

Effect of Skin Sebum Levels before and after Chemical Peeling with 30% Salicylic Acid

Ratna Agustina, Martinus Ahmad Raif, Chrismis Novalinda Ginting, Refi Ikhtari
Department of Biomedical Sciences, Universitas Prima Indonesia, Indonesia

Keywords: Chemical Peeling, Salicylic Acid 30%, Skin Sebum Levels.

Abstract: Salicylic Acid 30% is often considered as gold standard in chemical peels for the treatment of acne vulgaris and has been proven to be very effective in the treatment of inflamed lesions in acne vulgaris and comedonal acne. The purpose of this study was to measure sebum levels on facial skin before and after chemical peels with 30% salicylic acid. The data was collected before and after chemical peeling with 30% salicylic acid. Of the total 15 samples measured, the average sebum content before chemical peeling was $79.93 \pm 23.50\%$. And after chemical peeling was $66.20 \pm 18.72\%$. Based on the normality test using the Shapiro-Wilk test, levels of facial skin sebum before and after chemical peeling with salicylic acid 30% significance value > 0.05 , this implies the data are assumed to be normally distributed. Then the data is analyzed by paired t test. The result is sig .000. From the results, the average skin sebum level before the procedure was 79.93%, while the average skin sebum level after the procedure was 66.20%. There is a significant difference between the levels of sebum in the skin before and after chemical peeling with 30% salicylic acid in patients with skin types Fitzpatrick III, IV, V aged 17-35 years.

1 INTRODUCTION

Chemoexfoliation, which is often referred to chemical peeling, is a technique for scrape skin tissue using certain ingredients that allow rapid erosion to reach the desired skin depth so that results in improved appearance is someone skin. The purpose of chemical peel is to evenly remove damaged skin tissue, which in turn allows skin regeneration, skin rejuvenation, and simultaneously minimizing complications such as scar and unwanted pigment changes (Soleymani et al., 2018).

Material used for chemical peels can control keratocoagulation and denaturation of protein in the epidermis and dermis, which causes the release of inflammatory mediators such as cytokines and chemokines. The mediator will stimulate the formation of new collagen and elastin tissue, rearrange the protein structure of skin connective tissue, and the formation of new keratinocytes. This process will cause regeneration and thickening of the epidermis layer of the skin and increase the thickness of the dermis layer (Berson et al., 2009).

The mechanism of action of chemical peels is to stimulate the growth of the epidermis by changing the stratum corneum layer, destroying the damaged skin

layer and replacing it with normal tissue, causing deep inflammatory reactions in the tissue and then causing necrosis caused by chemical peeling materials. Activation of inflammatory mediators can produce new collagen in the dermis as well as basic substances such as glycosaminoglycans (Rendon et al., 2010).

Although there are some differences between the chemicals used in peeling, in general, the purpose of chemical peels is to improve the appearance of the skin by reducing the amount of wrinkles on the skin or acne scars, reducing both lesions that are inflamed or not, increases depigmentation, and results in a younger, brighter skin appearance (Hassan et al., 2013).

Chemical peeling is a popular, relatively affordable, and safe procedure in the management of several types of skin disorders, to brighten and rejuvenate the skin. Chemical peels are classified based on their level of penetration as follows superficial, medium and deep. The depth level of chemical peels has a significant influence on the clinical changes in facial skin. The deeper the penetration is done, the greater the changes obtained. However, with increasing depth of chemical peels, there are some disadvantages that can occur, which

can lead to various light spots, a longer healing period, and the possibility of greater complications (Arif, 2015; Turnip et al, 2020; Wijaya et al, 2019).

Superficial chemical peels, which are involved in peeling only the epidermal layer, and may also be minimal involvement of the dermis, usually this depth level is used in the management of diseases such as acne, melasma, actinic keratoses, and increase facial brightness. After superficial peeling, epidermal regeneration is expected to occur in 3-5 days. Chemical peeling medium, penetrating to the deeper layers of the dermis from the superficial, this peeling is commonly used in the treatment of superficial scar, and pigmentation disorders. The healing process is longer peeling, usually complete epithelialization occurs within 1 week. Chemical peeling deep, peeling penetration reaches a depth to the dermis, approximately reaching half its depth. This is commonly used for the treatment of deep scars and wrinkles (Ptavitasari and Setyaningrum, 2012).

