

Evaluation of facial skin type by sebum secretion: Discrepancies between subjective descriptions and sebum secretion

Sang Woong Youn, Soo Jung Kim, In A Hwang and Kyoung Chan Park

Department of Dermatology, Seoul National University, College of Medicine, Seoul, Korea

Background/aims: Facial skin is usually classified as dry, normal, and oily in the cosmetics field. However, there is no standard objective method for classifying facial skin.

Methods: We measured sebum excretion with Sebumeter[®] at four sites on the face. Based on the amount of sebum secretion, we reclassified skin type according to the guidelines provided by the manufacturer. The mean of sebum excretion (mean facial sebum excretion; MFSE) was also calculated.

Results: People secrete varying amounts of sebum at different skin sites. Reclassification of skin type based on sebum secretion revealed that most participants underestimated the amount of facial sebum excretion. When sebum secretion amounts were compared, a statistically significant difference

was apparent between the oily and dry skin types. However, there were no statistical differences between oily and normal, and normal and dry skin.

Conclusion: We showed that subjective skin type does not match the amount of sebum secreted. Thus, this simple and subjective classification is of very limited use and it should be re-evaluated by using an objective and standardized measuring tool.

Key words: sebum – facial skin type – Sebumeter[®]

© Blackwell Munksgaard, 2002

Accepted for publication 12 November 2001

BECAUSE THE face is exposed to the environment, it is covered by lipid film, which is derived from sebum and epidermal lipid (1). Of these two, sebum is the major component of the lipid film. Sebum secretion is a regulated process, which operates by the interaction between androgen and functional androgen receptors expressed on sebocytes (2). Moreover, sebum secretion is dependent on the inherited traits of each individual but varies according to age, sex, and topographic variations of skin. Sebum is also known to control moisture, and protect the skin from microbiological infections (3).

Sebum is an important factor for facial skin care because there are big differences in facial skin types in terms of the amount of sebum secreted. In general, skins are classified into three types according to each individual's subjective feelings concerning sebum secretion: oily, normal, and

dry. However, individual assessments based on feelings are too subjective. Recently, two categories of methods have been used for measuring sebum excretion (3, 5, 6). One is a qualitative method using the microporous, hydrophobic Sebutape[®], and the other is a quasi-qualitative, photometric method performed with the Sebumeter[®]. Sebutape[®] shows the quantity of sebum excreted on the tape after applying it to the face for more than an hour (7). Sebutape is simple to use, but the quantification of sebum secretion is difficult (8). Sebumeter[®] is a device that is easy to handle, it displays the amount of sebum secreted in a range between 0–99 $\mu\text{g}/\text{cm}^2$. However, when seborrhea is intense, the quantification may not be accurate because the plastic strip involved may become saturated (9). In spite of this limitation, the guidelines proposed by the manufacturer are commonly used in the classification of skin type.

This study was undertaken to: (a) investigate the regional variations of sebum secretion on the face, and (b) evaluate whether the subjective skin type description correlates with Sebumeter[®] measurement values.

Materials and Methods

Study population

Ninety-four healthy Korean women (aged 20–39 years) were included in this study. Subjective skin type was decided upon by individual subjects based only on their preconceptions. The three groups used in this study were: the oily skin group ($n = 32$), the normal group ($n = 31$), and the dry skin group ($n = 31$).

Sebum measurements

The amount of facial sebum secretion was measured using the Sebumeter[®] (SM 810 PC, Courage and Khazaka, Cologne, Germany) (1). Four different sites of face were selected; the forehead (mid-glabella), nose (the tip), cheek (the most prominent area of zygoma), and chin (mental prominence). Sebum was collected from each site on a plastic strip with a constant pressure of 10N for 30s. Participants were asked not to put on any cosmetics for 4h before the measurements. Reclassification of the skin type was done according to the manufacturer's guidelines based on the sebum measurements, as follows: $> 66 \mu\text{g}/\text{cm}^2$, oily type; $33\text{--}66 \mu\text{g}/\text{cm}^2$, normal type; $< 33 \mu\text{g}/\text{cm}^2$, dry type. Mean facial sebum

excretion (MFSE) was defined as the average amount of sebum excretion from the four different sites of each participant.

Condition of measurements

All procedures were performed by the same investigator in a room with constant temperature and humidity (Clinical Research Institute, Seoul National University Hospital). The room had a relative humidity of 42% and a temperature of 22 °C.

Statistical data analysis

One-way ANOVA and the post HOC test were used for the comparisons. $P < 0.05$ was considered to be statistically significant.

