Improvement of conspicuous skin pores with a serum containing supramolecular retinol, pyridoxine, salicyloyl phytosphingosine and lactobionic acid

Poster ID
BI_358

Ye,Ying[1]; Li,Yanan[1]*; Jiang,Ligang[1]
[1]Research & Innovation Center, Proya Cosmetics Co. Ltd, Hangzhou, China
*Li, Yanan, 588 Xixi Road, Hangzhou, Zhejiang, China, Tel: +86 156 1840 6966, e-mail: liyanan@proya.com

Introduction:

Conspicuous skin pores generate many aesthetic concerns or complaints. Despite the prevalence of conspicuous skin pores, there have been few published articles of topical cosmetics treatment to improve the appearance of conspicuous pores. Generally, pores are considered as conspicuous pores when the opening becomes visible to the naked eye and the facial appearance is compromised[1].

Many causes are associated with conspicuous pores, including endogenous factors (such as genetics, aging, skin dehydration, lack of collagen, excessive secretion by the sebaceous glands, and hormones) and exogenous factors (such as sun exposure damage and inappropriate external compression)[2]. There are three major clinical causes[3-5]:

- **Excessive sebum excretion**
  In general, people who secrete a large amount of sebum and face areas where produce more sebum have wider and conspicuous pores. It has been reported that sebum output level is the most important cause for pore enlargement relative to elasticity and other factors[6].
- **Decreased elasticity around pores**
  Usually, the medial cheek has an oval shape with long pores and they become more visible as a decrease in skin elasticity with aging[7,8]. The age-related loss of dermal integrity and perifollicular structural support may result in enlarged pores.
- **Increased hair follicle volume**
  Pore volume might be decreased because of hair removal.

Nowadays there have been many attempts to develop cosmetic ingredients able to effectively relieve facial skin pores[9]. Conspicuous pores can be treated with sebum secretion suppression therapies such as isotretinoin[10], niacinamide[11] or salicylic acid. Various dermal therapies that plump up the dermis could be applied in treating conspicuous pores, such as tretinoin[12] or α-hydroxy acid(AHA)[13].

The test product was a serum formulated with 0.8% supramolecular retinol, 0.1% pyridoxine, 0.1% salicyloyl phytosphingosine and 0.1% lactobionic acid, designed to target conspicuous skin pores though inhibiting sebum production, increasing dermal collagen, as well as exfoliation on the skin surface. Supramolecular retinol is a stable structure with retinol encapsulated through cavitation in hydroxypropylγ-cyclodextrin, designed to reduce irritation and increase bioavailability through a sustained release technique. Along with retinol, salicyloyl phytosphingosine[14] and lactobionic acid[15] help to prevent and restore photodamaged skin. In addition, pyridoxine regulates the secretion of sebum and thus prevents blocked pores. The purpose of our study was to evaluate the efficacy and tolerability of the serum.

Materials & Methods:

Clinical research

A randomized, double-blind study was conducted between October and November 2020 in Shanghai, China. Thirty-three healthy females aged 24-58 with conspicuous facial pores (clinical score≥2 according to skin aging atlas[16]) were screened and enrolled by experienced technicians in the 4 week clinical study. Before enrollment, each subject signed written informed consent. All the study procedures were carried out under temperature and humidity-controlled conditions (temperature 21±1℃ and relative humidity 50±10%). Subjects were instructed to clean their face with an assigned cleanser and acclimate to the controlled conditions for 30min before measurements. Before the clinical study, the serum had passed a 24-h occlusive patch test and proved no adverse effects.

Subjects were not pregnant, nursing, or intending to become pregnant during the study. Subjects with skin disease, aesthetical or dermatological treatment that may interfere with the study, allergy to cosmetic products, toiletries, sunscreens were excluded from the study. Subjects were instructed to apply the serum on facial conspicuous pores first and then mix the serum with basic skincare lotion, and subsequently use the mixture on the entire face. Subjects were also asked to cooperatively use sunscreen in the daytime.

