

Trichoscopy in Clinical Studies: The Challenges of Standardization - A Scoping Review

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Abstract

Introduction: Standardization of trichoscopy images, regarding the compatibility of before and after images, poses a challenge. Given this issue, the aim of this study was to investigate the methodologies used by researchers in clinical studies in the field of trichoscopy.

Methodology: The methodology of this scoping review was developed according to the purposes of a scoping review. For this, the keywords 'trichoscopy' and 'hair' were searched in the Scopus, Web of Science, and Embase databases. Studies published from 2019 to December 2023 were included.

Results and Conclusion: Among the 4,088 studies found, 341 were duplicates, 3,742 did not fully meet the objectives of this review; thus, 5 studies were selected and 4 were subjected to appraisal of this scope. According to the analyses of the studies, the compatibility of trichoscopy images in clinical studies depends on the techniques developed by researchers, which are few in number, yet innovative. The TrichoLAB software appears to be a promising tool, yet it requires a high investment, which makes it difficult for researchers and universities to access. The standardized grid by Starace et al. (2019, 2020, and 2021); and Alessandrini et al. (2021), needs to be further explored and explained so that other researchers can benefit from the use of this model. It is also suggested to apply tests based on the FMaps concept by Kasprzak, Sicińska, and Tosti (2019) to prove the efficacy of the grid. Given that the challenge of compatibility of before and after trichoscopy images is a real issue, it is suggested that other standardization models be developed. Likewise, it is possible that some studies were not included in this review; therefore, the continuation of this research is suggested.

Keywords: Tricoscopy; Standardization; Clinical trials.

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1. Introduction

Trichoscopy is a non-invasive examination that allows visualization of the scalp and hair strands with a magnification of 20 to 100x (or more) and with polarized and non-polarized lights, which favor the observation of important details such as the perifollicular vascularization, the thickness of the hair, the oiliness, the presence of flaking, the absence of chenogenic hair or follicular ostia, etc. These signs are crucial for the professional to choose the appropriate treatment for the patient. The images generated by trichoscopy are viewed on a computer monitor, television set, cell phone or tablet [1].

Many researchers also use this assessment tool to determine the effectiveness of treatments evaluated in their studies. A common difficulty among professionals and researchers with the use of trichoscopy is monitoring the evolution of the treatment, as existing methods of repeating images captured in the initial and final assessment are difficult to access or difficult to accept by patients. Despite being an easy-to-perform exam and very important in hair

evaluation, it requires the professional to develop knowledge about the equipment and become familiar with visualizing the signs of pathologies, which are often only seen in books. According to Rudnicka [1], trichoscopy is considered a challenge for dermatologists due to its complexity in interpreting the resulting images and its recent introduction into clinical practice.

In this sense, based on the above, there is a need to research which methodologies are being used in scientific research, to standardize image capture, with regard to the compatibility of before and after images.

2. Methodology

The search string used in this research was based on keywords separated according to their interest groups. The following groups were defined: assessment tool; object of evaluation. Based on this process, the following search string was created:

((tricoscopy OR trichoscopy OR trichoscopic hair OR "polarized microscopy" OR dermoscopy OR dermoscopic OR trichoscope OR "polarized microscope" OR dermatoscope) AND (hair OR hair OR trichology OR scalp))