Results

Topographical variations of facial sebum excretion

Significant regional variations in sebum secretion were observed. In the majority of participants, sebum secretions of the forehead and nose were higher than those of the chin or cheek. The cheek was usually the site of lowest sebum secretion (Fig. 1).

Comparison of sebum excretion measurements

The MFSE of the groups were as follows: oily: $78.8 \pm 15.6 \mu\text{g}/\text{cm}^2$, normal: $68.7 \pm 13.5 \mu\text{g}/\text{cm}^2$, dry: $59.7 \pm 19.9 \mu\text{g}/\text{cm}^2$ (Fig. 2). A significant difference was noted between oily and dry skin ($P < 0.05$). However, no statistically significant

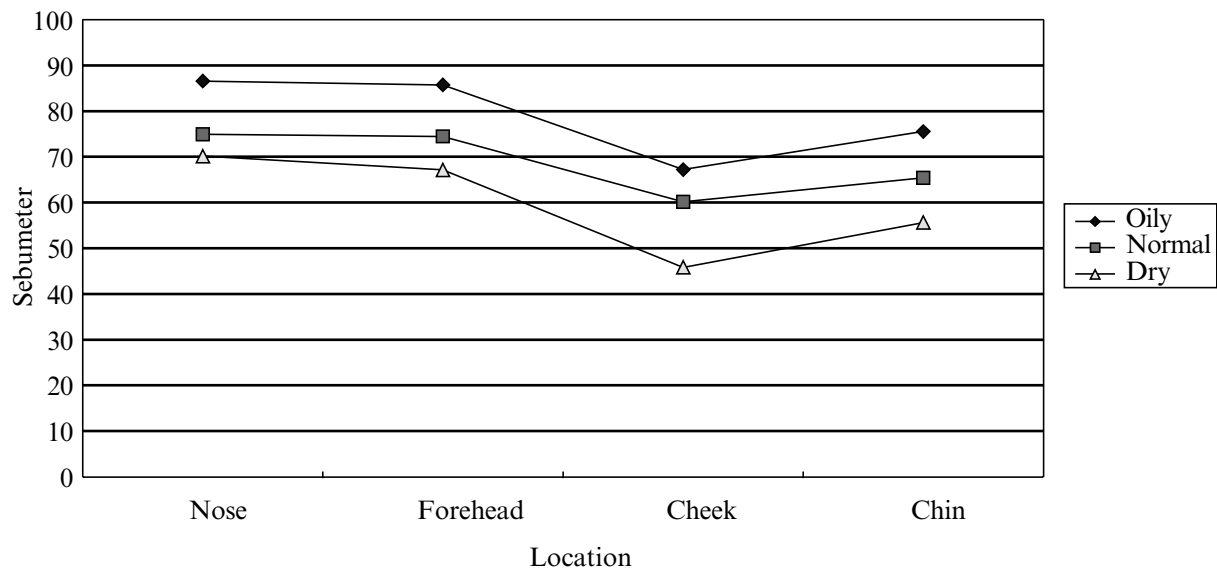


Fig. 1. Regional variations of Sebumeter[®] measurements.

differences were found between oily and normal skin, and between normal and dry skin ($P > 0.05$). (Table 1).

Reclassification of skin type

Skin types were reclassified using the guidelines provided by the manufacturer. Based on the MFSE data, the subjective oily group was composed of 75% of the Sebumeter[®] oily type and 25% of the Sebumeter[®] normal skin type. The subjective normal group was composed of 35.5% of the Sebumeter[®] normal and 64.5% of the Sebumeter[®] oily skin type. Similarly, the subjective dry group was composed of only 9.7% of the Sebumeter[®] dry skin type, the majority being Sebumeter[®] normal (48.4%) and Sebumeter[®] oily (41.9%) skin types (Table 2). Thus, following the Sebumeter[®] guideline, a number of the participants were reclassified as different skin types.

Regional measurement showed similar results. In the subjective oily group, most of the T zone area (nose and forehead) had oily skins (93.8% and

90.6%) by Sebumeter[®]. However, sebum secretion of the cheek area was reclassified as oily (53.1%) and normal (40.6%) skin by Sebumeter[®]. The chin area was also reclassified as oily (68.8%), normal (25.0%), and dry (6.3%) skin types by Sebumeter[®]. These results showed that some areas of the face were found to be normal and dry even in the subjective oily skin group.