Salicylic acid, also known as orthohydrobenzoic acid or 2- hydroxy-benzoic acid, has a chemical structure of $C_7H_6O_3$. Salicylic acid contains not less than 99.5% and not more than 101.0% $C_7H_6O_3$ calculated on the dried substance. Salicylic acid has a pKa of 2.97 (Bahtiar, 2016).

Now, salicylic acid can be synthetically produced. Macroscopic form of salicylic acid in the form of white crystalline powder, shaped like a fine needle with a rather sweet taste, odorless, and stable in free air. Salicylic acid powder is difficult to dissolve in water and more easily soluble in fat. The lipophilic nature of salicylic acid makes its clinical effect limited to the epidermis layer (Sulistyaningrum et al, 2012).

Sebum is a mixture of triglycerides, cholesterol, protein and inorganic salt. sebum prevents excessive evaporation of water, softens the skin and inhibits the growth of some bacteria. Factors that influence sebum production such as Androgens, retinoid, melanocortin, Peroxisome Proliferator Activated and Acyl-CoA: Diacylglycerol Acyltransferase (Freedberg et al, 2002).

Sebaceous glands require androgenic stimulation to produce sebum. Although the strongest androgens are testosterone and DHT, testosterone levels do not parallel the sebaceous gland activity. Sebum secretions begin to increase in childhood during adrenarche or 2 years before puberty. Isotretinoin is the best pharmacological inhibitor of sebum production. Sebum reduction can be seen 2 weeks after retinoid use (Freedberg et al, 2002).

Salicylic Acid has been widely used in dermatology for the past several decades. Salicylates

are soluble in oil but not soluble in water, which makes it easier, faster to penetrate the protective layer of fat found in the epidermis. Clinically, this makes salicylate very effective for the management of skin disorders associated with an increase in sebum production, namely acne vulgaris. Salicylic acid 30% is often considered the gold standard in chemical peels for the treatment of acne vulgaris and has been proven to be very effective in the management of inflamed lesions in acne vulgaris and comedonal acne (Soleymani et al., 2018).

Indications of salicylic acid such as Acne vulgaris (whether inflamed or not), Rosacea acne, melasma, post inflammatory hiperpigmentation, freckles, lentigines, photodamage (mild to moderate), coarse textured skin. In other hand, the Contraindications of salicylic acid is Salicylic acid allergy, Excessive patient expectations, Active dermatitis / inflammation, Acute virus infection, Pregnant, The use of isotretinoin in the last 3-6 months (Soleymani et al., 2018).

Based on Lee's research who conducted a study of 35 patients in Korea with facial acne when treated with chemical peels of salicylic acid 30% for 12 weeks, inflammatory and non-inflammatory lesions were found to be reduced. Where one of the cause of acne is due to increased levels of sebum on the face (Lee et al., 2003). According to Chen's study, who claim that salicylic acid seems to be more effective than jessner solution for the treatment of non-inflammatory acne lesions. And this was proven in Chen's study, which compared 30% salicylic acid with jessner solution. The result is more effective salicylic acid to reduce the amount of blackheads (Chen et al., 2018). Chen also compares the combination of 30% salicylic acid plus 10% mandelic acid versus 35% glicolic acid. The result is the combination of salicylic acid and mandelic acid is better in reducing the amount of blackheads, papules, and pustules than glycolic acid (Chen et al., 2018).

The results of this study are also supported by the statement of Soleymani that Salicylic Acid is very effective in the management of diseases associated with increased sebum production, such as acne vulgaris. In fact, 30% salicylic acid is often regarded as the gold standard superficial peeling for the treatment of acne vulgaris (Soleymani et al., 2018).

So, in this study, skin sebum levels will be measured to see how much different levels of sebum in the skin before and after chemical peels with salicylic acid.

