



Cross-Section Trichometry, A Clinical Tool for Assessing the Progression and Treatment Response of Alopecia

Joaquin J. Jimenez, Tongyu Cao Wikramanayake, Lucia M. Mauro, Irene A. Tabas, Anne L. Chen, Isabel C. Llanes, Lawrence A. Schachner

Department of Dermatology & Cutaneous Surgery, University of Miami Miller School of Medicine, Miami, FL

ABSTRACT

Background: Hair loss affects millions worldwide. At present, most dermatologists use simple, non-quantitative methods to monitor hair loss progression and response to treatment, with an emphasis on density alone. However, the diameter of the hair fibers also contributes greatly to the appearance of hair.

Objective: Evaluate the accuracy and sensitivity of a cross-section trichometer (the HairCheck® device), a simple, hand-held device that measures hair mass influenced by both density and diameter.

Materials and Methods: Using surgical silk and cut human hair, we analyzed the correlations between the HairCheck® readings, the number and diameter of strands, and the bundle dry weight.

Results: Direct correlations were observed between a bundle's cross-sectional area, displayed as the Hair Mass Index (HMI), the number of strands, fiber diameter, and bundle dry weight.

Conclusion: Cross-Section Trichometry (CST), the HairCheck® System and its methodology to determine the HMI, may provide a quick and accurate tool to assess progressive alopecia and treatment response in the clinic.