In the subjective normal group, the T zone (nose and forehead) were mainly oily (74.2% and 67.7%) by Sebumeter[®]. Sebum secretion of cheek was found to be normal (54.8%) and oily (38.7%) by Sebumeter[®], and the chin area was reclassified as oily (54.8%) and normal (38.7%) by Sebumeter[®]. These results showed that T zone area is usually oily and some areas of the face such as the cheek and chin are also oily, even in subjective normal skin type.

In subjective dry group, the T zone (nose and forehead) were also mainly oily (67.7% and 54.8%) by Sebumeter[®]. Sebum secretion of cheek was found to be oily (29.3%), normal (25.8%), and dry (45.2%) by Sebumeter[®], and the chin was reclassified as oily (41.9%), normal (32.3%), and dry (25.8%) by Sebumeter[®]. These results showed that the T zone and the chin are usually oily even in the subjective dry skin type (Table 3).

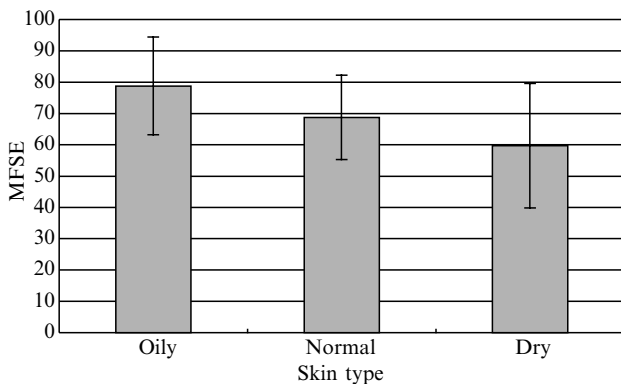


Fig. 2. Mean facial sebum excretion (MFSE) according to skin type.

TABLE 1. P-value results of statistical analysis (post HOC test)

Subjective Groups Compared	P-value
Oily–Normal	0.059
Oily–Dry	< 0.000
Normal–Dry	0.106

TABLE 2. Reclassification of skin type using Sebumeter measurements

Sebumeter value	Oily (n=32)	Normal (n=31)	Dry (n=31)	Total (n=94)
Oily (> 66)	24 (75%)	20 (64.5%)	13 (41.9%)	57 (60.6%)
Normal (33–66)	8 (25%)	11 (35.5%)	15 (48.4%)	34 (36.1%)
Dry (< 33)	0 (0%)	0 (0%)	3 (9.7%)	3 (0.3%)

Discussion

The characteristics of facial skin seem to be very important for ideal facial skin care and the treatment of sebum related disease. However, the concept of skin type is formed by several indirect clues that suggest facial sebum secretion, such as tightness of skin after washing, the size and number of pores, daily greasiness, or daily makeup maintenance, etc. (10).

In order to classify the skin type objectively, several methods have been developed to measure sebum secretion (5). In this study, we used a Sebumeter[®] to measure sebum levels. The method relies on the absorption of onto a plastic film, the photometric transparency of which determines the sebum level (11). It is simple and easy to

TABLE 3. Reclassification of regional skin type using Sebumeter measurements

Subjective	Sebumeter	Nose	Forehead	Cheek	Chin
Oily ($n=32$)	Oily	30 (93.8%)	29 (90.6%)	17 (53.1%)	22 (68.8%)
	Normal	1 (3.1%)	3 (9.4%)	13 (40.6%)	8 (25.0%)
	Dry	1 (3.1%)	0 (0%)	2 (6.3%)	2 (6.3%)
Normal ($n=31$)	Oily	23 (74.2%)	21 (67.7%)	12 (38.7%)	17 (54.8%)
	Normal	7 (22.6%)	10 (32.3%)	17 (54.8%)	12 (38.7%)
	Dry	1 (3.2%)	0 (0%)	2 (6.5%)	2 (6.5%)
Dry ($n=32$)	Oily	21 (67.7%)	17 (54.8%)	9 (29.3%)	13 (41.9%)
	Normal	6 (19.4%)	13 (41.9%)	8 (25.8%)	10 (32.3%)
	Dry	4 (12.9%)	1 (3.2%)	14 (45.2%)	8 (25.8%)

handle. Therefore, the Sebumeter[®] is commonly used by dermatology practices and cosmetic companies. However, to the best of our knowledge this is the first study that has used the Sebumeter[®] to classify facial skin type.