2 MATERIALS AND METHODS

This type of research is comparative research. The application of comparative research in this study was used to determine the comparison between sebum levels before chemical peels with 30% salicylic acid and after chemical peels with 30% salicylic acid. Fifteen subjects were recruited by nonprobability purposive sampling technique; anyone who meets the criteria will be included in the study. The inclusion criteria are: women aged 17-35 years old; belongs to Fitzpatrick skin type III, IV, or V; agreed to be involved throughout the experiment. On the other hand, anyone with hypersensitive to salicylic acid. The research located in Miracle Aesthetics Clinic Medan. The research material consisted of a 30% salicylic acid and instrument used to measure skin hydration was Janus Facial Skin Analysis System.

The stages of the research procedure are Gathering the subject, Fill in informed consent, the status of the research such as subject identity, subject history, taking photo documentation before chemical peeling and measurement of skin sebum levels before treatment with Janus Facial Skin Analysis System. After that, Apply 30% salicylic acid as much as 2.5 ml using brush. Wait a while until it reaches frosting (reddish colored covered like white powder). Then neutralize the post peel neutralizer containing sodium bicarbonate. After that, rinse your face with running water. Measure the skin sebum levels after treatment.



Figure 1: apply 30% salicylic acid as much as 2.5 ml using brush. Wait a while until it reaches frosting (reddish colored covered like white powder).



Figure 2: measure the skin sebum levels after treatment using Janus Facial Skin Analysis System.

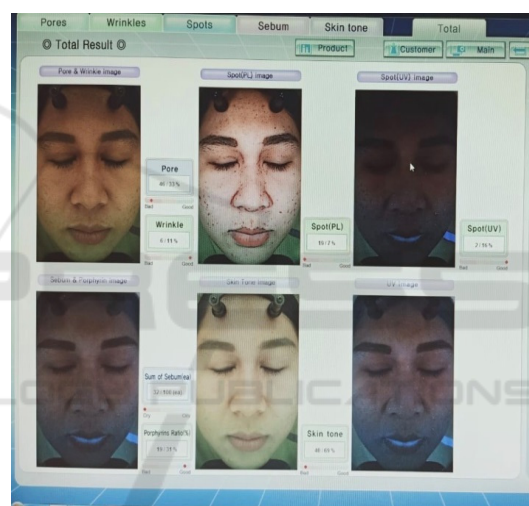


Fig 3. Showed the result of the skin sebum levels after peeling.

The results of skin sebum measurements were processed using the SPSS 13.0 for Windows Statistics Base Program. Furthermore, in this study, a normality test will be conducted from the data obtained. If the normality test results show that the numerical data is normally distributed, then it will be statistically tested by paired t-test.

3 RESULTS AND DISCUSSION

Table 1 shown the result of the 15 subjects assessed by age, gender, skin type and sebum levels before and after chemical peeling.

Table 1: Data of 15 Subjects

| No | Age | Gender | Fitzpatrick skin type | Sebum levels before | Sebum levels after |
|----|-----|--------|-----------------------|---------------------|--------------------|
| 1 | 30 | FM | V | 48% | 32% |
| 2 | 20 | M | V | 128% | 92% |
| 3 | 32 | FM | IV | 100% | 78% |
| 4 | 18 | FM | III | 72% | 68% |
| 5 | 23 | M | III | 108% | 90% |
| 6 | 33 | FM | IV | 55% | 50% |
| 7 | 28 | FM | IV | 45% | 43% |
| 8 | 25 | M | III | 60% | 45% |
| 9 | 24 | M | IV | 86% | 75% |
| 10 | 27 | FM | III | 76% | 65% |
| 11 | 31 | FM | III | 105% | 90% |
| 12 | 35 | FM | III | 89% | 80% |
| 13 | 22 | M | III | 68% | 50% |
| 14 | 26 | M | IV | 79% | 70% |
| 15 | 29 | FM | IV | 80% | 65% |

Based on Table 1, according to the age, the majority are aged <30 years old 66.7%, the rest are aged \geq 30 years 33.3%.

According to gender the majority are women 60.0%, the rest are men 40.0%. because women are more concerned with facial appearance and the average sample was found to be <30 years old, where at that age the sebum gland was still actively working so that sebum production was higher. Sebaceous glands in humans show age-related differences as determined by quantitative and qualitative examinations. Sebaceous secretions are low in children and begin to increase in the mid to late childhood under the influence of androgen hormones. This increase continues until the end of adolescence, after which there is no further significant effect until the end of life (Pochi et al., 1979).

