

Assessment of Efficacy of Platelet-Rich Plasma Injection for Facial Rejuvenation

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Abstract

Background: Facial rejuvenation includes different therapeutic modalities of returning facial youthfulness. PRP injection delivers very high concentrations of growth factors that lead to accelerated tissue regeneration and remodeling.

Aim of Study: The aim of this work was to evaluate the efficacy of single session of intradermal injection of autologous Platelet Rich Plasma (PRP) in facial rejuvenation.

Patients and Methods: 20 subjects with different types of facial wrinkles were included in this study. They were selected from Dermatology and Venereology Department, Tanta University Hospitals. All of them received single session of intradermal injection of autologous PRP and were clinically assessed before and 2 months after PRP injection using Wrinkle Severity Rating Scale (WSRS), Skin Texture Scale, and Subject Satisfaction Scale.

Results: All subjects showed significant clinical improvement of all types of facial wrinkles after PRP injection. At the end of follow-up period, there was statistically significant decrease in Wrinkle Severity Rating Scale (WSRS) comparable to that before PRP injection. Additionally, there was a statistically significant improvement of skin texture and subject satisfaction after PRP injection.

Conclusion: Intradermal injection of autologous PRP is well tolerated and capable of rejuvenating the face and producing a significant correction of different types of facial wrinkles.

Key Words: PRP – Cutaneous aging – Facial rejuvenation.

Introduction

PLATELET-Rich Plasma (PRP) is an autologous concentrate of human platelets contained in a small volume of plasma. PRP has been used over the last several years as an effective treatment in various surgical and medical fields including orthopedic, dental, plastic surgeries and dermatology. In the field of dermatology, PRP has proven successful

for accelerating wound healing. Furthermore, it has been used clinically in mesotherapy for skin rejuvenation [1,2].

Aging is a complex and progressive biological process linked to the passage of time. Many of the clinical facial manifestations, influenced by aging, are caused by decrease in collagen, loss of volume, gravity, reduction of skin elasticity, gradual bone resorption, redistribution of subcutaneous tissues which result in dry and wrinkled skin that is easily bruised. With age, the skin's natural rejuvenation process slows dramatically and the skin becomes thinner, drier and less elastic [3,4]. Skin aging is influenced by several factors including genetics, environmental exposure (Ultraviolet (UV) radiation, xenobiotics, and mechanical stress), hormonal changes and metabolic processes (generation of reactive chemical compounds such as activated oxygen species). All factors together act on the alterations of skin structure, function, and appearance. Yet solar UV radiation unquestionably is the single major factor responsible for skin aging [5].

Platelet-Rich Plasma (PRP) aimed to obtain a high yield of harvested platelets and fibrin rich plasma. Platelet concentration increased from 1.65- to 4.4-fold in comparison with whole blood initially used. A high variation (5-to 27-fold) was found in growth factor concentration in relation to the method used and also a high variation in the kinetics of growth factor. Full complement of clotting factors but in a normal physiological concentration [6].

Good results were obtained in most patients who had PRP injection for rejuvenation including improvement of the texture and the skin appearance, skin homogeneity and tonicity. When PRP

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is injected in an area, it stimulates the tissue, causing mild inflammation that triggers the healing cascade. As a result, new collagen begins to develop. As this collagen matures, it begins to shrink and tightens and strengthens the skin. Improvement in skin texture and tone is noticeable within 3 weeks. Full collagen regeneration requires 3 months [7]. Growth factors including PGDF, ILGF, VEGF, EGF, and TGF β and the adhesive glycoproteins secreted from the activated platelets interact with the cells in the subcutaneous tissue by binding to their specific cellular receptors. Then, the glycoproteins and the growth factors activate intracellular processes that stimulate cell proliferation, migration, survival, as well as the production of extracellular matrix proteins especially new collagen formation [8].

The aim of this work was to evaluate the efficacy of intradermal injection of autologous Platelet Rich Plasma (PRP) for facial rejuvenation.

Patients and Methods

This study included 20 females presented with different types of facial wrinkles, their age was more than 30 years and they were willing to join study and write informed consent, in the period from March 2016 to March 2017.

Exclusion criteria:

Pregnancy and lactation, history of syncope during or immediately after venipuncture either due to fear of injection or exaggerated vascular vasovagal tone, patients suffering from or having a history of any procoagulative or thrombophilic condition, any patient with active skin infection at the site of injection specially who have history of recurrent facial or labial herpes simplex, patients using NSAIDs, systemic corticosteroids, anticoagulant or blood thinners such as aspirin, warfarin, etc and those with chronic disease such as (chronic renal failure, hepatic insufficiency, cardiovascular disorders, uncontrolled diabetes mellitus, thyroid disorder, anemia, and cancer, etc.).

