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OPPORTUNITIES OF PLATELET RICH PLASMA APPLICATION IN THE TREATMENT OF SKIN SCARS

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ABSTRACT — The number of patients with hypertrophic skin scars is increasing every year. Scar tissue is formed as a result of healing of a wound defect. Therefore, in order to develop optimal methods for the treatment of scarring skin changes, it is necessary to understand the pathogenesis of the wound process. The purpose of this work was to analyze the literature data on the effectiveness of the use of platelet-rich plasma (PRP) in the treatment of scarring that appeared in patients with acne. PRP contains epidermis growth factor, vascular endothelial growth factor, which help accelerate the healing of skin wounds.

CONCLUSION: PRP can be successfully used in the treatment of atrophic scars on the skin after acne. Therefore, this method can be used both in monotherapy and in combination with surgical methods of treatment.

KEYWORDS — acne, scars of skin, platelet rich plasma, treatment.

INTRODUCTION

Today, from the total number of people who need treatment for cicatricial skin changes, about 18% are patients with keloid scars, about 8% are patients with hypertrophic scars, and about 14% are patients with hypotrophic scars [1]. The number of such patients increases every year. The most common type of cicatricial skin changes are post-acne scars, or atrophic scars.

Acne inflammation is the primary process that precedes follicular hyperkeratosis. Signs of inflammation persist from the appearance of acne (in the form of inflammatory lesions) to secondary post-inflammatory changes in the skin: post-inflammatory erythema (PIE), post-inflammatory hyperpigmentation (post-inflammatory hyperpigmentation, PIH) and scars. Both PIE and PIH are signs of inflammation. Due to the increased blood supply in the area of inflammation and the high permeability of the capillary walls, im-

mune cells rush into these tissues. Scars are the result of impaired healing after inflammation, characterized by the presence of inflammatory cellular infiltrates, and are found in 77% of atrophic scars [2].

To date, dermatologists use a combined approach in the treatment of scars on the skin after acne. At the first stage it is necessary to carry out a comprehensive assessment of post-acne scars by estimation of cicatricial erythema, type, depth and location of scars. The treatment of acne scars should be carried out according to an algorithm that includes the impact on each stage of the scarring process. After elimination of cicatricial erythema, it is necessary to influence the atrophic scar itself. The approach is determined by the type of scars and their prevalence: generalized spread or local foci [1].

It is considered that it is necessary to treat all active manifestations of acne before proceeding with the treatment of atrophic scars so as not to cause an activation of lesions in those areas where the treatment has already done.

Given the relationship between the severity and duration of inflammation in the development of scars, early treatment of acne is the best approach to prevent the appearance of acne scars. Therapy should be carried out until the inflammatory component is entirely eliminated and stopped in the absence of new rashes [3].

In recent years, a fundamentally new approach is offered for the treatment of skin scars using platelet-rich plasma (PRP), an autologous blood component in which the concentration of platelets is in 3–5 times higher than the normal concentration of platelets is in the blood [4]. To date, more than 40 commercial systems have been proposed for obtaining PRP from whole blood, in most of them PRP is obtained by double centrifugation. Moreover, the final platelet concentration depends not only on the system used, but also on several individual characteristics of the patient, such as age and associated diseases [5].

The PRP properties are based on the use of the activity of some growth factors that are secreted by platelets after their activation. These factors, which are predominantly found in alpha granules, regulate key cellular processes, including chemotaxis, mitogenesis, and cell differentiation. Growth factors directly

stimulate the migration of mesenchymal and epithelial cells, their division, the synthesis of collagen and other components of the intercellular matrix. Many growth factors interact with each other and activate various intracellular signaling pathways, which are necessary for regenerative processes [6].

Studies of the use of PRP for skin rejuvenation have shown that its intradermal injections improve a state of post-acne scars. It is established that the local administration of PRP has a good effect when used together with microneedle therapy for post-acne scars. This is caused by the microneedle effect on the skin that promotes better penetration of PRP and enhances the effect of platelets to boost of wound healing. It was established that the use of plasma both in the form of an intradermal injection and in the form of applications after using an ablative CO₂ laser improved the recovery of laser-damaged skin and improved the clinical appearance of post-acne scars compared to the control group [7].

