



Application of Phased Radiofrequency Microneedles in Periorbital Rejuvenation

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Abstract: Objective: For analysis on the application effect of phased radiofrequency microneedles in periorbital rejuvenation. Methods: A total of 106 patients who received orbital repair treatment in the author's unit from 2019 to 2021 were selected as research objects and were divided retrospectively into observation group and control group according to different treatment methods, with 53 patients in each group. The control group was treated with botulinum toxin type A repair therapy, and the observation group was treated with phased radio frequency microneedle repair therapy on the basis of the control group. The periorbital skin texture, wrinkles and static wrinkles before and after treatment were compared between the two groups. Results: After 2 weeks of treatment, the periorbital wrinkle and texture based evaluation value and static wrinkle score of 2 groups were decreased to different degrees, and the observation group was lower than the control group, with statistical significance ($P < 0.05$). After 1 month and 3 months of treatment, the periorbital wrinkle and texture evaluation value and static wrinkle score of the observation group were lower than those of the control group, with statistical significance ($P < 0.001$). Conclusion: Phased radiofrequency microneedles are beneficial to the rejuvenation of periorbital skin with satisfactory repair effect.

Keywords: phased radio frequency microneedles, periorbital rejuvenation, wrinkles

Some practices have shown[1] that the essence of periorbital aging is the qualitative and quantitative change of periorbital soft tissue structure, which is a dynamic and involved degenerative change occurring in periorbital subcutaneous tissue, expression muscle and deep tissue, which directly leads to local tissue sagging and displacement, resulting in periorbital aging.

The orbital circumference with eyes as center, is an important part of facial beauty. The injection of botulinum toxin type A has been used to improve periorbital aging and muscle relaxation, but its improvement effect on static lines is not ideal[2]. With the advent of phased radio frequency microneedles, many facial rejuvenation problems have been solved in clinical practice.

The mechanism of radiofrequency microneedles is to use the insulated tip to release energy and achieve a higher temperature in the dermis without thermal damage, so as to stimulate the regeneration and remodeling of dermal collagen and thus promoting local skin tightness[3]. In order to further analyze the application effect of phase-controlled radiofrequency microneedles in periorbital rejuvenation, 106 patients with periorbital repair were selected in this study, and the results are reported as follows.

1. Recipients and method

1.1 Recipients data

A total of 106 patients who received orbital repair from 2019 to 2021 were selected as the study recipient, and were retrospectively divided into observation group and control group according to different treatment methods, with 53 cases in each group. General data of control group: ① Gender: male 8 cases, female 45 cases; ② The average age was (35.8 ± 2.5) years old, ranging from 29 to 55 years old. The general data of the observation group were as follows: ① Gender: 6 males and 47 females; ② The average age was (35.6 ± 2.3) years old, ranging from 30 to 55 years old. The general data of the two groups were included in statistical analysis, and the results showed no statistical significance ($P > 0.05$).

1.2 Inclusion criteria

All 106 patients, aged between 29 and 55 years old, received reparative therapy in the author's work unit. All patients voluntarily received reparative therapy and signed informed consent. Exclusion criteria: ① Patients with allergic reaction, allergy to botulinum toxin and lidocaine; ② Patients with coagulopathy; ③ Patients with severe infectious diseases; ④

Patients with a pregnancy plan within six months; (5) Treatment of patients with local damaged and active skin diseases; (6) Patients with a history of sun exposure and invasive treatment within 1 month; (7) Lactation patients; (8) Patients who cannot be followed up and revisited on time[4].

1.3 Methods

Control group was treated with botulinum toxin Type A for injection (Commodity Name: BOTOX, provided by Allergan Company with drug registration certificate No. S20171005). Standard injection method was adopted, covering crow's feet, wrinkles and forehead lines. According to the distribution of wrinkles in different patients, the injection sites of periorbital expression lines were determined, and 3-6 spots were injected into crow's feet each time.

100U Botulinum toxin +0.9% normal saline solution (2.5ml) was taken and injected into each site about 2-4U. All patients were uniformly given subcutaneous injection at the designated site with 30G needle. After each injection, local pressure was applied for 1-5min to reduce swelling and congestion. Patients were observed for 20min after botulinum toxin injection, and treated as normal if no abnormality was found.

Observation group was injected with botulinum toxin Type A after 1 week of phase controlled RF microneedle repair treatment, the injection method was the same as that of control group. The phased microneedle RF device is provided by EndyMed Israel, model 3Deep. The size of microneedle treatment head is 7×7 needle body, the matrix is arranged on the square panel of about 1cm, the tip of about 0.33mm is non-insulating material, and the rest is insulating material.