- **Measurement of skin pores**
  - ✓ Skin pore number and average area were measured by Visia-CR imaging system combined with Image-Pro Plus7.0. Visia-CR allows visualize skin conditions and analyze skin pores on the forehead, nose, cheek and jaw under cross-polarized image photography[17].
  - ✓ Visia captures images to quantify the feature counts and visualize the cheek pores with its built-in analysis software.
  - ✓ Dermatologists assessments were also performed to evaluate the pore size based on published grading atlas[16], which classifies facial pores into six grades (range from 0-5).
- **Measurement of sebum output level** The sebum content was measured by Sebumeter on the same site on the cheek (next to the nose) at each test time point.
- **Measurement of dermal density and thickness** Dermal density and thickness were measured by Ultrascan UC22. The dermal thickness and dermal density increase with more collagen content.
- **Measurement of skin smoothness** Skin smoothness (SEsm) was measured on the cheek (next to the nose) by VisioscanVC 20Plus and software SELS.The smaller the SEsm, the smoother and more homogeneous the skin surface.
- **Subject self-assessment** Subjects were instructed to complete a self-perceived assessment via a questionnaire comprising efficacy, tolerance and preference at each follow-up visit. Assessments were made on facial skin conditions as totally agree, agree, neutral, disagree or totally disagree. The subjects who agree or totally agree were counted; the higher the percentage, the higher the agreement.

Statistics

Data were reported as Mean±Standard Error of Media(SEM). All statistical analyses were carried out by SPSS. Statistical significance of instrumental data was performed by paired Student's t-test and visual grading by Wilcoxon signed rank test. Results were considered significantly different when $P < 0.05$ (*$P < 0.05$ vs. baseline, **$P < 0.01$ vs. baseline). Improvement degree of each parameter was expressed a change of percent, which was defined as: Decrement or Increment rate(%) = [(After treatment (2weeks or 4weeks) - Before treatment (baseline)] / Before treatment (baseline).

Results & Discussion:

1. Improvements in the appearance of conspicuous pores after 4 weeks' application

- Visia-CR&IPP results showed that the pore number and pore area (%) on the forehead, nose, jaw and cheek experienced significant reduction to varying degrees(Table1). There were significant differences compared between baseline and 4 weeks on sites like nose, jaw and cheek, and there showed a tendency to decrease on the forehead, indicating that the serum benefits to the entire facial pores.
- Visia results demonstrated that feature counts of identified pores significantly decreased. Exemplary images from Visia showed improvements in pore numbers and density observed at 4 weeks compared with baseline(Figure1).
- Dermatologist evaluations showed that visual grading significantly declined(Figure2), which is consistent with instrumental results, further verifying effective improvements in the appearance of pores and texture.

Table1 Statistical analysis of the skin pores in five sites by Visia-CR

Parameter	Site	Week	Mean	SEM	P-value	Decrement (%)
Pore number	forehead	0	208.12	0.65	-	-
		2	206.24	0.55	0.136	-0.90%
		4	204.00	0.54	0.059	-1.98%
	nasal tip	0	106.73	0.37	-	-
		2	103.27	0.37	0.001	-3.24%
		4	103.03	0.37	0.000	-3.46%
	nasal alae	0	75.27	0.25	-	-
		2	73.48	0.25	0.004	-2.38%
		4	72.09	0.25	0.000	-4.23%
	jaw	0	141.18	0.70	-	-
		2	137.52	0.76	0.009	-2.60%
		4	135.12	0.66	0.003	-4.29%
	cheek	0	170.73	0.52	-	-
		2	166.06	0.47	0.001	-2.73%
		4	164.70	0.47	0.000	-3.53%
Pore area(%)	forehead	0	8.44	0.04	-	-
		2	8.33	0.03	0.144	-1.20%
		4	8.18	0.03	0.071	-3.06%
	nasal tip	0	8.20	0.04	-	-
		2	8.08	0.04	0.087	-1.42%
		4	7.83	0.04	0.002	-4.48%
	nasal alae	0	9.17	0.04	-	-
		2	8.89	0.04	0.004	-2.97%
		4	8.89	0.04	0.004	-3.05%
	jaw	0	5.32	0.04	-	-
		2	5.23	0.04	0.140	-1.71%
		4	5.13	0.04	0.046	-3.69%
	cheek	0	8.15	0.03	-	-
		2	7.99	0.04	0.008	-1.98%
		4	7.85	0.04	0.000	-3.62%

Figure1 Exemplary Visia images showed minimized pores. Subject 27, female, 37 y old, Chinese.