One shortcoming of the Sebumeter[®] is its extrapolated photometric calculating method. This method may be inaccurate when seborrhea is intense because of saturation of the plastic strip (9). Sebumeter[®] data are displayed in the range 0–99 $\mu\text{g}/\text{cm}^2$. However, we frequently obtained data greater than 99 $\mu\text{g}/\text{cm}^2$, although accurate data could not be obtained under these circumstances, the frequency of obtaining such results suggests that the MFSE data in our study could have been underestimated.

When we compared the MFSE of the skin type groups, as defined by the individuals, higher sebum secretion was observed in the oily skin group and lower sebum secretion in the dry skin type. However, statistically significant difference was only found between the oily and dry skin types. These results suggest that the grouping of skin type by subjective description is not always useful, although there is some relationship between sebum secretion and skin type. In addition, large regional variations in sebum secretion is found. We suggest that these unduly influence individuals' conception of skin type.

Subjective classification methods, such as dry, normal, and oily skin types are very simple. Moreover, variations of this classification exist, including severely dry, mildly dry, mildly oily, and severely oily. In fact, classifications that include these more complex types are more generally used. However, these varieties were produced intentionally for the purpose of marketing cos-

metic products, and this classification is overly complex and confusing. If we had included the concept of complex type, most of the participants would have been classified as complex type. Our results suggest that classification involving complex type is very difficult without a clear definition of the complex type.

In this study, our results showed that the amount of sebum secretion is relatively higher than was expected by individuals. In other words, people regard their skin to be rather drier than is indicated by the amount of sebum secretion by their faces. Even for those professing dry skin, sebum secretion of the T-zone, which covers nose and forehead, was high. Moreover, these areas were determined to be oily using the Sebumeter[®]. It seems probable that most people estimate their skin type on the basis of their experiences and from the largest area of the face, such as cheek. These are the reasons why the sebum secretion of participants was higher than that expected by subjective descriptions of skin type.

In conclusion, this study shows that an individual's opinion of skin type does not match any definition of skin type based on the amount of sebum secreted. The T zone of all participants was found to secrete high amounts of sebum even in dry skins. These findings suggest that simple classifications, such as oily, normal, and dry skins, based on subjective assessments are not useful for classifying skin types. People are believed to secrete different levels of sebum in different skin regions. We recommend that the guidelines for skin type classification should be re-evaluated, and believe that a more precise and practical definition should be proposed.

References

1. Thiele JJ, Weber SU, Packer L. Sebaceous gland secretion is a major physiologic route of vitamin E delivery to skin. *J Invest Dermatol* 1999; 113: 1006–1010.
2. Bohm M, Luger TA. The pilosebaceous unit is part of the skin immune system. *Dermatology* 1998; 196: 75–79.
3. Cunliffe WJ, Simpson NB. Disorders of the sebaceous gland. In: *Textbook of Dermatology*, 6th edn. London: Blackwell science 1998; 1927–1984.
4. Draelos ZD. Facial foundation. In: *Cosmetics in Dermatology*, 2nd edn. New York: Churchill Livingstone 1995; 1–14.
5. Lookingbill DP, Cunliffe WJ. A direct gravimetric technique for measuring sebum excretion rate. *Br J Dermatol* 1986; 114: 75–81.
6. Champion RH, Burton JL, Burns DA, Breathnach SM. *Textbook of Dermatology*, 6th edn. London: Blackwell science 1998; 1930–1933.
7. Serup J. Formation of oiliness and sebum output-comparison of a lipid-absorbent and occlusive-tape method with photometry. *Clin Exp Dermatol* 1991; 16: 258–263.
8. Piérard GE, Piérard-Franchimont C, Kligman AM. Kinetics of sebum excretion evaluated by the Sebutape[®]-Chromameter[®] technique. *Skin Pharmacol* 1993; 6: 38–44.
9. Piérard GE, Piérard-Franchimont C, Marks R, Paye M, Rogiers V. EEMCO guidance for the *in vivo* assessment of skin greasiness. *Skin Pharmacol Appl Skin Physiol* 2000; 13: 372–389.
10. Leffell DJ. Dream in a bottle: caring for your skin. In: *Total Skin*, 1st edn. New York: Hyperion 2000; 75–90.
11. Zlotogorski A, Galser B, Bercovici B, Dikstein S. Sebum measurements for rapid identification of hyperandrogenism due to an ovarian Leydig cell tumor. *Int J Dermatol* 1991; 30: 276–277.

Address:
Kyoung Chan Park
28 Yongon-dong
Chongno-gu Seoul 110-744
Korea

Tel: 82 2 3668 7474
Fax: 82 2 3675 1187
e-mail: gcpark@snu.ac.kr