Operation parameters: (1) The energy was in the range of 6-8W; (2) The action time lasts 500ms; (3) The action depth was 1.2mm for temporal and outer canthus, and 0.8mm for eyelid. One hour before treatment, the patient was instructed to take 1 capsule of Fenbeide orally, and evenly applied 5% compound lidocaine cream (Tongfang Pharmaceutical Group, national drug approval number H20063466) on the surface of the patient's periorbital skin for local surface anesthesia. One hour later, the anesthetic was wiped clean, and then phased microneedle radiofrequency repair was performed after local cleaning, and the lower eyelid and temporal side were treated twice. Cold compress for 2h after radiofrequency therapy.

All patients should be away from water for 24h after treatment.

1.4 Evaluation indicators

All patients were followed up. Skin analyzer (VISIA) was used to analyze periorbital skin texture and wrinkles at the time of enrollment, 2 weeks of treatment, 1 month of treatment, and 3 months of treatment, respectively.

The patients' periorbital static wrinkles were evaluated according to the wrinkle grading method at different time of treatment (Enrollment, 2 weeks of treatment, 1 month of treatment, and 3 months of treatment)[5]. The specific grading was as follows: (1) 1-3 points, which was judged as mild wrinkles; (2) 4-6 points, judged as moderate wrinkles; (3) A score of 7-9 is judged as severe wrinkles. The average score was calculated according to the score of each group, and the score of the two groups was compared. The higher the final score was, the more obvious the periorbital wrinkles were.

1.5 Statistical analysis

All data in this study were processed by software SPSS24.0 and collected by the author. Statistical value $P < 0.05$ indicates statistically significant difference. The statistical data were expressed in the form of "n(%)" and χ^2 test was used. Relevant measurement data are expressed in the form of " $\bar{x} \pm s$ ". The pair comparison of data is achieved with group sample t test, and F test is adopted for the comparison of data at different times.

2. Results

2.1 Analysis of the changes of periorbital wrinkles and texture in patients with different repair times

At the time of enrollment, there was no statistical significance in the evaluation of periorbital wrinkles and texture between the two groups ($P > 0.05$). After 2 weeks of treatment, the evaluation values of periorbital wrinkles and texture in 2 groups were decreased to different degrees, and the observation group was lower than the control group, with statistical significance ($P < 0.05$). After 1 month and 3 months of treatment, the evaluation values of periorbital wrinkles and texture in the observation group were lower than those in the control group, the difference was statistically significant ($P < 0.001$). See Table 1 and Table 2.

Table 1. Comparison of periorbital wrinkles ($\bar{x} \pm s$)

| Groups | Cases | Enrollment | After 2 weeks of treatment | After 1 month of treatment | After 3 months of treatment |
|-------------------|-------|------------|----------------------------|----------------------------|-----------------------------|
| Observation group | 53 | 88.4±7.9 | 76.5±9.8 | 52.9±7.3 | 40.2±7.6 |
| Control group | 53 | 88.2±7.5 | 80.7±9.3 | 58.1±6.8 | 56.3±7.1 |
| <i>T value</i> | - | 0.134 | 2.263 | 3.795 | 11.270 |
| <i>P value</i> | - | 0.894 | 0.026 | 0.000 | 0.000 |

Table 2. Comparison of periorbital texture ($\bar{x} \pm s$)

| Groups | Cases | Enrollment | After 2 weeks of treatment | After 1 month of treatment | After 3 months of treatment |
|-------------------|-------|------------|----------------------------|----------------------------|-----------------------------|
| Observation group | 53 | 54.7±8.2 | 47.5±6.2 | 30.8±7.5 | 25.6±7.1 |
| Control group | 53 | 55.1±7.9 | 50.3±6.8 | 36.2±7.8 | 32.0±7.5 |
| <i>T value</i> | - | 0.256 | 2.215 | 3.633 | 4.512 |
| <i>P value</i> | - | 0.799 | 0.028 | 0.000 | 0.000 |

2.2 Assessment of periorbital static wrinkles in patients with different repair times

At the time of enrollment, the static wrinkle scores of the two groups were similar, $P > 0.05$. After 2 weeks of treatment, the static wrinkle scores of 2 groups were decreased to different degrees, $P < 0.05$. At 1 month and 3 months of treatment, the static wrinkle score of observation group was lower than that of control group, $P < 0.001$. See Table 3.

Table 3. Comparison of periorbital wrinkles at different repair times between the two groups ($\bar{x} \pm s$)

| Groups | Cases | Enrollment | After 2 weeks of treatment | After 1 month of treatment | After 3 months of treatment |
|-------------------|-------|------------|----------------------------|----------------------------|-----------------------------|
| Observation group | 53 | 8.4±0.5 | 6.2±0.4 | 3.7±0.5 | 2.3±0.2 |
| Control group | 53 | 8.4±0.4 | 6.4±0.5 | 5.1±0.4 | 4.2±0.2 |
| <i>T value</i> | - | 0.000 | 2.274 | 15.9175 | 48.904 |
| <i>P value</i> | - | 1.000 | 0.025 | 0.000 | 0.000 |

3. Discussion

Periorbital aging is an important topic in cosmetic surgery of peri-orbital rejuvenation. However, the periorbital anatomy is a complex process, with distribution of the eyeball and a rich network of dynamic and venous blood, which requires high safety during tissue repair. A certain effect has been achieved for the previous injection of botulinum toxin Type A to repair the periorbital skin tissue.

