Efficacy of Micro Vibration Cleansing Device Compared with Conventional Facial Cleansing Method in Asian Skin: A Randomized Split-Face Clinical Trial

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ABSTRACT:

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Background: Excessive cleansing of the skin or the use of strong cleansing agents are considered harmful and may cause problems in the skin barrier. The micro vibration cleansing device was developed to adequately remove dirt in the skin pores.

Objective: To compare the efficacy and safety of micro vibration cleansing device with manual facial cleansing in pore tightening.

Methods: This was a prospective, randomized split-face clinical trial with a total of 23 subjects who presented with enlarged pores or fine wrinkles. All subjects received 1 treatment session and each side of the face was randomized to the method of cleansing ("treated" or "control"). The primary outcome measured was the improvement in pore tightening. Other parameters such as skin texture, wrinkles and moisture were also assessed. Evaluation were done at baseline and after the treatment session. Adverse reactions were also reported.

Results: All 23 subjects completed the study. After one session of facial cleansing, the mean pore volume on both groups decreased significantly when compared to the baseline (*p*-value =0.003 and 0.001). The mean difference was better in the treated group; however, it was not significant. In the treated group, a high magnification image of the skin captured using Antera3D® showed visible improvement of pore tightening immediately after cleansing when compared to the baseline. There were no adverse reactions recorded in the study.

Conclusion: The micro vibration cleansing device is safe and can be used as an adjunctive treatment in pore tightening.

Key words: Micro vibration, cleansing device, pore tightening

Introduction

Over the years, there has been an increase in the atmospheric particulate pollution due to human activities. Air pollution can be easily trapped in enlarged pores or rough skin, therefore increasing the prevalence of comedones and also skin-aging[1,2]. Dirty skin is an accumulation of soot, dust, natural skin by-products, sebaceous secretions and cosmetic products that remain trapped in the skin pores[3]. These results in a material that is very difficult to be remove by superficial cleansing.

Facial cleansing is the first step in every skincare routine and this remains a challenge because if the skin is inadequately or excessively cleaned, the skin barrier becomes compromised resulting in acute or chronic conditions that may require medical attention[4]. It is important to have a balance between the removal of excess sebum

and loosened comedones in the pores while maintaining an intact stratum corneum barrier[5].

At present, a wide variety of cleansing products have been developed, which includes soaps, lipid-free cleansers, cleansing sheets, peeling masks and facial scrubs. These agents have good cleansing efficacy but can cause more irritation to the skin. Cleansing devices have shown its efficacy and safety in cleaning the pores and also in the improvement of the skin barrier[5,6]. The novel cleansing device has an electronic micro vibration technology combined with an oscillatory brush that gently loosens and detaches the dirt from the skin surface. The produced mechanical energy in the device has an optimal amplitude and frequency to loosen the plug in the pores without causing trauma to the surrounding skin[3,5,6]. The vibrating technology is also used in electronic toothbrushes, since it was proven to have a better outcome in oral health compared to a manual toothbrush[7].

This study aims to compare the efficacy and safety of micro vibration cleansing device with manual cleansing in pore tightening.

Materials and methods

This was a prospective, single-center, split-face randomized controlled trial. A total of 23 subjects, with age ranging from 25 to 41 years old, with Fitzpatrick skin types IV to V, and presenting with enlarged pores or fine wrinkles were included in the study. Exclusion criteria included subjects who are pregnant or lactating, postpartum within the past 3 months, had skin infection, history of active or systemic infection, history of hypertrophic scar, eczema or sunburn in the area, psychological disorder, and those who received isotretinoin within 1 year before the study.

The investigational device was the micro vibration cleanser (LG Pra.L Dual Motion Cleanser®, LG Electronics Inc., Seoul, South Korea) suitable for gentle daily or deep pore cleansing. The device comes with 2 interchangeable micro fine oscillatory brush for either gentle or deep pore cleansing. The vibration and speed level can also be adjusted: level 1 for the weak left to right motion while level 2 for the strong left to right motion with vibration. The device has a maximum frequency of 12,000 vibrations per minute. It is waterproof and it comes with a UV LED charging cradle for hygienic purposes.

Prior to the study, the subjects were advised not to wear any make-up on the day of the treatment. All subjects received 1 treatment session and the method of cleansing (treated vs control) was randomized to either the left or right side of the face. Subjects were instructed to wash their face using 0.5 ml of the mild cleansing agent (SENKA Perfect Whip®, Shiseido Japan Co.,LTD) under the supervision of a well-trained research assistant. The treated side was cleansed using the micro vibration device set at level 2, while the

control side was cleansed by ordinary manual method. The duration of cleansing was controlled at 1 minute for each side, after which the subjects rinsed their skin thoroughly to remove the excess cleanser. No other medications were applied after cleansing.