EXPERIMENTAL PROCEDURES

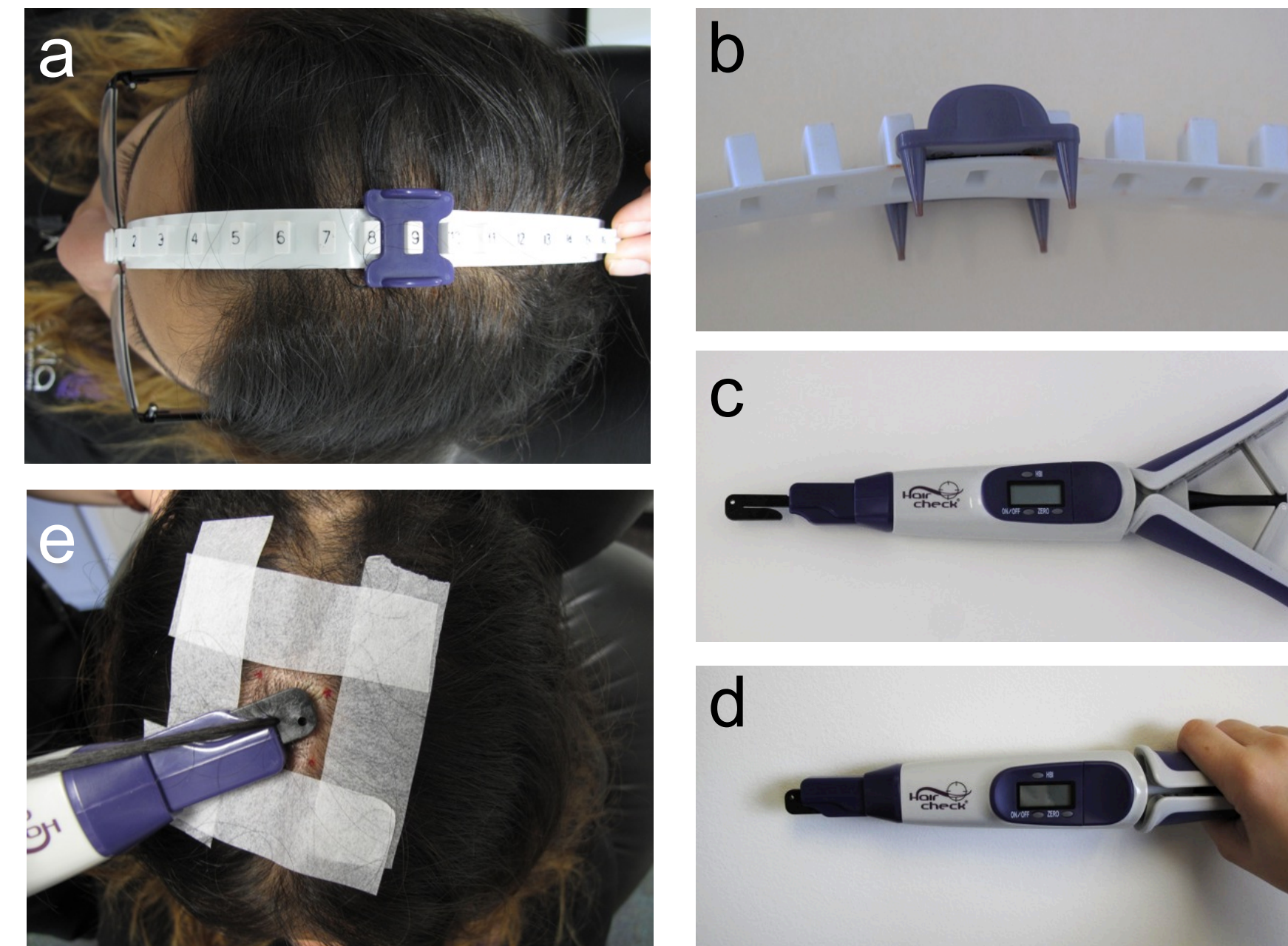


Figure 2. The HairCheck® System consists of a locating strip (a,b) attached to a pair of eyeglasses (a) and the measuring device (c,d). A four-legged template is placed on a numbered tab of the locating strip (b) to mark the sample site, and the tab number is recorded to allow return to the same site for future measurements. The measuring device is hand-held and transmits a pre-determined load to a bundle of hair (at least 2.5 cm [1 inch] in length) captured by a J-slot (c, d, e). The hair can be of any type, from super fine to very coarse.

Obtaining the Hair Mass Index (HMI): Bundles of surgical silk or cut human hair were placed in the J-slot of the measuring device (c). When the lever arm is squeezed (d), the cross sectional area of the bundle is instantaneously displayed as the HMI on the device's LED screen and expressed as: mm² of hair per cm² of scalp x 100, rounded up to the closest integer.

RESULTS

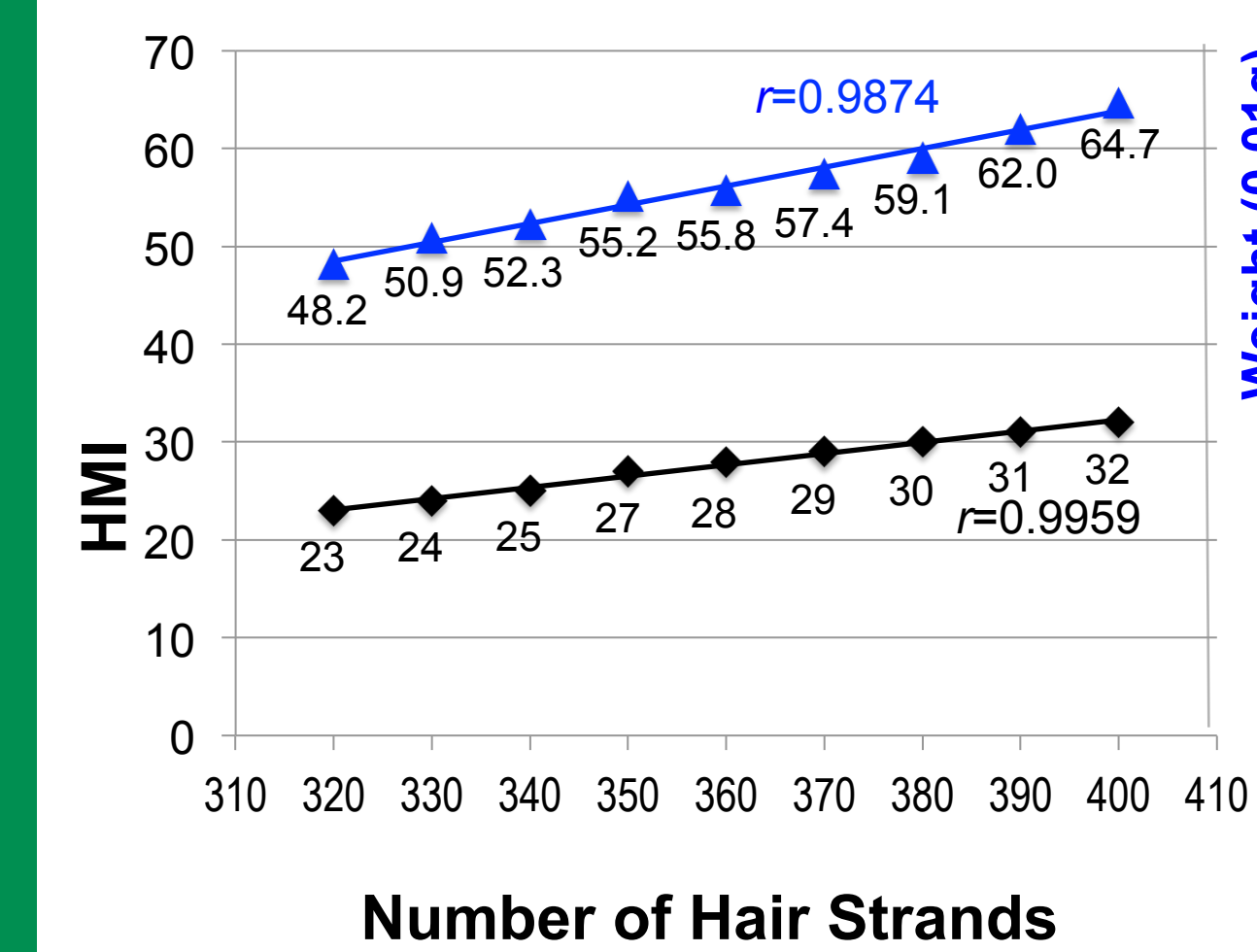


Figure 4. Cross-Section Trichometry of bundles of cut human hair using the HairCheck® device. Shown is correlation between the HMI, the number of hair strands, and bundle weight.

