



2023

Comparative study of trichoscopic versus digital follisopic findings of Telogen Effluvium

Alzahraa Gamal Mohammed Elsaghier

Cairo Hospital for Dermatology and Venereology, Cairo, Egypt, rorhgimy@yahoo.com

Ahmed Sadek Mohamed

Dermatologist, Venereology and Andrology department, faculty of medicine, Al_Azhar University, Cairo, Egypt

Amr Gharib Mohammed

Dermatologist, Venereology and Andrology department, faculty of medicine, Al_Azhar University, Cairo, Egypt

Follow this and additional works at: <https://aimj.researchcommons.org/journal>



Part of the [Medical Sciences Commons](#), [Obstetrics and Gynecology Commons](#), and the [Surgery Commons](#)

How to Cite This Article

Elsaghier, Alzahraa Gamal Mohammed; Mohamed, Ahmed Sadek; and Mohammed, Amr Gharib (2023) "Comparative study of trichoscopic versus digital follisopic findings of Telogen Effluvium," *Al-Azhar International Medical Journal*: Vol. 4: Iss. 4, Article 29.

DOI: <https://doi.org/10.58675/2682-339X.1746>

This Original Article is brought to you for free and open access by Al-Azhar International Medical Journal. It has been accepted for inclusion in Al-Azhar International Medical Journal by an authorized editor of Al-Azhar International Medical Journal. For more information, please contact dryasserhelmy@gmail.com.

Comparative Study of Trichoscopic Versus Digital Folliscope Findings of Telogen Effluvium

Ahmed Sadek Mohamed^a,
Amr Gharib Mohammed^a, Alzahraa Gamal Mohammed Elsaghier^{b,*}

^a Department of Dermatology and Venereology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

^b Cairo Hospital for Dermatology and Venereology, Cairo, Egypt

Abstract

Background: All mammals have hair, a distinctive trait they share with no other species. In humans, it is a unique and priceless characteristic, especially in females, but its primary purposes are to protect the skin from mechanical insults and to facilitate the homeothermy, for example, eyebrows and eyelashes block objects from entering the eyes, while scalp hair shields the head and neck from sunlight, cold, and physical harm.

Aim of the study: This research's objective is to assess the role of both trichoscopy and folliscopy in the diagnosis of cases of telogen effluvium (TE) and compare each method against the other.

Subjects: and methods: One hundred adult participants with telogen effluvium were included in this study. They are diagnosed clinically and by trichogram as TE. All patients underwent trichoscopic and digital folliscope evaluation.

Results: The presence of more than 5% new regrowing anagen hair is a sure diagnostic sign of telogen effluvium by trichoscopy and folliscopy. Trichoscopic and folliscope signs, such as empty hair follicles, single hair follicles, and peripilar halo are also found in TE patients.

Conclusion: The study has proved that both trichoscopy and folliscopy are highly accurate, highly sensitive diagnostic modalities in telogen effluvium, but trichoscopy has the advantage that it is easier and less time-consuming than folliscopy.

Keywords: Folliscopy, Telogen effluvium, Trichoscopy

1. Introduction

All mammals have hair, a distinctive trait they share with no other species. In humans, it is a unique and priceless characteristic, especially in females, but its primary purposes to enable homeothermy and protect the skin from mechanical harm; For instance, scalp hair protects the head and neck from the sun, cold, and physical harm, while eyebrows and eyelashes prevent items from entering the eyes.¹

Having healthy hair is a sign of health, youth, and vigor for both men and women. Hair has evolved to fulfill defensive and evolutionary purposes in mammals. From a biological standpoint, human hair may not be crucial for maintaining the skin

barrier, but hair and pigment or a lack thereof can significantly affect social relevance perception, as well as emotional and psychological well-being. There is still a high need for a product that might be able to stop, slow down, or even reverse hair senescence despite the development of follicular unit extraction and the availability of numerous synthetic hair pigmentation regimens to revive scalp hair.²

The characteristics of human hair loss have been the subject of extensive research worldwide, but the pathogenesis and potential therapeutic approaches for alopecias remain largely unknown.³

A person's self-image is greatly influenced by their hair, and depending on how much hair is lost, this could have substantial psychological effects. As

Accepted 17 October 2022.

Available online 30 December 2023

* Corresponding author at: Cairo Hospital for Dermatology and Venereology, Cairo, Egypt.
E-mail address: rorhgimy@yahoo.com (A.G. Mohammed Elsaghier).