The clinical evaluations were obtained at baseline and after the cleansing session. All subjects were photographed with identical camera settings, lighting, and positioning using a Canon PowerShot G9 stand-off camera (OMNIA imaging System, Canfield Scientific Inc., Fairfield, NJ).

The primary outcome was the improvement in pore tightening as assessed as skin volume using the Antera3D® (Miravex Limited, Dublin, Ireland) and the UVA-light video camera (Visioscan® VC 98, Courage + Khazaka Electronic GmbH, Köln, Germany). In addition, the wrinkles, skin texture, and moisture (reported as scaliness of the skin) were objectively evaluated using Visioscan® VC 98 and analyzed using the Surface Evaluation of the Living Skin (SELS) program. Prior to skin assessment, the subjects were acclimated to testing conditions for 15 minutes at a temperature of 20 ± 2˚C with a relative humidity of 50 ± 5% for both baseline and after cleansing. Adverse reactions such as pain and erythema were monitored throughout the study.

Descriptive analysis was used for the demographic data. The data were analyzed using paired t-test (normality) and repeated measure ANOVA for parametric distribution. The statistical analysis was performed using a statistical software (SPSS version 18.0; SPSS Inc., Chicago, USA), with *a p*-value < 0.05 indicating statistical significance. This study was approved by the ethics committee of the Siriraj Institutional Review Board. Written informed consent was obtained from all subjects prior to their enrollment in the study.

Results

All 23 subjects completed the study and were included in the final analysis. The demographic data of the subjects are described in Table 1.

Table 1 Demographic data of subjects enrolled in the study.

Characteristics	Total, n (%) (n=23)
Age, years (min – max)	34.9 ± 5.2 (25 - 41)
Sex, n (%)	
• Male	3 (17.4%)
• Female	20 (82.6%)
Fitzpatrick's skin type, n (%)	
• Type IV	10 (43.4%)
• Type V	13 (56.5%)

Table 2 Assessment of mean pore volume using Antera3D® on both groups from baseline and after treatment.

	Treated	Control	*p*-value
Baseline	0.21 ± 0.19	0.14 ± 0.14	
After Treatment	0.09 ± 0.08	0.07 ± 0.08	
Mean Difference	0.12 + 0.16	0.06 ± 0.02	0.165
***p*-value**	0.003*	0.001*	

** statistically significant at p < 0.05*

The assessment of pore volume using Antera3D® and Visioscan® VC 98 were presented in Tables 2 and 3, respectively. After one session of facial cleansing, the mean pore volume decreased significantly on both groups when compared to the baseline (*p*-value =0.003 and 0.001). The mean difference was better in the treated group compared with the control group; however, it was not statistically significant. A high magnification image of the skin captured using Antera3D® showed visible improvement of pore tightening immediately after cleansing when compared to the baseline (Figure 1). A high magnification image captured using Visioscan® VC 98 showed visible improvement in the wrinkles and roughness of the skin in the treated group when compared to the baseline (Figure 2). The clinical improvement of pore tightening is shown in Figure 3.

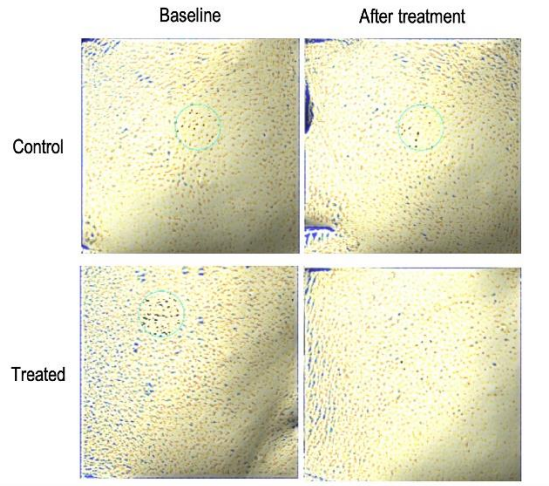

Figure 1 Clinical improvement in pore tightening was demonstrated in the photographs using Antera 3D® camera on both groups from baseline and after treatment.

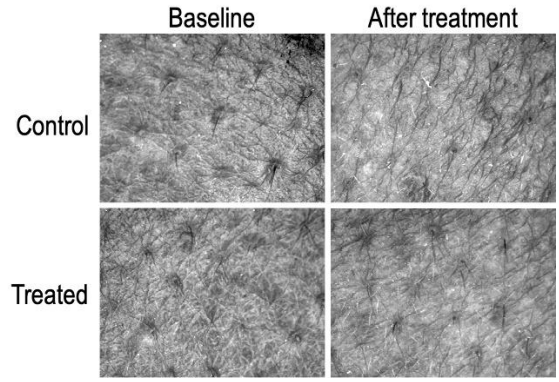

Figure 2 Clinical photographs of both groups using Visioscan® VC 98 at baseline and after one treatment session.