CONCLUSIONS

- Direct correlations were observed between the bundle's cross-sectional area, displayed as the Hair Mass Index (HMI), the number of strands, the silk/hair diameter, and the bundle dry weight. Therefore, HMI is a meaningful measure of the hair mass.
- We have given the name Cross-Section Trichometry (CST) to the trichometer system and its methodology. CST is a simple modality that can quickly and accurately measure the cross-sectional area of a bundle of hair, and converts it to HMI for display.

Applications of Cross Section Trichometry:

- Early detection of non-visible hair loss.
- Progression of hair loss.
- Evaluation of response to hair loss treatments (drugs, devices and over-the-counter products).
- For hair transplantation, CST in the donor area during initial consultation will help develop realistic expectations.
- Assess hair breakage.

INTRODUCTION

- Currently, most dermatologists use simple, non-quantitative methods to evaluate alopecia, with an emphasis on hair density alone.
- Small decreases in hair density are not easily detected by the naked eye, e.g., in global photographs.
- In addition to density, the diameter of hair fibers also contributes greatly to the appearance of hair mass.

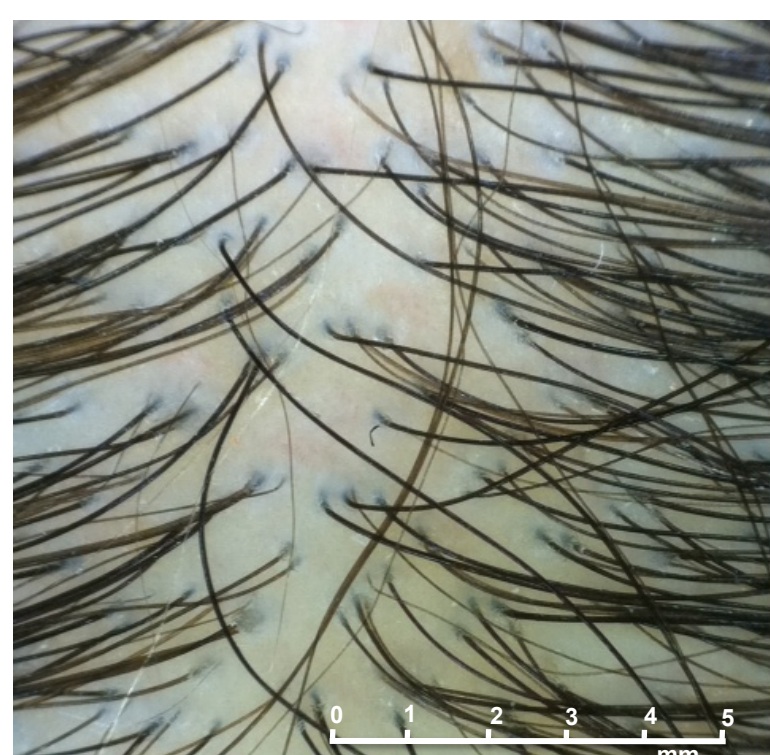


Figure 1. For assays of hair density, any hair with a diameter of greater than 30µm is counted as one hair without consideration of the variation in hair diameter. But for conditions such as androgenetic alopecia, the hair diameter varies greatly (left).