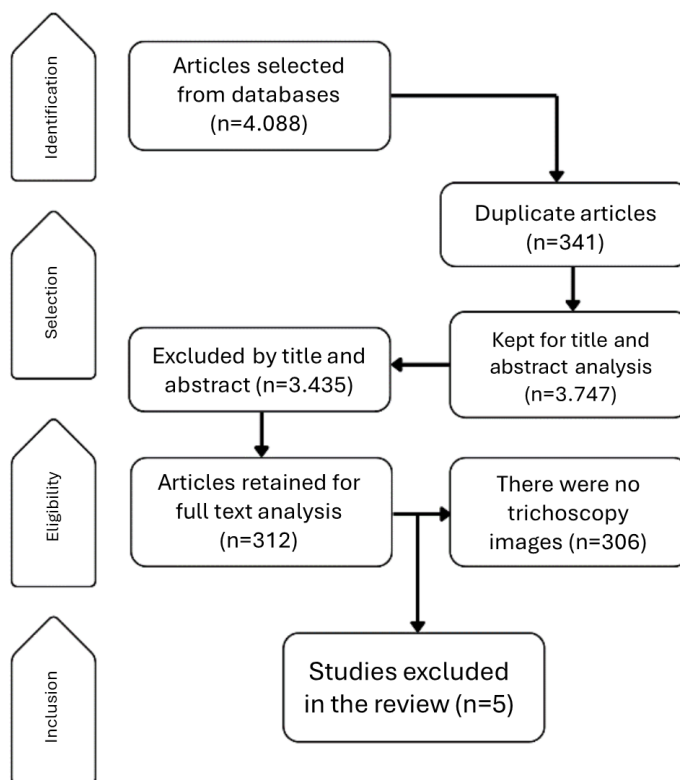
The string was applied to three databases: Web Of Science, SCOPUS and Embase. Embase is the database that stands out in the health area and the other two databases were used due to the large number of publications and relevance in the evaluation area.

The inclusion criteria defined for the scoping review are studies published from 2019 until December 2023; presence of trichoscopy images before and after. The exclusion criteria defined by the author are scoping or systematic reviews will not be accepted; studies that do not present compatible triscoscopies. Among the 4088 studies found, 341 were duplicates, 3742 did not fully meet the objective of this review; thus, 5 studies were selected. To date, it has not been possible to access one of the articles. Therefore, 4 articles were submitted for consideration under this scope.

3. Results

The result of the review and the path taken are shown below, in Figure 1, which follows the guidelines of the PRISMA-ScR 2020. The articles were evaluated for their research methodology and the methodology used to capture compatible trichoscopy images for comparison before and after clinical studies. Below is a description of the found articles.

Figure 1. Scope review flowchart.



An open, non-randomized, single-group, single-center pilot study was carried out by Starace et al. [2] with 10 female patients with androgenetic alopecia and unresponsive using conventional treatment with topical minoxidil and/or oral finasteride, for at least 1 year. The study used Platelet Rich Plasma (PRP) therapy and was conducted in such a way that the treatment lasted 8 weeks, with the application of PRP every 2 weeks, totaling 4 sessions and the follow-up lasted 12 weeks, totaling 24 weeks of clinical study. The injections were applied in the temporal region bilaterally at points located at a distance of 4cm from the “V” point, which marks the intersection between the mid-sagittal line and the coronary line connecting both ends of the patient’s tragus. From point “V”, the authors used a grid to plot the distance to the following points. There is no specification regarding the nature of this grid, whether physical or imaginary. Triscopies were performed in weeks 1, 12 and 24 of the study, at the “V” point and in the frontal region 6cm away from the “V” point and in the occipital region, at the same distance. The trichoscopic images obtained were submitted to the TrichoScan software to evaluate the thickness of the rods.

Alessandrini et al. [3] developed an open, non-randomized, single-group, single-center pilot study with 30 men and 30 women with androgenetic alopecia. The proposed treatment involved 4 sessions, which were held every 3 weeks. The procedure consisted of using a device that makes microdermal incisions with a 0.25 mm long needle in the longitudinal, vertical and diagonal directions, eight times in each direction or until mild erythema. After the incisions, growth factors were applied and the scalp was treated with the same equipment, but with the function of “patting” the skin, followed by iontophoresis to allow greater absorption of the active ingredient. On the first visit, patients underwent dermatological examinations, global photography and trichoscopy. The trichoscopic images were analyzed using the TrichoScan software, which allows the thickness to be assessed and the follicles counted. They were repeated after 6 and 12 months, with magnifications of 20x, 40x and 70x. The authors also used a standardized grid on the scalp in each session, using the “V” point as the primary reference, but there is no further information or description about the grid.

The study by Starace et al. [2] evaluates the preliminary results of using microneedling on the scalp in different types of alopecia. The sample evaluated consisted of 36 women and 14 men, some with androgenetic alopecia and others with telogen effluvium. Three microneedling sessions were carried out with an interval of 4 weeks between them. A dermaroller with a 1.5mm needle was used in the longitudinal, vertical and diagonal directions, eight times in each direction or until mild erythema. Trichoscopy evaluation was performed before starting treatment and 6 months later. Trichoscopic images were obtained with magnifications of 20x, 40x and 70x, at the vertex and central line of the scalp and were analyzed using the TrichoScan software, which allows the evaluation of thickness and counts of follicles. The same standardized grid from the research by Starace et al. [2] was used in this study, with the “V” point as a reference.