In the study evaluated the efficacy of the combined use of PRP and fractionated laser (FL). Patients participating in the study with scars after injuries were divided into 3 groups. Patients of the 1st group underwent transplantation of adipose tissue with the PRP administration. FL was used in the 2nd group. Patients of the 3rd group received combined treatment using both methods [8].

In another study, the purpose of which was to study the PRP efficacy in the treatment of scars, patients of the 1st group underwent transplantation of adipose tissue without PRP, patients of the 2nd group underwent transplantation of adipose tissue 7–10 days after the preliminary administration of PRP, and patients of the 3rd group had only transplantation of adipose tissue on one side and transplantation of adipose tissue in combination with the use of PRP on the contralateral side [9]. In all studies, higher efficacy of the combined use of PRP and adipocytes was demonstrated.

The efficacy of the PRP use has been studied in the treatment of post-acne scars. Patients were prescribed laser therapy with erbium FL (EFL), then — PRP locally (in gel form). A 50% improvement was observed in 68% and 91% of patients after the 1st and 3rd courses of treatment, respectively [10]. In this study, treatment of different parts of the face was not carried out using different methods in the same patient. So, it is not possible to determine which method was more effective. In another study, patients with post-acne scars after a course of laser therapy with an ablative fractional CO₂ laser were given PRP injections on one half of the face and physiological saline injections on the opposite side [11]. The PRP use was accompanied

by a decrease in erythema duration from 10.4 ± 2.7 to 8.6 ± 2.0 days. In addition, against the background of the PRP use, erythema was significantly less pronounced already on the 4th day (according to chromometry), and the duration of the presence of edema decreased by about 1 day. The PRP use has contributed, according to independent expert dermatologists, to a significantly more pronounced improvement in the overall scoring of treatment efficacy compared to the corresponding level of assessment on the control side. The average improvement was 2.7 ± 0.7 points after applying the PRP and 2.3 ± 0.5 points on the control side [11].

A comparison was also made of the efficacy and safety of PRP in the form of injections and for topical local application after therapy with FL for post acne scars. Patients were randomized into 2 groups. In the 1st group after FL, PRP was administered intradermally in one half of the face and physiological saline in the other one. In patients of the 2nd group after FL, on one half of the face, PRP was administered intradermally, on the other, it was applied superficially. 3 courses of treatment were carried out with an interval of 1 month between courses. Efficacy assessment was carried out 6 months after the start of treatment. It was found that the PRP use, both in the form of injections and topical, was accompanied by a shorter recovery period and significant improvements in clinical indicators [6].

Study of scar depth using optical coherence tomography showed that when using only FL for their treatment, a less pronounced improvement was noted in comparison with the combined therapy of FL and PRP (both with external and intradermal plasma application). There were no significant differences in clinical efficacy with intradermal administration and external PRP use. But it was noted that external PRP use was better tolerated, that is, it was safer [12].

The possibility of PRP using in the treatment of striae — dermal scars with epidermal atrophy arising from prolonged skin stretching — has also been demonstrated. In one of the works, such patients underwent combined treatment — radiofrequency thermal lifting in combination with PRP — once every 4 weeks [7]. The efficacy of the separate PRP use and radiofrequency thermal lifting has not been studied. After 12 weeks of treatment, the results were evaluated by a specialist using a quartile scale. All of 19 patients showed at least a slight improvement (0–25%). A pronounced improvement of 36.8% was recorded in 5.3% of patients, moderate in 31.6% of cases, and minimal improvement in 26.3% of patients. 12 out of 19 patients were satisfied with the treatment results. In addition, PRP was used to treat striae in combination with ultrasound therapy after plasma fractional

radiofrequency therapy [10]. Ultrasound was used to improve the transepidermal penetration of PRP every 2 weeks for 8 weeks. It was established that the average width of the widest striae decreased from 0.75 to 0.27 mm. In a total, 71.9% of patients reported good or very good results. In addition, a histological examination of the samples obtained by biopsy revealed an increased density of collagen and elastic fibers of the dermis, although quantitative data are not given in the publication [10].