<https://doi.org/10.58675/2682-339X.1746>

2682-339X/© 2023 The author. Published by Al-Azhar University, Faculty of Medicine. This is an open access article under the CC BY-SA 4.0 license (<https://creativecommons.org/licenses/by-sa/4.0/>).

a result, TE's primary impact is primarily psychological. The doctor must handle any probable emotional reactions to alopecia, such as rage, anxiety, and melancholy.⁴

A form of diffuse, non-scarring alopecia called telogen effluvium (TE) develops after the hair cycle shifts from anagen to catagen to telogen. About two to three months after the initiating event, this change in the hair cycle results in an aberrant change in the follicular cycling, and subsequent premature hair shedding after the telogen phase. TE can be acute or chronic, depending on when the hair loss started and how long it lasted.⁵

Numerous injuries, including those that can be physical, emotional, or chemical, have been linked to telogen effluvium.⁶

There is a need for noninvasive techniques that can assist the physician in daily practice because the traditional methods for diagnosing hair and scalp diseases, such as basic clinical inspection, pull test, and biopsy, differ in repeatability and invasiveness. Dermoscopy increases diagnostic precision and may aid in gaining insight into the pathophysiology of hair diseases.⁷

Dermoscopy is a useful, quick, noninvasive method for evaluating individuals with hair loss that enables a magnified visualization of the hair and scalp skin. In dermatology, dermoscopy is widely used to assess pigmented skin lesions.⁸

Dermoscopy in this instance may be referred to as 'trichoscopy,' and it can be carried out using either a manual dermoscopy (with a maximum magnification of ten) or a video dermoscopy (with a maximum magnification of one thousand).^{9,10}

The Folliscope is a compact, straightforward USB-based device that is conveniently portable and uses a computer screen as an interface. The folliscope has only been used in a few varieties of research on hair density and thickness; the majority has instead used camera-based phototrichograms and manual examination.¹¹

This work aimed to study the role of both trichoscopy and folliscopy in the diagnosis of cases of telogen effluvium and compare each method against the other.

2. Patients and methods

The study involved 100 patients diagnosed clinically and by trichogram as telogen effluvium in the Dermatology and Venereology department of El Hussein university hospital From July 2021 to March 2022. All study participants provided their written consent prior. Based on a set of inclusion and exclusion criteria, patients were chosen.

2.1. Inclusion criteria

All patients with telogen effluvium either acute or chronic diagnosed by hair pull test and trichogram.

2.2. Exclusion criteria

- (1) Patients suffer from diffuse alopecia areata.
- (2) Patients suffer from androgenetic alopecia.

These procedures were administered to all patients:

- (1) Full history taking as regarding family history of AGA, past history of diseases, drug intake, harmful hair cosmetic procedures, and thorough general examination.
- (2) Local examination to determine hair loss pattern and excluding both AGA and alopecia areata incognito. Scalp examination for the presence of scales, inflammation, or pustules.
- (3) Digital photographs were taken.
- (4) Trichoscopic and folliscopic findings were recorded.

All participants underwent a pull test (>10% of hairs were easily removed by using gentle upward pressure or by rubbing fingers through the hair to further loosen already-loosened hair) and a unit area trichogram (>25% of plucked hairs were confirmed to be telogen hairs).

Digital photography: using a digital camera (oppo F9, 16 megapixels, f/1.8, China).

2.3. Methods

2.3.1. Trichoscopic examination

Devices: The patients were examined using trichoscopy (3 Gen Dermlite HUD).

To determine the percentage of short regrowing anagen hair (>5%).

2.3.2. Folliscopic evaluation

Devices: With a digital folliscope (Micro viewer USB, 1/4 color CMOS image sensor, 1280 × 1024 pixel, high-speed USB, 2 interfaces, China) the patients were examined at 50× magnification for hair percentage and 200× magnification for hair thickness.

To measure the proportion of terminal hairs (thickness >0.03 mm), vellus hairs (thickness 0.03 mm), average hair thickness, and the proportion of short regrowing anagen hairs (>5%) in the same area caught by trichoscopy.

The technique of examination for both folliscopy and trichoscopy:

Points of hair examination:

About 12 cm from the glabella or about 18 cm from the tip of the nose. All areas of the scalp were examined.

3. Case presentation

3.1. Case (1)

Female patient, 38 years of age, presented with diffuse hair loss of 10 months duration. No history of systemic illness or hair cosmetic harmful procedures.

A positive hair pull test and trichogram showed more than 25% telogen hairs.

3.1.1. Trichoscopy

Fig. 1.

3.1.2. Folliscopy

Figs. 2 and 3.

