alterations in the anagen and telogen hair populations, supporting the diagnostic utility of trichogram in differentiating common non-scarring alopecias.

In patients with Androgenetic Alopecia, a significant reduction in anagen hairs (60–70%) and a corresponding increase in telogen hairs (20–40%) were observed. These findings are comparable to those reported by Schweikert HU, Gollnick HP, and Orfanos (1986), who demonstrated a reduction in anagen hair percentages to approximately 65–70% with a concomitant increase in telogen hairs to 30–35% in affected scalp regions. Similar to their observations, my study also identified progressive follicular miniaturization and an increased proportion of vellus hairs, which are characteristic features of androgenetic alopecia resulting from progressive shortening of the anagen phase and follicular regression.

Among patients with Alopecia Areata, trichogram analysis revealed a marked reduction in anagen hairs (20–50%) and an increase in telogen hairs (40–80%). Furthermore, dystrophic hairs constituted more than 10% of the reduced anagen hair population. These findings correlate well with the study by Peereboom-Wynia et al. (1993), who reported abnormal trichogram patterns characterized by an increased proportion of dystrophic anagen hairs in active alopecia areata. The presence of dystrophic hairs in my study reflects ongoing immune-mediated damage to the hair follicle and indicates active disease.

In the Telogen Effluvium group, a decrease in anagen hairs to 50–60% and an increase in telogen hairs to 40–50% were observed, without evidence of follicular miniaturization. These findings are in agreement with the observations of Rebora A, Guarrera M, and Baldari M. (1981), who reported telogen hair percentages exceeding 25% with a corresponding reduction in anagen hairs in patients with telogen effluvium. The absence of follicular

miniaturization in both studies supports the concept that telogen effluvium is primarily a disorder of hair cycle dynamics rather than follicular destruction or miniaturization.

Overall, the findings of the present study are consistent with previously published literature and demonstrate distinct trichogram patterns in the three major forms of non-scarring alopecia. Androgenetic alopecia was characterised by follicular miniaturization and increased vellus hairs, alopecia areata by a high proportion of dystrophic hairs and severe reduction in anagen hairs, and telogen effluvium by a marked increase in telogen hairs without follicular miniaturization. These observations highlight the value of trichogram analysis as a simple, cost-effective, and reliable diagnostic tool for assessing hair cycle abnormalities and differentiating various hair loss disorders in routine clinical practice.

Conclusion

The present study highlights the usefulness of trichogram analysis as a simple, reliable, and minimally invasive diagnostic tool for assessing hair follicle activity and differentiating common non-scarring alopecias. Distinct alterations in hair cycle dynamics were observed among patients with Androgenetic Alopecia, Alopecia Areata, and Telogen Effluvium.

Patients with Androgenetic Alopecia demonstrated a reduction in anagen hair percentage with a corresponding increase in telogen hairs, along with characteristic findings of progressive follicular miniaturization and increased vellus hair formation. Alopecia Areata was characterized by a marked decrease in anagen hairs, increased telogen hairs, and the presence of dystrophic hairs, reflecting active follicular damage. In contrast, Telogen Effluvium showed a significant shift of hair follicles from the anagen phase to the telogen phase without evidence of follicular miniaturization.

The distinct trichogram patterns observed in each disorder emphasize the diagnostic value of trichogram examination in routine dermatological practice. The technique provides valuable information regarding hair cycle abnormalities and can serve as a useful adjunct in the diagnosis and evaluation of patients presenting with hair loss disorders, particularly in resource-limited settings where advanced diagnostic modalities may not be readily available.

Limitations of the Study

The study was conducted at a single tertiary care center with a relatively small sample size and short study duration. Histopathological correlation and advanced hair assessment techniques. Further studies with larger sample sizes are required to validate these findings.

Abbreviation Full Form

AGA : Androgenetic Alopecia

AA : Alopecia Areata

TE : Telogen Effluvium

DVL : Dermatology, Venereology and Leprology

IEC : Institutional Ethics Committee

OPD : Outpatient Department

SD : Standard Deviation

P-value: Probability Value

HP : Hair Percentage

References

1. Schweikert HU, Gollnick H, Orfanos CE. Hair root patterns in androgenetic alopecia and their diagnostic significance. Arch Dermatol Res. 1986;278(7):439-445.

2. Peereboom-Wynia JD, Beek CH, Mulder PGH, Stolz E. The trichogram as a prognostic tool in alopecia areata. Acta Derm Venereol. 1993;73(4):280-282.
3. Rebora A, Guarrera M, Baldari M. The trichogram in telogen effluvium. Dermatologica. 1981;163:49-52.
4. Rebora A. Telogen effluvium: a comprehensive review. Clin Cosmet Investig Dermatol. 2019; 12:583-590.
5. Rebora A, Guarrera M, Baldari M, Vecchio F. Distinguishing androgenetic alopecia from chronic telogen effluvium when associated in the same patient: a simple noninvasive method. Arch Dermatol. 2005;141(10):1243-1245.
6. Whiting DA. Chronic telogen effluvium: increased scalp hair shedding in middle-aged women. J Am Acad Dermatol. 1996;35(6):899-906.
7. Headington JT. Telogen effluvium: new concepts and review. Arch Dermatol. 1993;129(3):356-363.
8. Kligman AM. Pathologic dynamics of human hair loss. I. Telogen effluvium. Arch Dermatol. 1961; 83:175-198.
9. Messenger AG, Sinclair RD. Follicular miniaturization in androgenetic alopecia: clinicopathological correlations. Br J Dermatol. 2006;155(5):926-930.
10. Olsen EA. Female pattern hair loss. J Am Acad Dermatol. 2001;45(3 Suppl):S70-S80.
11. Sinclair R. Diffuse hair loss. Int J Dermatol. 1999;38(Suppl 1):8-18.
12. Tosti A, Duque-Estrada B. Dermoscopy in hair disorders. J Egypt Women Dermatol Soc. 2010;7 (1):1-4.
13. Rudnicka L, Olszewska M, Rakowska A. Trichoscopy: a new method for diagnosing hair loss. J Drugs Dermatol. 2008;7(7):651-654.
14. Alkhalifah A, Alsantali A, Wang E, McElwee KJ, Shapiro J. Alopecia areata update: part I. Clinical picture, histopathology, and pathogenesis. J Am Acad Dermatol. 2010;62(2):177-188.
15. Malkud S. Telogen effluvium: a review. J Clin Diagn Res. 2015;9(9): WE01-WE03.