Thus, an analysis of the literature shows that scarring of the skin has a multifactorial etiology, and requires a comprehensive approach to treatment.

CONCLUSION

At present, many surgical, conservative methods, including medical and physiotherapeutic ones, of treating cicatricial skin changes have been offered. However, these approaches do not always allow achieving the desired results. The introduction of platelet rich plasma into the area of atrophic skin scars after acne promotes a good cosmetic effect and is accompanied by a minimum number of complications. Reducing the number of scars after platelet rich plasma therapy allows the use of this drug as monotherapy and in combination with surgical methods of treatment.

REFERENCES

1. GAUGLITZ G.G., KORTING H.C., PAVICIC T. ET AL. Hypertrophic scarring and keloids: pathomechanisms and current and emerging treatment strategies // *Mol. Med.* – 2011. – Vol.17. – P. 113–125.
2. SAINT-JEAN M., KHAMMARI A., JASSON F. ET AL. Different cutaneous innate immunity profiles in acne patients with and without atrophic scars // *Eur. J. Dermatol.* – 2016. – Vol. 26. – P. 68–74.
3. DEL ROSSO J.Q., KIRCIK L.H. The sequence of inflammation, relevant biomarkers, and the pathogenesis of acne vulgaris: what does recent research show and what does it mean to the clinician? // *J. Drugs Dermatol.* – 2013. – Vol.12. – P. 109–115.
4. KNEZEVIC N.N., CANDIDO K.D., DESAI R., KAYE A.D. Is Platelet-Rich Plasma a Future Therapy in Pain Management? // *Med. Clin. North. Am.* – 2016. – Vol. 100, No 1. – P. 199–217.
5. PORWAL S., CHAHAR YS., SINGH PK. A Comparative Study of Combined Dermaroller and Platelet-Rich Plasma Versus Dermaroller Alone in Acne Scars and Assessment of Quality of Life Before and After Treatment. *Indian J Dermatol.* 2018 Sep-Oct;63(5):403-408. doi: 10.4103/ijd.IJD_118_17.
6. EL-DOMYATI M., ABDEL-WAHAB H., HOSSAM A. Microneedling combined with platelet-rich plasma or trichloroacetic acid peeling for management of acne scarring: A split-face clinical and histologic comparison. *J Cosmet Dermatol.* 2018 Feb;17(1):73–83. doi: 10.1111/jocd.12459.
7. ZHU J.T., XUAN M., ZHANG Y.N. ET AL. The efficacy of autologous platelet-rich plasma combined with erbium fractional laser therapy for facial acne scars or acne // *Mol. Med. Rep.* – 2013. – Vol. 8. – P. 233–237.
8. LEE J.W., KIM B.J., KIM M.N. ET AL. The efficacy of autologous platelet rich plasma combined with ablative carbon dioxide fractional resurfacing for acne scars: a simultaneous split-face trial // *Dermatol. Surg.* – 2011. – Vol. 37. – P. 931–938.
9. NA J.I., CHOI J.W., CHOI H.R. ET AL. Rapid healing and reduced erythema after ablative fractional carbon dioxide laser resurfacing combined with the application of autologous platelet-rich plasma // *Dermatol Surg.* – 2011. – Vol. 2037. – P. 463–468.
10. SUH D.H., LEE S.J., LEE J.H. ET AL. Treatment of striae distensae combined enhanced penetration platelet-rich plasma and ultrasound after plasma fractional radiofrequency // *J. Cosmet. Laser Ther.* – 2012. – Vol. 14. – P. 272–276.
11. CERVELLI V., NICOLI F., SPALLONE D. ET AL. Treatment of traumatic scars using fat grafts mixed with platelet-rich plasma, and resurfacing of skin with the 1540 nm nonablative laser // *Clin. Exp Dermatol.* – 2012. – Vol. 37. – P. 55–61.