According to density measurements, the patient has more than 5% upright short regrowing anagen hair, and hair diameter diversity is less than 20%. A case of chronic telogen effluvium (CTE).

3.2. Case (2)

Male patient, 21 years of age, presented with diffuse hair loss of 3 months duration. No history of



Fig. 1. Trichoscopy revealed more than 5% short upright anagen hair (arrows), and hair diameter diversity is within normal (less than 20%).

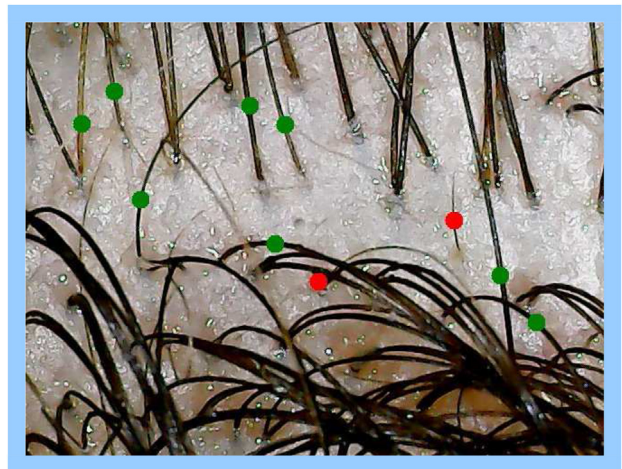


Fig. 2. Hair Density. Green dot = terminal hair and Red dot = Short anagen hair.

systemic illness. There is a history of doing harmful hair cosmetic procedures (use of hair straighteners).

A positive hair pull test and trichogram showed more than 25% telogen hairs.

3.2.1. Trichoscopy

Fig. 4.

3.2.2. Folliscopy

Figs. 5 and 6.

According to density measurements, the patient has more than 5% upright short regrowing anagen hair, and hair diameter diversity is less than 20%. A case of acute telogen effluvium.

4. Results

This study included 100 patients, 97 females and 3 males, with an age range from 18 years to 58 years (mean age 40 years), who suffer from generalized

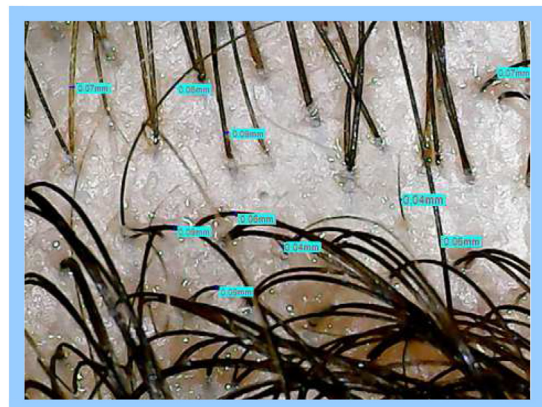


Fig. 3. Hair diameter.



Fig. 4. Trichoscopy revealed more than 5% short upright anagen hair (arrows) and hair diameter diversity is within normal (less than 20%).

hair loss and were diagnosed clinically and by trichogram as telogen effluvium.

Trichoscopy and folliscope were used to assess all of the cases.

In every case, the trichoscopic findings were compared to those obtained by folliscope.

The patients' mean hair thickness by folliscope ranged from 0.05 to 0.09 mm, and the mean hair thickness was 0.077 ± 0.014 mm.

Regarding new regrowing anagen hair, 93 cases were diagnosed by digital folliscope, while 90 of them could be detected by trichoscopy (Table 1, Fig. 7).

Ninety-five cases were diagnosed to have single hair follicles by digital folliscope, 91 of them could be detected by trichoscopy (Table 2, Fig. 8).

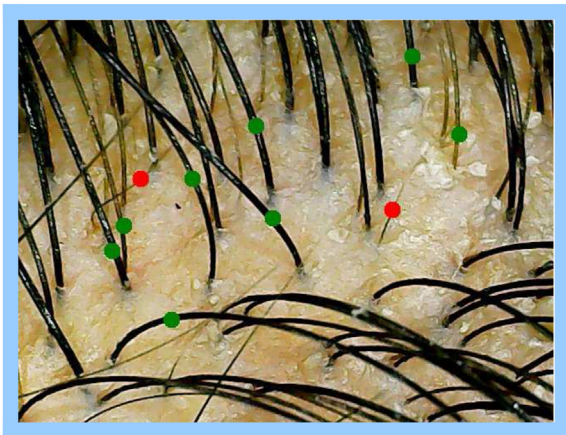


Fig. 5. Hair Density. Green dot = terminal hair and Red dot = Short anagen hair.