According to Fitzpatrick's skin type, the majority are type III (46.7%), Fitzpatrick type IV (40.0%) and the rest are Fitzpatrick type V (13.3%). This is quite reasonable considering that Indonesia only has 2 seasons and located on the equator, while Fitzpatrick I and II mostly found in Caucasians.

Based on Table 2, The average levels of facial skin sebum before chemical peeling with salicylic

acid 30% is 79.93% with a standard deviation of 23.50. The average sebum after chemical peeling with salicylic acid 30% is 66.20% with a standard deviation of 18.72.

Normality test using the Shapiro-Wilk test, levels of skin sebum level before chemical peeling with 30% salicylic acid significance value > 0.05 , this implies the data are assumed to be normally distributed, then the data is then analyzed by paired T-test.

Correlation test was conducted in this study. The first test was carried out between skin sebum levels before and skin sebum levels after chemical peels. In Table 2, the value of sig. shows the number .000. Because this value <0.05 , it can be concluded that there is a correlation between the two variables tested; in this case the skin sebum levels before and after the chemical peeling procedure with 30% salicylic acid. The average skin sebum level before the procedure was 79.93%, while the average skin sebum level after the procedure was 66.20%. Decrease in skin sebum levels is said to be significant because the sig value <0.05 .

Table 2 correlation analysis of data before and after chemical peeling.

P0 (Skin sebum levels before peeling)

P1 (Skin sebum levels after peeling)

P2 (Skin sebum level before and after peeling)

| | Mean | N | Std. Deviation | Std. Error Mean |
|----|-------|------|----------------|-----------------|
| P0 | 79,93 | 15 | 23,496 | 6,067 |
| P1 | 66,20 | 15 | 18,724 | 4,835 |
| | | N | Correlation | Sig. |
| P2 | 15 | .946 | .000 | P2 |

Chemical peeling is the use of ingredients for skin exfoliation, with the purpose to exfoliate the existing epidermis and / or dermis to regenerate new epidermis and dermis tissue (Rendon et al., 2010).

In this study, chemical peels using 30% salicylic acid. The results showed sebum levels of skin after chemical peels with 30% salicylic acid tended to decrease. The results of this study are consistent with the results of previous studies that equally examined the effect of chemical peels with 30% salicylic acid by (Lee et al., 2003) who conducted a study of 35 patients in Korea with facial acne when treated with chemical peels of salicylic acid 30% for 12 weeks, inflammatory and non-inflammatory lesions were found to be reduced (Lee et al., 2003).

The results of this study are also supported by the statement of Soleymani that Salicylic Acid is difficult

to dissolve in water, but is very soluble in fat, coupled with its small molecular size, salicylic acid can easily, quickly and can penetrate the protective layer of fat from the epidermis (Soleymani et al., 2018). Clinically, it is very effective in the management of diseases associated with increased sebum production, such as acne vulgaris. In fact, 30% salicylic acid is often regarded as the gold standard superficial peeling for the treatment of acne vulgaris (Soleymani et al., 2018). According to Abdel-Motaleb, the histological image after chemical peeling with salicylic acid also shows the appearance of sebaceous glands surrounded by many inflammatory cells. This might cause a decrease in skin sebum levels (Abdel, 2017).

The number of sebaceous glands remains approximately the same throughout life, while their size tends to decrease with age. The function of the sebaceous glands is to secrete sebum. Androgens are famous for their effects on sebum excretion (Zouboulis, 2005). Based on Sugawara's research, which examined the relationship of age to sebaceous glands, it was found that, the area of sebaceous units was reduced and the depth of the maximum area was shallower in elderly female subjects compared with young female subjects. Therefore, the sebaceous glands are thought to shrink with age (Sugawara et al., 2019). According to Abdallah, which examines the comparison of sebum levels in men and women, the result is that sebum levels in men tend to be higher than women, this can be explained by the fact that skin sebum is mainly influenced by androgen hormones such as testosterone and dehydroepiandrosterone, whereas estrogen has the opposite effect in the function of the sebaceous glands. Androgens are also known to have an important role in the physiology of the sebaceous glands through modulation of sebum production (Abdallah et al., 2017).