The objective evaluation of skin texture, moisture and wrinkles using Visioscan® VC 98 were presented in Table 4. In terms of smoothness, the results on both groups decreased significantly when compared to the baseline (*p*-value= <0.001). However, the difference between both groups was not statistically significant. The skin roughness on both groups increased significantly when compared to the baseline (*p*-value= 0.003 and 0.049), but the difference between both groups was not statistically significant. The number of wrinkles on both groups also increased when compared to the baseline, but it was not statistically significant. The moisture level of the stratum corneum decreased on both groups, however it was not significant. There were no adverse reactions such as discomfort, skin irritation, erythema or abrasion recorded during the study.

Figure 3 Clinical photographs of both groups at baseline and after one treatment session.

Table 3 Assessment of mean pore volume using Visioscan® VC 98 on both groups from baseline and after treatment.

	Treated	Control	p-value
Baseline	106.96 + 7.82	106.65 ± 9.14	
After Treatment	98.70 ± 8.37	98.13 ± 10.25	
Mean Difference	8.26 ± 10.04	8.52 ± 12.12	0.937
***p*-value**	0.001*	0.003*	

** statistically significant at p < 0.05*

Table 4 Evaluation of skin texture, moisture (reported as scailiness) and wrinkles using Visioscan® VC 98.

		Baseline	After the treatment	Mean Difference	*p*-value
Smoothness					
	Treated	114.75 ± 25.63	81.52 ± 20.73	-33.23 ± 23.75	< 0.001*
	Control	118.66 ± 22.92	85.11 ± 21.65	-33.55 ± 23.40	< 0.001*
	p-value			0.963	
Roughness					
	Treated	3.39 ± 0.89	4.06 ± 1.30	-0.68 ± 0.95	0.003*
	Control	3.49 ± 0.92	4.03 ± 1.34	-0.53 ± 1.23	0.049*
	p-value			0.664	
Wrinkle					
	Treated	35.99 ± 3.27	36.32 ± 3.95	-0.33 ± 4.68	0.737
	Control	36.40 ± 4.53	36.48 ± 4.52	-0.08 ± 4.15	0.927
	p-value			0.848	
Scailiness					
	Treated	0.92 ± 0.44	1.12 ± 0.43	-0.20 ± 0.66	0.153
	Control	0.81 ± 0.24	1.00 ± 0.39	-0.18 ± 0.50	0.088
	p-value			0.912	

** statistically significant at p < 0.05*

Discussion

Cleansers were developed to remove dirt, sweat, sebum, and oil in the skin, and the cleansing process promotes its normal exfoliation for skin rejuvenation[8]. In patients with comedones, facial cleansing is essential to remove excess sebum and prevent hair follicular obstruction however, intensive washing can cause skin barrier impairment and dry skin[9]. There are many cleansing products available in the market, but the method is still user-dependent and can lead to inconsistent cleansing.

The bidirectional motion of the electronic skin brush can gradually break the adhesions between the acroinfundibulum and the comedones[4]. In a previous study, the sonic brush significantly removed more sebum, soil, and pollutants in the skin after only 1 treatment session compared to manual cleansing[3]. In another study, majority of the subjects agreed that their pores were deeply cleaned after using the sonic brush[6]. This finding was consistent with the results of our study, wherein there was a significant improvement in the mean pore volume when compared to the baseline. The mean pore difference was also better compared to the control group; however, it was not significant.

The combined use of facial massaging device with an anti-aging cream after 8 weeks showed significant improvement in wrinkles, skin texture, and sagging[10]. However, in our study we did not see any improvement in terms of wrinkles and skin texture. Effective cleansing and moisturizing right after helps to manage the pH level of the skin to enable sufficient water retention[5]. In our study, there was a drop of moisture level after using the device when compared to the baseline, but it was not statistically significant. This could depend on the type of cleanser use[11]. Hence, we advice application of moisturizers after cleansing to maintain the moisture of the skin Other benefits of using a sonic oscillatory cleansing brush include the reduction of non-inflammatory acne lesions after 12 weeks, compared to manual cleansing[12].

The recommended use of the micro vibration cleansing device (LG Pra.L Dual Motion Cleanser®) was twice a day, but in this clinical trial, we only used it in one treatment session, which could possibly be a factor with the insignificant findings. Therefore, further clinical studies with more frequent use and longer treatment period were recommended to evaluate for wrinkle reduction and skin texture improvement. The clinical results of our study were subtle and more treatment sessions were probably needed to achieve a better outcome. Our study was limited by small sample size and a short study duration. We recommend conducting larger randomized controlled trials in the future.

Conclusion

The micro vibration cleansing device is safe and can be used as an adjunctive treatment for pore tightening.

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