Sixty-nine cases were diagnosed to have empty hair follicles by folliscope, and only 46 of them were detected by trichoscopy (Table 3, Fig. 9).

Sixty-eight cases were diagnosed to have peripilar signs by folliscope, and only 52 of them were detected by trichoscopy (Table 4, Fig. 10).

There was no discernible distinction between folliscope and trichoscopy as regards upright regrowing hair distribution of patients ($P = 0.447$).

There was no significant difference between folliscope and trichoscopy as regards follicular units with only one hair distribution of patients ($P = 0.552$).

There was a significant difference between folliscope and trichoscopy as regards empty hair follicles distribution of patients where the detection was higher by folliscope ($P = 0.001$).

There was a significant difference between folliscope and trichoscopy as regards the perifollicular discoloration (peripilar sign) distribution in patients where the detection was higher by folliscope ($P = 0.021$).

5. Discussion

An ectodermal structure with major cosmetic value is hair. It helps humans to maintain their self-image and carry on healthy and fruitful social interactions.¹²

A common and worrying problem that typically affects women is excessive hair loss. The most typical type of hair loss is called telogen effluvium (TE).¹³

The condition is so common and terrifying that the patient needs to see a dermatologist right away. The disease's actual incidence is unknown.¹⁴

TE is a type of nonscarring alopecia marked by diffuse hair shedding, frequently beginning suddenly. There is also a chronic form with a more

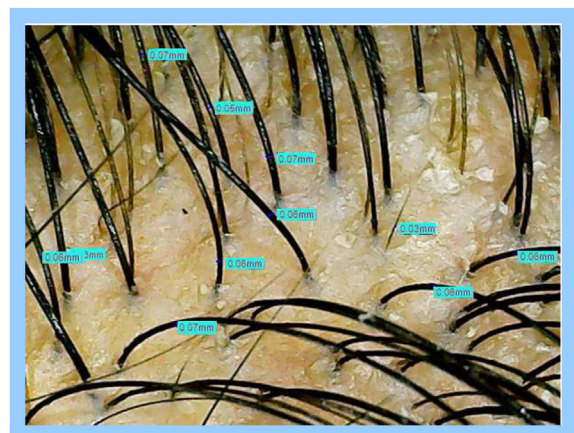


Fig. 6. Hair diameter.

Table 1. Comparison between folliscopy and trichoscopy as regards upright regrowing hair distribution of patients.

	Upright regrowing hair		Total	X ²	P-Value
	Yes	No			
Trichoscopy					
N (%)	90 (90.0%)	10 (10.0%)	100 (100.0%)	0.579	0.447
Folliscopy					
N (%)	93 (93.0%)	7 (7.0%)	100 (100.0%)		

gradual onset and a protracted course (Exceeding 6 months).^{6,15}

There are invasive (biopsy), semi-invasive (trichogram), and noninvasive methods for diagnosing alopecia (hair count, weighing shed hair, and pull test). These are crucial diagnostic measures for identifying CTE and setting it apart from other types of widespread noncicatricial alopecia.¹⁶

Dermoscopy is an effective, noninvasive, and rapid procedure that is frequently used in dermatology for the examination of pigmented skin lesions for the evaluation of patients who are experiencing hair loss because it enables a magnified visualization of the hair and scalp skin. Considering the shortcomings and inconvenience of the aforementioned diagnostic techniques. A manual dermoscopy with a 10× magnification or a video dermoscopy with a 1,000× magnification can be used to do dermoscopy in this situation.¹⁷

Using a similar principle, the folliscopy was introduced as an additional tool for diagnosing hair disorders. It is a small, straightforward USB-based device that is easily portable and operated using a computer screen as an interface. It also has the advantage of using an integrated software analysis

system. The folliscopy has only been used in a small number of researches on hair density and thickness; instead, the majority have used camera-based phototrichograms with manual interpretation.¹¹

Trichoscopy can be used to diagnose alopecia, avoid needless biopsies, and, if a biopsy is still necessary, it can be used to select the best place for the biopsy. Moreover, it is a great tool for analyzing the therapy response photographically at each follow-up.¹⁶

In the past, authors have claimed that trichoscopy is only marginally useful for telogen effluvium diagnosis. They contend that rather than relying solely on the direct satisfaction of certain trichoscopy criteria, the diagnosis of CTE may be made by ruling out other potential causes of hair loss.⁸