After obtaining informed consent, a 10mL venous blood sample was aspirated from each participant and collected in the sterile tubes. Five vacuum tubes (2.0mL) equipped with anticoagulant were prepared. Each test tube was centrifuged at 1800 rpm for 15 minutes. Meanwhile, the subject was prepared and digital photographs were taken. The blood samples were separated by centrifuge, thus two-part of plasma were obtained; the upper part is consisting of 1.0mL of PPP; and the lower part is consisting of 0.5mL of PRP. A lower red part

containing erythrocytes. The PPP was first gently aspirated to avoid its mixing with PRP, and PRP prepared for activation by calcium gluconate with proportion of 0.01mL per 1mL of PRP, thus obtaining a 2.5mL concentrate of activated PRP. These 2.5mL of PRP were divided into three 1.0mL syringes [9].

Technique of injection:

After taking photos, a topical anesthetic cream (lidocaine 5%) was applied to the face for 15 minutes, and then washed by normal saline. Then, the face was cleansed with local antiseptic solution then removed by normal saline. Injection points and injected quantities were standardized. Then, 1.0-1.5mL of PRP was injected using a "linear retrograde technique" [10] for correction of nasolabial folds, or "cross-hatching technique" for correction of marionette lines [11]. Pre-and post-treatment photography at 2, and 12 weeks was carried out using 16 megapixel canon camera for follow-up.

Effectiveness assessment: All subjects included in this study were examined before PRP injection, and 2 months after PRP injection as follow:

- A- The degree of improvement was evaluated using Wrinkle Severity Rating Scale (WSRS) [12] and scored as follow; 0=No wrinkles, 1=Just perceptible wrinkles, 2=Shallow wrinkles, 3=Moderately deep wrinkles, 4=Deep wrinkles, well-defined edges, and 5=Very deep wrinkles, redundant fold.
- B- The degree of improvement in the skin texture was assessed as follow [13]; 1=Marked worsening, 2=Mild worsening, 3=Mild improvement, 4=Moderate improvement, 5=Marked improvement.
- C- Clinical evaluation by digital photos to assesses the degree of improvement according to Lee's five-point grading scale [14] as follow; 0 (No improvement), 1 (Slight response): <25% improvement, 2 (Moderate response): 25-50% improvement, 3 (Significant response): >50-75% improvement, 4 (Excellent response): >75% improvement.
- D- Subject satisfaction: Patients were asked about their gratification with the results of PRP injection and graded as follow [15]: 1=Markedly unsatisfied, 2=Unsatisfied, 3=Satisfied, 4=Markedly satisfied.

Statistical analysis:

Data were fed to the computer IBM SPSS software package Version 20.0. Qualitative data were

described using number and percent. Quantitative data were described using mean and standard, minimum and maximum. For ordinal data (stages or grading) were described using number and percent. Significance test results are quoted as two-tailed probabilities. Values ≤ 0.5 was considered significant [16].

Results

The clinical characteristics of the studied groups were as follow: 20 females with different types of facial wrinkles [12 females (60.0%) with deep nasolabial fold (Photo 1), 8 females (40.0%) with prominent marionette lines (Photo 2)]. Their ages ranged from 35 to 58 years with a median age of 47 years. All participants were skin photo types grades III and IV [9 females (45.0%) were with grade III, and 11 females (55.0%) were grade IV]. Duration of wrinkles ranged from 1.0 to 5.0 years with median of 3 years. According to WSRS, 3 females (15.0%) had mild grade of facial wrinkles, 9 females (45.0%) had moderate grade and 6 females (30.0%) had sever deep grade and 2 females (10.0%) had extremely deep grade.

Clinical assessment:

All females included in this study showed noticeable reduction of the facial wrinkles after PRP injections as follow:

- 1- *Wrinkle Severity Rating Scale (WSRS):* The score before treatment ranged from 2.0 to 4.0 with a mean of 3.25 ± 0.79 . While after treatment, it ranged from 1.0 to 3.0 with a mean of 1.70 ± 0.66 . There was a statistically significant decrease in the mean values of WSRS after PRP injection in comparison to its value before injection with p -value < 0.001 * (Table 1).
- 2- *Skin homogeneity and texture scale:* All participants showed various grades of improvement in facial skin texture and homogeneity after PRP injection as follow; 9 subjects (45.0%) showed grade 4 moderate improvement and 11 subjects (55.0%) showed grade 5 marked improvement (Table 2).
- 3- Clinical evaluation by digital photos at the end of follow-up period (8 weeks) according to Lee's five-point grading scale, [14] there were 12 subjects (60.0%) with significant improvement (grade 3), and 8 subjects (40.0%) with excellent improvement (grade 4) (Table 3).
- 4- After PRP injection, 10 subjects (50.0%) were satisfied (grade 3), and 10 subjects (50.0%) were markedly satisfied (grade 4) (Table 4).