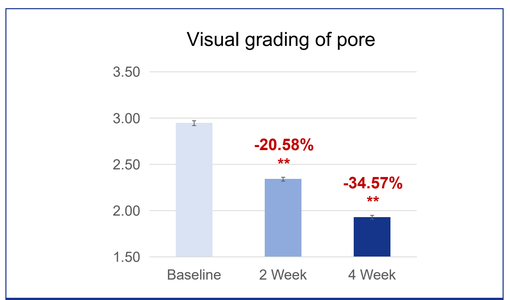

Figure2 Improvement of visual grading of pore. Improvement (%) are also presented

2. Improvements in sebum output level, skin smoothness, dermal density and thickness after 4 weeks' application

- The sebum output content on the cheek decreased by 5.76% after 2 weeks' application, and continued to significantly decrease by 18.90% at the end of 4 weeks' application, which proved the efficacy of inhibiting sebum production and reducing sebum content left on the skin (Figure3a).
- The value of SEsm significantly decreased by 16.43% and 17.85% at 2 and 4 weeks, respectively, indicating that subjects' cheek surface began to be smoother and more homogenous by 2 weeks and experienced further improvement until 4 weeks (Figure3b).
- The dermal density and thickness rarely changed at 2 weeks, and significantly increased at 4 weeks (Figure3c). Dramatic effects began to be detected at 4 weeks implies the gradual process of the serum exerting efficacy on dermal collagen and a recommended treatment period of more than 2 weeks.

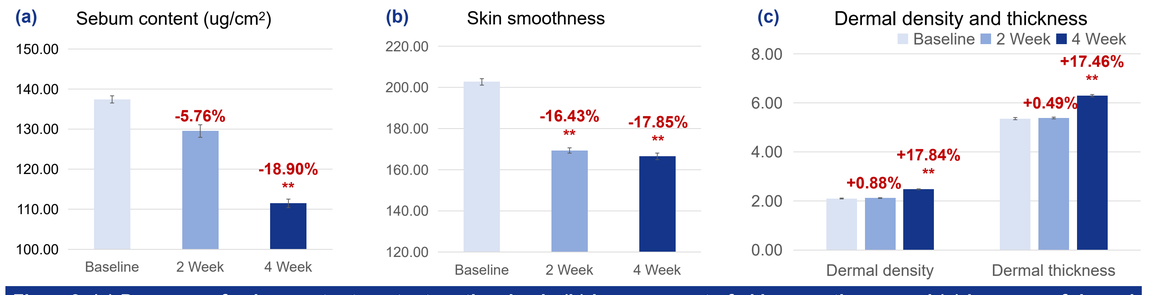

Figure3. (a) Decrease of sebum output content on the cheek, (b) improvement of skin smoothness and (c) increase of dermal density and thickness by the serum. Improvement(%) are also presented

3. Subject self-assessment on facial skin conditions including sebum output level, appearance of conspicuous pores, skin smoothness and overall improvements

- Based on the questionnaire, more than 75% of the participants agree with all 6 evaluation statements. The serum was well tolerated by all subjects in the study and 97% of the participants felt comfortable during the course of the study and wished to continue using it. 94% and 91% of the subjects showed improvement in microcomedones and facial surface oil that can directly lead to microcomedones. In addition, 88% ,79% and 76% of the subjects experienced improvement in skin elasticity, smoothness and appearance of visible pores, respectively.
- Overall the serum was highly rated on performance and well accepted on tolerance by subjects.

Conclusions:

By patch test, instrumental measurements, dermatologist evaluations and subject self-assessments, the serum can effectively minimize pores, decrease sebum production, stimulate collagen accumulation and improve the smoothness of the skin surface. For those with conspicuous skin pores and anti-aging needs, this serum provides a good cosmeceutical ingredients solution.By patch test, instrumental measurements, dermatologist evaluations and subject self-assessments, the serum can effectively minimize pores, decrease sebum production, stimulate collagen accumulation and improve the smoothness of the skin surface. For those with conspicuous skin pores and anti-aging needs, this serum provides a good cosmeceutical ingredients solution.