In a similar vein, Inui⁹ proposed an algorithmic method for trichoscopic detection of common hair loss illnesses and contended that telogen effluvium lacks any distinctive diagnostic symptoms beyond an increase in the proportion of short, sharp-ended hairs.⁹

Later, Rudnicka and Rakowska¹⁸ introduced the 3-A system, a way of using trichoscopy to differentiate between different causes of hair loss (for the three-algorithm system). A significant number of five or more upright regrowing hairs were found to be highly suggestive of CTE in this system in both the frontal and another location (occipital or temporal).¹⁸

The cause of telogen hair loss does not affect on the trichoscopy results.¹⁹

In our study, we assured that the presence of more than 5% new regrowing short anagen hairs in all examined areas (more than in four fields of vision) is a sure diagnostic trichoscopic sign of telogen effluvium in cases of diffuse hair loss on parole absence

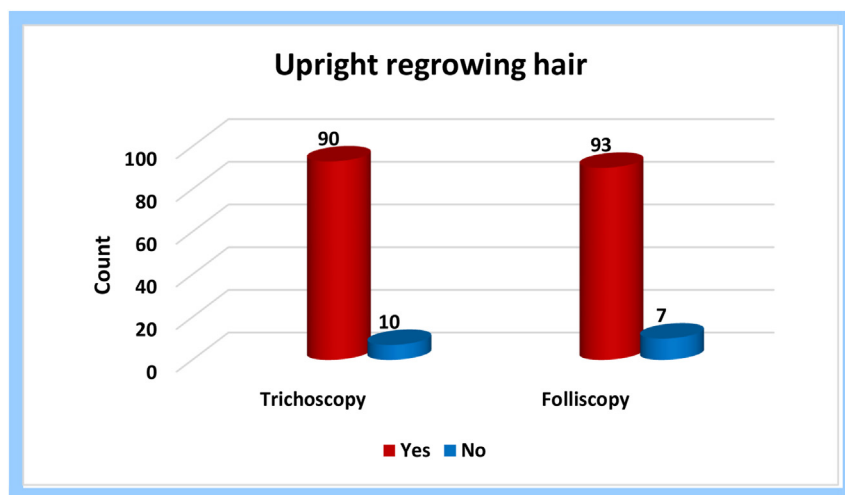


Fig. 7. Comparison between folliscopy and trichoscopy as regards upright regrowing hair distribution in patients.

Table 2. Comparison between folliscopy and trichoscopy as regards follicular units with only one hair distribution of patients.

	Follicular units with only one hair		Total	X ²	P Value
	Yes	No			
Trichoscopy					
N (%)	91 (91.0%)	9 (9.0%)	100 (100.0%)	0.355	0.552
Folliscopy					
N (%)	95 (95.0%)	5 (5.0%)	100 (100.0%)		

of diagnostic criteria for androgenetic alopecia (AGA) and diffuse alopecia areata (AA).

The purpose of the present study was to evaluate the role of both trichoscopy and folliscopy in the

diagnosis of cases of telogen effluvium and compare each method against the other. In order to offer a reliable, accurate, highly sensitive, and easily accessible diagnostic tool for TE.

To the state of the art, this study is the first to compare trichoscopy and folliscopy.

Folliscopy has the advantage that it offers a precise data about hair diameter and density opposite to trichoscopy.

In a study conducted by Govindarajulu et al.²⁰ trichoscopy findings of telogen effluvium were upright hair (100%), single hair follicle unit (100%), empty follicles (88.2%), and yellow dots (35.2%).²⁰

It is crucial to distinguish between chronic TE and AGA because their prognosis is not

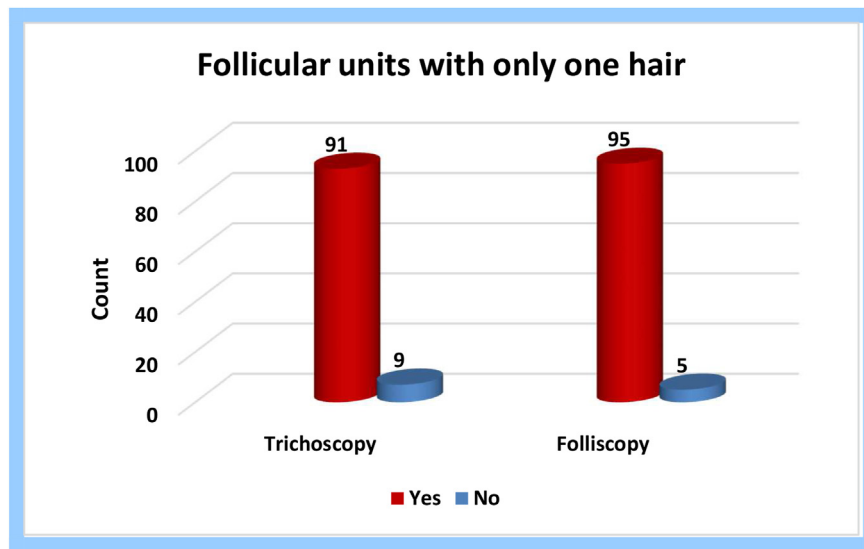


Fig. 8. Comparison between folliscopy and trichoscopy as regards follicular units with only one hair distribution in patients.