However, it is mainly effective for dynamic wrinkles, and the improvement effect is limited if the static periphery caused by changes in skin elasticity and texture, and the injection of botulinum toxin into lower eyelid may also lead to local relaxation and blepharoplasty relaxation[6]. Relevant studies have shown[7] that the main factors of structural and functional degradation of tissues around the eyes are that with the increase of age, collagen structure changes and the synthesis ability of fibroblasts around the orbit decreases. At the same time, collagen level decreases, the skin gradually loses elasticity and becomes thinner, dermal fibers break and sebaceous gland secretion decreases, and the skin gradually appears dryness, wrinkles and relaxation.

Phased radio-frequency microneedles are a integration of invasive radio-frequency technology and dot matrix principle. By using microneedles with insulating coating to act on and treat tissues at different depths, it has been proved that they can increase the secretion and expression of some collagen fibers in tissues and promote the rapid regeneration and recombination of collagen in the dermis[8].

In this study, the phased radio frequency microneedles were applied to the patients undergoing orbital repair. The results showed that after 2 weeks of treatment, the periorbital wrinkles and texture evaluation values and static wrinkle scores of the two groups were decreased to different degrees, and the observation group was lower than the control group, with statistical significance ($P < 0.05$). After 1 month and 3 months of treatment, the periorbital wrinkle and texture evaluation value and static wrinkle score of the observation group were lower than those of the control group, with statistical significance ($P < 0.001$). These results indicate that the phase-controlled radiofrequency microneedles have satisfactory repair effects of

orbital rejuvenation, and can significantly improve orbital static wrinkles and texture states. The author believes that the advantages of phased RF microneedles are as follows: ① Precise delivery of energy to the target tissue can be used to avoid the damage to the epidermis; ② The thickness and depth of the action are controllable; ③ Radiofrequency waves act on water molecules in tissues and can avoid the problem of hyperpigmentation[9]. In addition, parameters can be set for the phased RF microneedles according to the patient's skin conditions during the treatment process, and the patients have better tolerance and acceptance.

In conclusion, the phased radiofrequency microneedles are beneficial to the repair of periorbital skin tissue, and can effectively improve the static wrinkles and texture state of periphery, which has positive significance for the rejuvenation of periphery.

References

- [1] Wu Yalong. Analysis on the efficacy and safety of middle facial lifting combined with blepharoplasty in the treatment of patients with periorbital skin wrinkles[J]. *Practical Clinical Journal of Integrated Traditional Chinese and Western Medicine*,2020,20(4):150-152.
- [2] Zhang Yi. Effects of comprehensive nursing intervention on self-care ability and psychological state of periorbital skin wrinkle plastic surgery[J]. *Inner Mongolia Medical Journal*, 2021,53(5):624-625,628.
- [3] Ma Tao, Weng Rui, Zheng Yongsheng. Clinical effect of acupuncture and botulinum toxin A injection in the treatment of periorbital dynamic wrinkles[J]. *Chinese Journal of Medical Aesthetics and Cosmetology*,2016,22(3):133-136.
- [4] Kang Hanmei, Li Kai, Song Wenting, et al. Study on the effectiveness and safety of multi-source phased array radiofrequency in treating severe static wrinkles around orbit[J]. *Practical Journal of Dermatology*, 2021,14(6):343-346.
- [5] Li Fengying, Xiong Jianguai, Feng Chengcheng. Application of gold microneedles combined with hyaluronic acid in facial skin rejuvenation[J]. *Chinese Journal of Aesthetic Medicine*,2020,29(9):38-40.
- [6] Wang Xueli, Zhou Yesong. Clinical effect of interventional single microneedle radiofrequency technique in the treatment of lower eyelid wrinkles with eye bags[J]. *China Medical Cosmetology*, 2021,11(11):5-8.
- [7] Colvan Lora, Fleck Tina, Vega Virginia. Global periorbital skin rejuvenation by a topical eye cream containing low molecular weight heparan sulfate (LMW-HS) and a blend of naturally derived extracts[J]. *Journal of cosmetic dermatology*,2019,18(2):530-538.
- [8] Wu Xianglei, Cen Qingqing, Liu Ying, et al. A prospective randomized controlled study on the treatment of static wrinkles around the eye with microneedle dot-array radiofrequency[J]. *Journal of Tissue Engineering and Reconstructive Surgery*, 2021,17(3):243-246.
- [9] Wang Dandan, Li Jing, Yang Huizhe. Clinical study of negative pressure gold microneedle radiofrequency treatment of neck wrinkles[J]. *China Medical Cosmetology*, 2021,11(12):56-58.