RESULTS

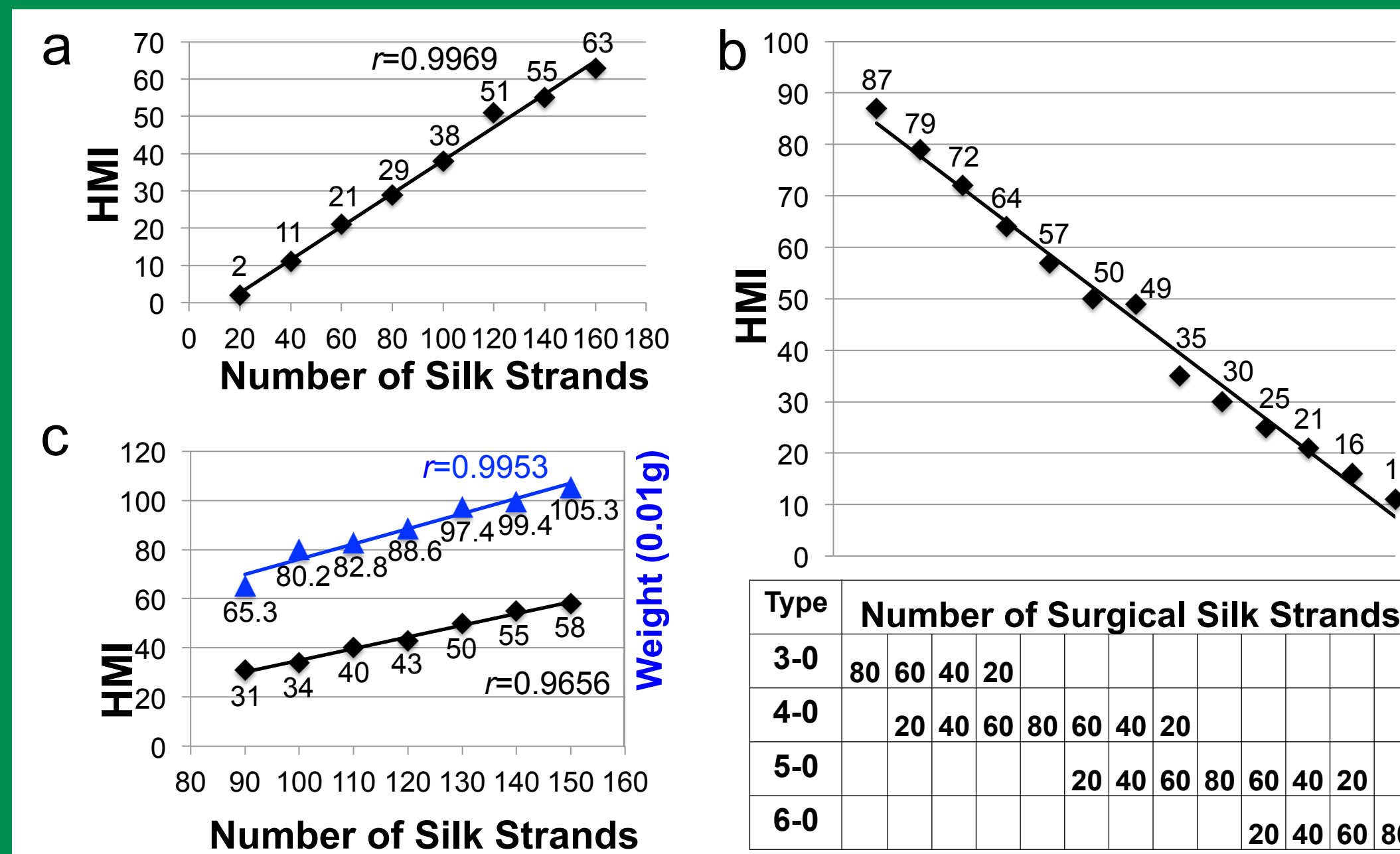
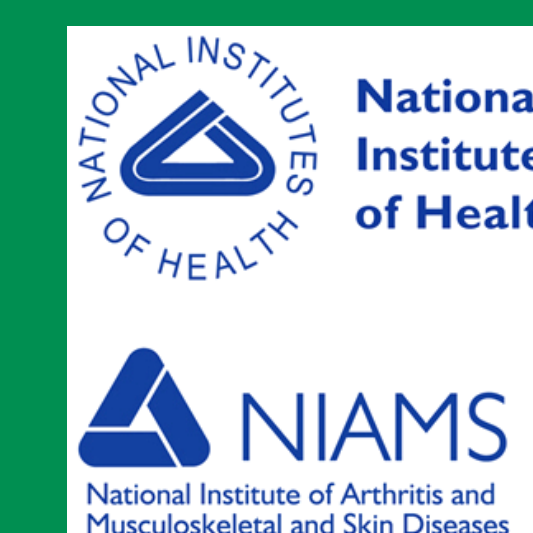


Figure 3. Cross-Section Trichometry (CST) of surgical silk. (a) Correlation between the number of 5-0 strands and Hair Mass Index (HMI). (b) CST of mixed silk strands of different types/diameters. (c) Correlation between HMI, the number of strands, and bundle weight.

REFERENCES

- Arnold J. Hair mass index. 4th Annual Congress European Society of Hair Restoration Surgery Barcelona 2001.
- Cohen B. The cross-section trichometer: a new device for measuring hair quantity, hair loss, and hair growth. *Dermatol Surg* 2008;34:900-10; discussion 10-1.
- Hendriks MA, Geerts PA, Dercksen MW, van den Hurk CJ, Breed WP. Evaluation of Cohen's Cross-Section Trichometer for Measuring Hair Quantity. *Dermatol Surg* 2012. [Epub]

ACKNOWLEDGMENTS



TCW is the recipient of a Career Development Award from NIH/NIAMS (AR050487).