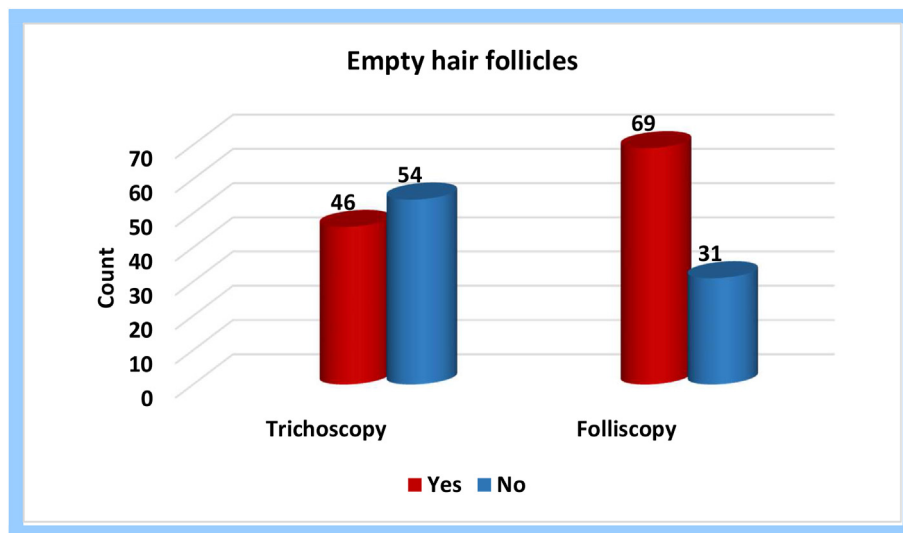


Fig. 9. Comparison between folliscopy and trichoscopy as regards empty hair follicles distribution in patients.

Table 3. Comparison between folliscopy and trichoscopy as regards empty hair follicles distribution in patients.

	Empty hair follicles		Total	X ²	P value
	Yes	No			
Trichoscopy					
N (%)	46 (46.0%)	54 (54.0%)	100 (100.0%)	10.82	0.001**
Folliscopy					
N (%)	69 (69.0%)	31 (31.0%)	100 (100.0%)		

Table 4. Comparison between folliscopy and trichoscopy as regards Perifollicular discoloration (peripilar sign) distribution of patients.

	Perifollicular discoloration (peripilar sign)		Total	X ²	P value
	Yes	No			
Trichoscopy					
N (%)	52 (52.0%)	48 (48.0%)	100 (100.0%)	5.33	0.021*
Folliscopy					
N (%)	68 (68.0%)	32 (32.0%)	100 (100.0%)		

comparable. AGA and chronic TE can be distinguished from one another using trichoscopy. The early trichoscopic characteristic of AGA is a >20% fluctuation in hair shaft diameter in the affected areas. The frequently spared occipital region is devoid of this finding. The progression of hair follicle miniaturization, the early presence of peripilar halo, the predominance of single-hair follicles (unaffected follicles can contain up to four terminal hairs), and the presence of pearly white dots caused by hypertrophied sebaceous glands are additional distinguishing characteristics. In contrast, chronic TE patients have less hair and less pronounced hair follicle shrinking.²¹

The findings in the frontal and occipital areas are not significantly different from one another, which

also distinguishes telogen effluvium from androgenetic alopecia.²²

In a study by Miteva and tosti,⁸ the most frequent findings in acute telogen effluvium were numerous regrowing short hairs with an average thickness (0.03 mm) and empty follicles. CTE is diagnosed by dermoscopic means rather than by satisfying particular trichoscopic criteria. Less than 20% variation in hair diameter is the crucial characteristic.⁸

These are most likely regrowing hairs in the early stages of the anagen phase, and their increasing number suggests that the hair cycle has sped up, causing a significant replacement of hair roots.⁸

Folliscopy was previously only used in cases of AGA and AA.

