Clinical Efficacy of a New Sonic Skin Care Brush for Facial Cleansing

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Introduction

Effective daily facial cleansing is essential in maintaining healthy skin. Excessive facial oil and inefficient cleansing can result in skin disorders (e.g. acne) that have strongly associated social and psychological stigma. Excessive use of chemical agents and exfoliants can irritate the skin, particularly in those patients with barrier dysfunctions common with eczema, psoriasis, rosacea and other skin conditions. In response to these issues a sonic skin care brush has been developed for daily facial cleansing to gently and effectively cleanse the skin (1,2).

Methods to measure the effectiveness of cleansing products are few and usually restricted to testing on the forearm or hand; no purely facial cleansing studies exist (3). One possible approach to determine product effectiveness at facial cleansing is to quantify the level of casual sebum, the static concentration of sebum found on the skin's surface and remaining on the face after cleansing. This approach has been used to examine the reduction of oiliness in individuals with excessive sebum following medical treatment (4,5). Sebum functions as a sticky trap for dirt and other airborne particles (6). Previous studies have avoided monitoring these natural sebum deposits on the skin because sebum levels can fluctuate due to hormonal and circadian rhythms (7,8). However, these fluctuations can be controlled by employing a split-forehead design, whereby each subject serves as their own control (data not shown).

Two independent studies were conducted evaluating the effectiveness of facial cleansing comparing a new sonic skin care brush (SB) to manual cleansing (MC). Casual sebum was used as a surrogate measurement for evaluating dirty skin.

Objective

The first aim was to evaluate the cleansing efficacy of the SB (water only) compared to MC (water only). Efficacy was determined by measuring casual sebum using a split-forehead design.

The second aim was to compare SC to MC using a mild cleanser.

Methods

Two studies were performed. Both studies enrolled consenting healthy adult subjects (18-55 years of age) with moderate to high sebum levels. Subjects were instructed not to cleanse their forehead for at least 6 hours or partake in strenuous exercise for 4 hours prior to the clinical visits.

Study I enrolled ten subjects for 6 visits (1st visit baseline) comparing SB to MC using water alone. The cleansing method was randomized to left or right side of the forehead for the first visit and then switched at each subsequent visit. At each visit, a baseline sebum sample was collected at the center of the forehead prior to cleansing. The study aesthetician wet the subjects forehead with water then cleansed with the SB or MC. The SB was placed on the identified side and cleansed by using light pressure and 5 circular overlapping motions to the midline. MC was performed by starting at the MC side of midline; the index, middle and ring fingers were used to cleanse the MC side of the forehead with 5 vertical strokes and light pressure. A damp 4x4 gauze was used to gently blot the skin dry on both sides.

Study II enrolled 30 subjects for a single visit comparing the SB to MC using a mild cleanser using the same methods as Study I; however water and 1 ml of a gentle cleanser was placed on each side of the forehead prior to cleansing .

After cleansing (Study I and II), a mask [Figure 1, modified Piérard mask technique (4)] with 6 equally-spaced windows was placed on the subject's forehead (Figure 1). Sebum indicator strips (Sebutape Skin Indicators; CuDerm, Dallas, TX) were then placed in each window of the mask to determine the amount of sebum remaining after cleansing.

Image Analysis. Indicator Strips were scanned (HP scanjet 4570c, Hewelett-Packard; Palo Alto, CA), then sebum levels on the indicator strips were quantified using NIH-sourced digital image processing software (NIH; Bethesda, MD).

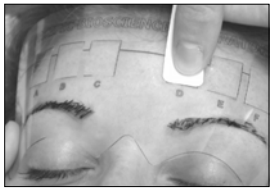


Figure 1. Modified Piérard mask used to define placement of Seubtape Skin Indicators.

Results

Study I: SB vs MC (water only)

The image data from the 6 samples taken at each visit were averaged within treatment (3 for SB, 3 for MC). Sebum images from one subject are shown in Figure 2.

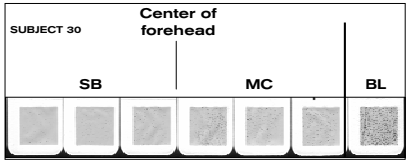


Figure 2. An example of baseline (BL) and residual sebum levels following cleansing with either the SB or MC.

Residual sebum remaining is reported as the number of pixels calculated for the area of the sebutape containing absorbed sebum. The distribution and medians of the residual sebum for each treatment and visit are illustrated in Figure 3. Statistical analysis using a mixed effects model indicated that the amount of casual sebum remaining after cleansing with the SB was significantly less than after MC ($p<0.001$). The model predicts that the median area of residual sebum present after MC is 17.8 times greater than that remaining after use of the SB.

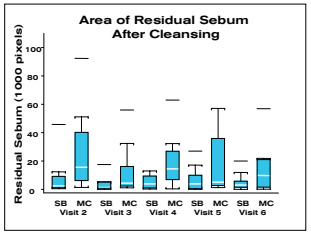


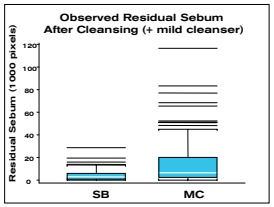
Figure 3. Boxplot of residual sebum remaining following cleansing with sonic skin care brush (SB) or manually (MC). Median values are indicated by the white bars.

Study 2: SB vs MC (mild cleanser)

Figure 4 shows the distribution and medians for the sebum remaining following cleansing with the SB or MC. Statistical analysis (mixed effects model) comparing the two treatments indicated that the amount of casual sebum remaining after cleansing with the SB + cleanser was significantly less than after MC + cleanser ($p<0.001$). The median area coverage of residual sebum present after MC was estimated at 2.34 times that of the side cleansed with the SB.

Results-Continued

Figure 4. Study 2 results showing residual sebum following use of a mild cleanser with a sonic skin care brush or manual cleansing. Median values are indicated by the white bars.



Conclusion

In numerous research settings the Sebumeter (9) is readily used to measure casual sebum, but for some researchers this instrument may not be affordable. By using a modified Piérard mask technique (4) in conjunction with Sebutape Skin Indicators plus free analysis software (ImageJ), a new inexpensive method to examine the efficacy of cleansing products by measuring casual sebum was developed (Casual Sebum Image Analysis Method; CSIAM). Utilizing this methodology, a new sonic skin care brush has proven more consistent and twice as effective at facial cleansing when using a mild cleanser than manual cleansing.

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Disclosure of Support

Research was sponsored by Pacific Bioscience Laboratories, Inc (Bellevue, WA), the developers of the CLARISONIC™ Skin Care Brush.