4 CONCLUSIONS

Based on the results of research and discussion it was concluded that there was significant difference in skin sebum levels before and after chemical peeling salicylic acid 30%. The effect of reducing skin sebum levels may be caused by salicylic acid which penetrates the fat layer very well so that activity of the sebaceous glands can decrease. Clinically, this makes salicylate very effective for the management of skin disorders associated with an increase in sebum production, such as acne vulgaris.

REFERENCES

- Abdallah M, et al. Comparative Study of Male and Female Sebum Production. *The Egyptian Journal of Hospital Medicine*, 2017; Vol 69 (2), Page 1874-18
- Abdel – Motaleb AA., “Dermal morphological changes following salicylic acid peeling and microdermabrasion,” *J Cosmet Dermatol* 2017; 1-6
- Arif Tasleem. “Salicylic Acid as a Peeling Agent : a Comparative Review,” 2015; 455- 461. Available at : [https:// www.ncbi.nlm.nih.gov](https://www.ncbi.nlm.nih.gov)
- Bahtiar R. 2016. “Optimasi Formula Gel Asam Salisilat dengan Kombinasi Basis Karbomer dan HPMC menggunakan metode SLD,” 2016. Universitas Gadjah Mada.
- Berson DS, Cohen JL, Rendon MI, et al. “Clinical Role and Application of Superficial Chemical Peels in Today’s Practice,” *J Drugs Dermatol*. 2009; (9) : 803-811.
- Chen X, Wang S, Yang M, et al. “Chemical Peels for Acne Vulgaris : A Systematic Review of Randomised Controlled Trials,” *BMJ Open* 2018;8:e019607.doi:10.1136/bmjopen-2017-019607.
- Freedberg IM, Eisen AZ, Wolff K, Austen KF, Goldsmith LA, Katz SI. 2002. “Fitzpatrick’s Dermatology in General Medicine,” 2002. Edisi ke-6. Newyork: McGraw-Hill; Hlm. 109-675.
- Hassan KM, Benedetto AV. “Facial Skin Rejuvenation: Ablative Laser Resurfacing, Chemical Peels, or Photodynamic Therapy Facts and Controversies,” *Clin Dermatol*. 2013; 31(6):737–740.
- Lee HS, et al. “Salicylic Acid Peels For The Treatment of Acne Vulgaris in Asian Patients,” *Dermatol surg*. 2003;14725662.
- Pochi PE, et al. 1979. “Age Related Changes in Sebaceous Gland Activity,” *J Invest Dermatol*.
- Ptavitarsi DN, Setyaningrum T. “Chemical Peeling pada Melasma. Staf Medik Fungsional Ilmu Kesehatan Kulit dan Kelamin Fakultas Kedokteran Universitas Airlangga Surabaya,” 2012. *Berkala Ilmu Kesehatan Kulit & Kelamin* Vol 24 No. 1 pp 55-57.
- Rendon ML, Berson DS, Cohen JL, et al. “Evidence and Considerations in the Application of Chemical Peels in Skin Disorders and Aesthetic Resurfacing,” *J Clin Aesthet Dermatol*. 2010; 3 (7) : 32 – 43.
- Soleymani T., Lanoue J., Rahman Z., “A practical approach to chemical peels: A review of fundamentals and step-by-step algorithmic protocol for treatment,” *J Clin Aesthet Dermatol* 2018;11(8):21-28.
- Sugawara T, et al. 2019. Gender and Age Related Differences in Facial Sebaceous Glands in Asian Skin, as Observed by Non-Invasive Analysis Using Three Dimensional Ultrasound Microscopy. *Skin Res Technol*.
- Turnip, A., Andrian, Turnip, M., Dharma, A., Paninsari, D., Nababan, T., Ginting, C.N., 2020. *An application of modified filter algorithm fetal electrocardiogram signals with various subjects*, *International Journal of Artificial Intelligence*, vol. 18, no., 2020.
- Wijaya, C., Andrian, M., Harahap, M., Turnip, A., 2019. *Abnormalities State Detection from P-Wave, QRS*

Complex, and T-Wave in Noisy ECG, Journal of
Physics: Conference Series, Volume 1230, (2019)
012015. doi:10.1088/1742-6596/1230/1/012015.

Zouboulis CC. 2004. Acne and Sebaceous Gland Function.
Clin Dermatol.