References:

1.Flament F, Francois G, Qiu H, Ye C, Hanaya T, Batisse D, Cointereau-Chardon S, Seixas M D, Dal Belo S E, Bazin R (2015) Facial skin pores: a multiethnic study. Clin Cosmet Investig Dermatol 8: 85-93.
2.Qian W, Zhang Y K, Hou Y, Lyu W, Cao Q, Li Y Q, Fan J F (2018) Effect analysis of intradermal hyaluronic acid injection to treat enlarged facial pores. J Cosmet Dermatol 17: 596-599.
3.Lee S J, Seok J, Jeong S Y, Park K Y, Li K, Seo S J (2016) Facial Pores: Definition, Causes, and Treatment Options. Dermatol Surg 42: 277-285.
4.Hameed A, Akhtar N, Khan H M S, Asrar M (2019) Skin sebum and skin elasticity: Major influencing factors for facial pores. J Cosmet Dermatol 18: 1968-1974.
5.Yu W, Han Y, Wu X, Shang Y, Ying H, Ma G, Liu Y, Lin X (2019) A split-face randomized controlled trial of treatment with broadband light for enlarged facial pores. J Dermatolog Treat 1-5.
6.Roh M, Han M, Kim D, Chung K (2006) Sebum output as a factor contributing to the size of facial pores. Br J Dermatol 155: 890-894.
7.Jung H J, Ahn J Y, Lee J I, Bae J Y, Kim H L, Suh H Y, Youn J I, Park M Y (2018) Analysis of the number of enlarged pores according to site, age, and sex. Skin Res Technol 24: 367-370.
8.Jang S I, Kim E J, Lee H K (2018) A method of evaluating facial pores using optical 2D images and analysis of age-dependent changes in facial pores in Koreans. Skin Res Technol 24: 304-308.
9.Joanna, Dong, Julien, Lanoue, Gary, Cutis G J (2016) Enlarged facial pores: an update on treatments.Cutis 98: 33-36.
10.Zouboulis C C (2006) Isotretinoin revisited: pluripotent effects on human sebaceous gland cells. J Invest Dermatol 126: 2154-2156.
11.Draelos Z D, Matsubara A, Smiles K (2006) The effect of 2% niacinamide on facial sebum production. J Cosmet Laser Ther 8: 96-101.
12.Anne B (2015) A double-blind randomized study comparing the association of Retinol and LR2412 with tretinoin 0.025% in photoaged skin. J Journal of cosmetic dermatology 14: 40-46.
13.Kim S J, Baek J H, Koh J S, Bae M I, Lee S J, Shin M K (2015) The effect of physically applied alpha hydroxyl acids on the skin pore and comedone. Int J Cosmet Sci 37: 519-525.
14.Pavicic T, Wollenweber U, Farwick M, Korting H C (2007) Anti-microbial and -inflammatory activity and efficacy of phytosphingosine: an in vitro and in vivo study addressing acne vulgaris. Int J Cosmet Sci 29: 181-190.
15.Grimes P E, Green B A, Wildnauer R H, Edison B L (2004) The use of polyhydroxy acids (PHAs) in photoaged skin. Cutis 73: 3-13.
16.Flament F, Bazin R (2010) Skin Aging Atlas Volume 2: Asian Type.
17.Dąbrowska M, Mielcarek A, Nowak I (2018) Evaluation of sex-related changes in skin topography and structure using innovative skin testing equipment. Skin Res Technol 24: 614-620.
18.Farwick M, Watson R E, Rawlings A V, Wollenweber U, Lersch P, Bowden J J, Bastrilles J Y, Griffiths C E (2007) Salicyloyl-phytosphingosine: a novel agent for the repair of photoaged skin. Int J Cosmet Sci 29: 319-329.
19.Mizukoshi K, Takahashi K (2014) Analysis of the skin surface and inner structure around pores on the face. Skin Res Technol 20: 23-29.
20.Sugiyama-Nakagiri Y, Sugata K, Iwamura M, Ohuchi A, Kitahara T (2008) Age-related changes in the epidermal architecture around facial pores. J Dermatol Sci 50: 151-154.