In a study by Moftah et al.,²³ the authors used folliscopy to measure the percent of terminal hair (>0.03 mm thick) and vellus hair (0.03 mm thick), as well as the average hair thickness within the same area.²³

The results of Tawfik & Osman.²⁴ Folliscopy, which he utilized to evaluate the impact of autologous activated platelet-rich plasma injection (PRP) on female pattern hair loss (FPHL), demonstrated a considerable improvement in hair thickness and density in all of the patients who received PRP. Density and diameter in the treated group increased from 73.66 to 150.94 and 0.1 mm–0.21 mm, respectively.²⁴

The results of folliscopy, which was utilized to assess the alterations in hair thickness and density in South Korean women suffering a loss of hair, revealed that while the density and thickness of the TE group were substantially lower than those of the controls, they continued to exhibit the identical order distribution as the control (normal) group.

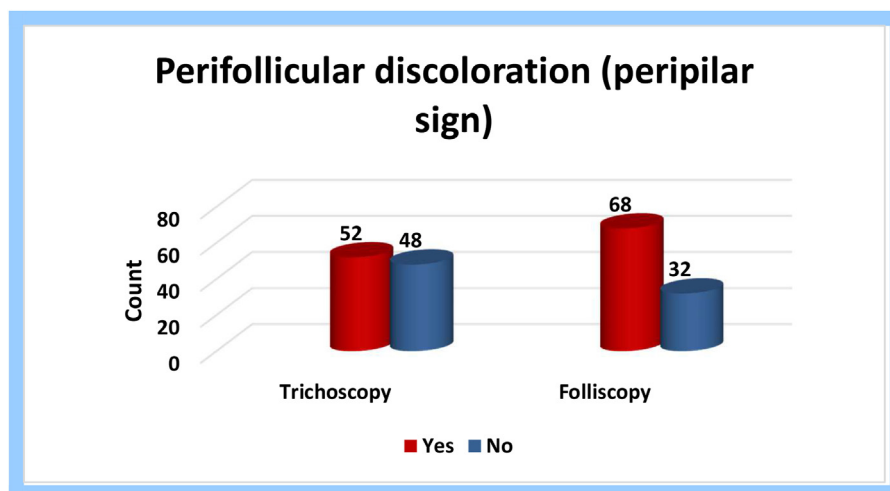


Fig. 10. Comparison between folliscopy and trichoscopy as regards Perifollicular discoloration (peripilar sign) distribution in patients.

The top, front, sides, and back of the TE group had the highest mean hair density and thickness orders, respectively. Hair density varied across all scalp sites, however only between the top and back and between the back and sides were changes in hair thickness seen. As regarding mean hair thickness in micrometres in each scalp area, front 77.9 ± 19.0 , top 77.5 ± 18.9 , back 80.7 ± 10.0 , sides 76.9 ± 29.3 .²⁵

This was consistent with our parameters regarding hair density and diameter 77 ± 14.0 .

The effectiveness of Rice Bran Supercritical CO₂ Extract (RBSCE) for Hair Growth in Androgenic Alopecia was also determined by Choi et al.²⁶ using folliscopy, demonstrating its value as a phototrichogram and a follow-up technique.²⁶

In a study to determine the efficiency of scalp shampoo containing extracts from inula helenium (IH) and *Caesalpinia sappan* bark (CS) on those who have androgenetic alopecia, following use for 16 and 24 weeks, there was a statistically significant rise in hair density and total hair counts. This indicated that the IH and CS extract complex helped to prevent loss of hair and encourage the growth of hair.²⁷

5.1. Conclusion

The study has proved that both trichoscopy and folliscopy are highly accurate, highly sensitive diagnostic modalities in telogen effluvium, but trichoscopy has the advantage that it is easier and less time-consuming than folliscopy.

Conflict of interest

Authors declare that there is no conflict of interest, no financial issues to be declared.

