**Supplementary Material S4.** **A short note on history from exhaustive hair growth measurements to calibrated Scalp Coverage Scoring and Hair Mass Index.**

During yearly encounters and discussions with Hugh Rushton about interrelated diameter and linear growth rates1,2, we developed the concept of Compound Index of Hair Growth (CIHG) and communicated orally in the early 90ies.

In those early days, hair diameter was measured under the light microscope, and a phototrichogram (PTG composed of 2 images, i.e., a first one immediately after clipping scalp hair and the second one taken after 2-day interval) was analyzed manually. The observer qualified elongation of the hair fiber within 48h and translated this as growth reflecting anagen follicles as opposed to those hair fibers with the same length on both images reflecting telogen or resting stages; the latter might also contain some exogen hair on their way out but still sticking into the hair follicle. Linear growth rates required clipped hair to be collected after 30 days post-PTG displayed for length estimates by microscopic examinations. All records were by trained technicians, i.e., many human interventions were associated with potential errors or lack of precision or accuracy.

In the second step, statistical methods were enhanced, and measurements were taken directly from 'source PTG-images.' The quantification process was improved by calibrating tools and precise information on hair diameter and elongation within a very accurately measured time-lapse, utilizing CCD imaging (Charge Coupled Devices). This marked a significant advancement. Since maintaining the growth phase is crucial over the long term3, our approach reported individual variations in hair growth according to scalp site and gender4.

Third Step: Exogen (shedding stage) hair fibers were removed from the field, and full-computer-assisted integration of all parameters on processed PTG images was implemented. This allowed for an exhaustive representation of hair dynamics as cumulative data, encompassing all hair growth variables - expressed as Time To Complete Coverage (TTCC) - during natural progression and potential improvements from drug treatments.5,6

Finally, by integrating all this dynamic data with the clinical classification and quantification of scalp hair coverage scores , we came up with the first calibrated Hair Mass Index (HMI).

Basically, both the SCS and TTCC methods can assess hair coverage and also predict 100% hair coverage over time with treatment, making both highly relevant to the patient care.

We also reasoned that transit from images to data with clinical relevance through global imaging could be improved by segmentation of the top of the head as shown in the main manuscript i.e. in Figure 1d. Employing a 5-point coverage scale6 we initially scored the total top of the head (d: upper panel; 9+9=18 fields) on the posterior aspect of the top of the head (1-9 bold type) or more peripheral areas (1-9 italic type) with hair combed as spokes of a wheel6. We pursued our imaging with parting hair along the midline and scoring on parted dry hair (d lower panel; 4 separate fields p1 to p46). This global scoring method copes with the diversity of real patterns shown in Figure 1e. Also, from longitudinal 5-year placebo studies7, we estimated that detection of reduced hair density using only schematic cartoons as a guide would probably require over 5 years (illustrated in Figure 1f) as opposed to a much shorter duration as with objective methods (i.e. properly calibrated and validated phototrichogram). However, many repeat sessions are required to detect clinically significant changes in a fluctuating continuum explored with the phototrichogram and specific imaging equipment, with associated software and precise site maintenance e.g. by tattoo. Furthermore, hair must be clipped and dyed requiring visits twice in just a few days6. Thus, there is a gap in the available clinical evaluation methods that can use the global photograph, but with the precision and reproducibility of repeated monthly phototrichograms without needing clipping and dyeing or high-precision site maintenance.

Furthermore, HMI has been quoted in a small number of papers traced during the last 10 years on Medline8-11 and is quite popular on various websites. However, HMI does not mean thorough calibration occurred beforehand, i.e., it is yet another qualitative classification with uncertainties in quantification. We underscore that the HMI abacus applies only in slowly progressing and non-inflammatory conditions.

To expand the range of data, we include extreme values on a graphic display. Given a 2-dimensional projection of images in a plane, it is clear that SCS cannot exceed 100%. The HMI abacus was developed based on observations of diffuse hair loss that was not associated with inflammatory conditions.

Nonetheless, we aimed to explore the limits by approaching the right side of the graph. In cases clinically referred to as ‘diffuse hair loss’ that are severe cases of alopecia areata, only a few hairs remain present. We documented 0% anagen hair and were able to predict total hair loss within the upcoming months. These extreme cases illustrate both the theoretical value of the HMI abacus and the limitations of the correlation between SCS and clinical estimation of growth potential—a truth that might apply to most technologies.

**Figure S4. Hair Mass Index abacus (HMI).** This HMI (Figure S4a ) mathematically interrelates the scalp coverage score (SCS%Max on the y-axis) and the time required to completely cover the region of interest (TTCC, days) based on computation of 504 subjects (normal and complaining of hair loss as detailed elsewhere6).

While the HMI abacus shows the regression line based on diffuse hair loss unrelated to inflammatory conditions, we wished to explore the methodological limits and challenge the theory.

With a 2-dimensional projection of images in a plane (Figure S4a), it seems evident that SCS cannot exceed 100%. This appears as a grey zone (upper left corner of the abacus; C1). Cluster C1 displays optimal SCS (>90%) and TTCC (<21 days) in controls and patients with significant amounts of hair and experiencing initial (subclinical or clinically non-relevant) hair loss.

The general practitioner considered the patient appearing in panel **b** as having androgen-related hair loss. Upon referral, we thought somewhat of alopecia areata incognita. Scalp Coverage Score in August (a global view on the left with a red dot) was 85% (Figure S4b). The region of interest (ROI) where the phototrichogram was performed is shown as a black ring. The ROI (August; the image on the left) showed a total density of 103 hair/cm2, dispatched as 20% thinner (diameter ≤30µm) or terminal (diameter>40µm) hair. Anagen counts were very low in the thinner hair (7% anagen), and we did not find a single terminal hair (0% anagen). The clinical pictures illustrate regression in 2 months to total alopecia (image on the right; October) and SCS almost 0%Max.

This clinical observation illustrated in panel **b** that an initial SCS % Max (panel **a**) dropped from the initial August (85%, red dot) to the October (SCS%Max 0%, blue-turquoise dot) while maintaining TTCC at ∞. This infinite TTCC cannot be marked on the x-axis but is shown as ∞ in the right margin). This point is located well beyond the limits of our HMI-regression line.

The initial SCS, along with the clinical image, helps to understand the erroneous diagnosis of the general practitioner.

Whatever the amount of hair initially present along with an acceptable SCS, and when patients are referred to for ‘diffuse hair loss’ hair specialists may suspect severe cases of alopecia areata incognita.

With the initial phototrichogram (m0; August), we documented 0% anagen hair and could predict total hair loss in the next few months (m2; October). The bad news helped the patient anticipate and cope with her condition.

A few such extreme cases illustrate the theoretical value of the HMI-abacus and, simultaneously, the limits of the correlation between SCS and clinical estimation of growth potential.

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