The study by Vastarella et al. [5] evaluated the efficacy and safety of oral Minoxidil (MO) in female androgenetic alopecia. 12 women were treated with MO by the Naples Federico II laboratory, Italy, over a period of 1 year. Initially the dose was 0.5 mg and until 3 months the dose was increased to 1.5 mg to 2 mg per day. Reviews were carried out every 6 months. Images were captured in the frontal line and vertex region in weeks 1 and 24. The trichoscopic equipment used for the evaluations was the FotoFinder Trichoscale, which is supported by TrichoLAB software, allowing the reproducibility of trichoscopy images. Trichoscopy showed an increase in the thickness of the hairs. This study does not describe collection points for trichoscopy images, however, by reporting on the equipment used, the image capture methodology is understood, answering the guiding question of this research. Therefore, below is a description of the process used.

TrichoLAB has developed software to reproduce the location of trichoscopy images. With the help of a model called “TrichoLAB Spot Template”, the professional places it on the patient’s scalp and makes adjustments so that the equipment can capture pre-determined points and read it using the TrichoLAB virtual assistant. The product guarantees an accuracy of $\pm 1-3$ mm in relation to the nasal point and the tips of the ear. Everything is shown and controlled on the computer screen and the results are saved in TrichoLAB Space [6].

The professional makes markings on the scalp, which will be like virtual tattoos on the platform, and when the FotoFinder tricoscope approaches, it will read. The “TrichoLAB Spot Template” also has several measurements, which must be noted down, so that it is possible to repeat the tricoscopy of the same location during reevaluation and generate compatible images. With this data evaluated, it was possible to develop a table, which compiles the most important information for this review. It follows on the next page, in table 2. This information

provides a clear overview of the approaches adopted by researchers and the technological resources used in each study, which contributes to understanding the current state of research on standardization of trichoscopy images.

Table 2. Scoping review results.

Clinical Study	Methodology	Software
Starace et al. [2]	Standardized Grid – "V" Point	TrichoScan
Alessandrini et al. [3]	Standardized Grid – "V" Point	TrichoScan
Starace et al. [4]	Standardized Grid – "V" Point	TrichoScan
Vastarella et al. [5]	Frontal Line and Vertex	TrichoLAB

4. Discussion

The challenge that researchers face when performing before-and-after triscopies in clinical studies is notable, given the low number of articles found in this scoping review. Articles with the presence of corresponding trichoscopic images and consequently, the explanation of the methodology used to take the images, were scarce. The grid technique, using the "V" point as a reference, was the most cited [2-4]. However, the lack of further information regarding the nature of the grid does not allow a complete assessment of the effectiveness and usability of the methodology.

The study by Vastarella et al. [5] uses the same FotoFinder equipment, but with the help of TrichoLAB software, which greatly facilitates image reproducibility. Based on the Follicular Map concept [7] and hair-by-hair level matching of baseline and follow-up images, Hair-to-Hair (H2H) Matching technology achieves sensitivity and accuracy of unprecedented measurement. Developed at TrichoLAB, the approach is an alternative to the analysis of photo-trichogram images and allows the easy replication of trichoscopy images at the same point, mainly helping researchers in clinical studies [6].

5. Conclusion

It is concluded that the studies in this scoping review used trichoscopy image capture methodology, techniques that were not very diverse, but innovative. The TrichoLAB software that supports the FotoFinder equipment is an innovative tool, but requires a high investment, which makes access difficult for researchers and universities. The standardized grid by Starace et al. [2, 4]; and Alessandrini et al. [3], needs to be further explored and explained so that other researchers can benefit from using this model. Since the challenge of compatibility of before and after trichoscopy images is a real problem, the development of other standardization models is suggested. Still in time, it is possible that some studies were not included in this review, because they were older, or because they did not present the keywords searched, therefore it is suggested that this research be continued, in a more comprehensive way.

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