References

1. Buffoli B, Rinaldi F, Labanca M, et al. The human hair: from anatomy to physiology. *Int J Dermatol*. 2014;53:331–341.
2. Park AM, Khan S, Rawnsley J. Hair biology: growth and pigmentation. *Facial Plast Surg Clin North Am*. 2018;26:415–424.
3. Yorulmaz A, Hayran Y, Ozdemir AK, et al. Telogen effluvium in daily practice: patient characteristics, laboratory parameters, and treatment modalities of 3028 patients with telogen effluvium. *J Cosmet Dermatol*. 2022;21:2610–2617.
4. Reid EE, Haley AC, Borovicka JH, et al. Clinical severity does not reliably predict quality of life in women with alopecia areata, telogen effluvium, or androgenic alopecia. *J Am Acad Dermatol*. 2012;66:97–102.
5. Cranwell WC, Sinclair R. *Telogen effluvium.* Miteva M. Alopecia. St. Louis: Elsevier; 2019:83–94.
6. Grover C, Khurana A. Telogen effluvium. *Indian J Dermatol Venereol Leprol*. 2013;79:591–603.
7. Tosti A, Duque-Estrada B. Dermoscopy in hair disorders. *J Egypt Women Dermatol Soc*. 2010;7:1–4.
8. Miteva M, Tosti A. Hair and scalp dermatoscopy. *J Am Acad Dermatol*. 2012;67:1040–1048.
9. Inui S. Trichoscopy for common hair loss diseases: algorithmic method for diagnosis. *J Dermatol*. 2011;38:71–75.
10. Micali G, Lacarrubba F, Massimino D, Schwartz RA. Dermoscopy: alternative uses in daily clinical practice. *J Am Acad Dermatol*. 2011;64:1135–1146.
11. Lee BS, Chan JY, Monselise A, McElwee K, Shapiro J. Assessment of hair density and caliber in Caucasian and Asian female subjects with female pattern hair loss by using the Folliscope. *J Am Acad Dermatol*. 2012;66:166–167.
12. Malkud S. A hospital-based study to determine causes of diffuse hair loss in women. *J Clin Diagn Res*. 2015;9:1–4.
13. Olsen EA, Reed KB, Cacchio PB, Caudill L. Iron deficiency in female pattern hair loss, chronic telogen effluvium, and control groups. *J Am Acad Dermatol*. 2010;63:991–999.
14. Asghar F, Shamim N, Farooque U, Sheikh H, Aqeel R. Telogen effluvium: a review of the literature. *Cureus*. 2020;12:8320.
15. Torres F, Tosti A. Female pattern alopecia and telogen effluvium: figuring out diffuse alopecia. *Semin Cutan Med Surg*. 2015;34:67–71.
16. Jain N, Doshi B, Khopkar U. Trichoscopy in alopecias: diagnosis simplified. *Int J Trichol*. 2013;5:170–178.
17. Lacarrubba F, Micali G, Tosti A. Scalp dermoscopy or trichoscopy. *Curr Probl Dermatol*. 2015;47:21–32.
18. Rudnicka L, Rakowska A. Three trichoscopy algorithms for clinical practice. *J Dermatol Case Rep*. 2012;7:651–654.
19. Rudnicka L, Rakowska A, Olszewska M. Trichoscopy: how it may help the clinician. *Dermatol Clin*. 2013;31:29–41.
20. Govindarajulu SM, Srinivas RT, Kuppuswamy SK, Prem P. Trichoscopic patterns of nonscarring alopecia's. *Int J Trichol*. 2020;12:99–106.
21. Chien Yin GO, Siong-See JL, Wang ECE. Telogen Effluvium - a review of the science and current obstacles. *J Dermatol Sci*. 2021;101:156–163.
22. Rudnicka L, Olszewska M, Rakowska A. *Atlas of trichoscopy: dermoscopy in hair and scalp disease*. vol. 24. Springer Sci Business Media; 2012:17–23.
23. Moftah N, Mubarak R, Abdelghani R. Clinical, trichoscopic, and folliscopic identification of the impact of metabolic syndrome on the response to intradermal dutasteride 0.02% injection in patients with female pattern hair loss: a prospective cohort study. *J Dermatol Treat*. 2021;32:827–836.
24. Tawfik AA, Osman MAR. The effect of autologous activated platelet-rich plasma injection on female pattern hair loss: a randomized placebo-controlled study. *J Cosmet Dermatol*. 2018;17:47–53.
25. Birnbaum MR, McLellan BN, Shapiro J, Ye K, Reid SD. Evaluation of hair density in different ethnicities in a healthy American population using quantitative trichoscopic analysis. *Skin Appendage Disord*. 2018;4:304–307.
26. Choi JS, Park JB, Moon WS, Moon JN, Son SW, Kim MR. Safety and efficacy of Rice bran supercritical CO₂ extract for hair growth in androgenic alopecia: a 16-week double-blind randomized controlled trial. *Biol Pharm Bull*. 2015;38:1856–1863.
27. Choi HC, Nam GW, Jeong NH, Choi BY. Hair growth promotion by extracts of Inula Helenium and Caesalpinia Sappan Bark in patients with androgenetic alopecia: a pre-clinical study using phototrichogram analysis. *Cosmetics*. 2019;6:66.