Table (1): Comparison between Wrinkle Severity Rating Scale (WSRS) in the studied subjects before and after PRP injection (n=20).

| | WSRS | |
|----------------|----------------------|---------------------|
| | Before PRP injection | After PRP injection |
| 1 | 4 | 3 |
| 2 | 4 | 2 |
| 3 | 2 | 1 |
| 4 | 2 | 1 |
| 5 | 2 | 1 |
| 6 | 4 | 2 |
| 7 | 4 | 2 |
| 8 | 3 | 2 |
| 9 | 4 | 2 |
| 10 | 2 | 1 |
| 11 | 4 | 2 |
| 12 | 4 | 2 |
| 13 | 3 | 1 |
| 14 | 3 | 2 |
| 15 | 3 | 1 |
| 16 | 3 | 1 |
| 17 | 3 | 2 |
| 18 | 4 | 2 |
| 19 | 3 | 1 |
| 20 | 4 | 3 |
| Min.-max. | 2.0-4.0 | 1.0-3.0 |
| Mean \pm SD. | 3.25 ± 0.79 | 1.70 ± 0.66 |
| Median | 3.0 | 2.0 |
| <i>p</i> | < 0.001 * | |

*: Statistically significant at $p \leq 0.05$.

Table (2): Distribution of the studied subjects according to improvement of skin texture after PRP injection (n=20).

| Degree of clinical improvement | No. | % |
|--------------------------------|-----|------|
| 1= Marked worsening | 0 | 0.0 |
| 2= Mild worsening | 0 | 0.0 |
| 3= Mild improvement | 0 | 0.0 |
| 4= Moderate improvement | 9 | 45.0 |
| 5= Marked improvement | 11 | 55.0 |

Table (3): Distribution of the studied subjects according to degree of clinical improvement after PRP injection (n=20).

| Degree of clinical improvement | No. | % |
|-------------------------------------|-----|------|
| 0= No change | 0 | 0.0 |
| 1= Slight improvement (1-25%) | 0 | 0.0 |
| 2= Moderate improvement (26-50%) | 0 | 0.0 |
| 3= Significant improvement (51-75%) | 12 | 60.0 |
| 4= Excellent improvement (>75%) | 8 | 40.0 |

Table (4): Distribution of the studied subjects according to subject satisfaction after PRP injection (n=20).

| Subject satisfaction | No. | % |
|-------------------------|-----|------|
| 1= Markedly unsatisfied | 0 | 0 |
| 2= Unsatisfied | 0 | 0 |
| 3= Satisfied | 10 | 50.0 |
| 4= Markedly satisfied | 10 | 50.0 |



(A)



(B)

Photo (1): A 40-year old- female with nasolabial fold deformity. (A) Before treatment; (B) 2 months after treatment with excellent improvement.



(A)



(B)

Photo (2): A 55-year-old female with marionette lines deformity; (A) Before treatment; (B) 2 months after treatment with moderate improvement.

Discussion

In this study, we evaluated the ability of PRP injection in facial rejuvenation and correction of nasolabial folds and marionette lines. There was a statistically significant improvement of grades of wrinkles after treatment with PRP ($p < 0.001$). These results are consistent with the study carried out by Sclafani et al., who tested the efficacy of autologous platelet-rich fibrin matrix on 30 patients with deep nasolabial folds by single injection. He reported that there was significant long-term diminution of deep NLFs without use of foreign materials [17]. In addition, our results were in accordance to El-Nehrawy et al., [13] who conducted a study, on evaluation of the efficacy of autologous PRP injection in 20 patients with different types and grades of facial wrinkles by single PRP injection. They reported that all subjects with fine wrinkles had more than 25% improvement in their appearance, while 40% of those with deep wrinkles had no improvement after 8 weeks.

In the present study, we prepared PRP from activated platelets by adding calcium gluconate, which provides higher yields of immediate, massive and unsustained release of growth factors [9]. The activated platelets continue to secrete and synthesize more growth factors within the following 7 days of their life span [18,19]. In addition, the secreted growth factor after PRP injection, support regeneration by activating fibroblast and attracting un-differentiated cells to the dermis leading to enhancing collagen production. These changes accompanied by epidermal and dermal regeneration resulting in reduction of wrinkles depth [20]. Wastlain et al., [21] found that PRP trigger and increase circulating growth factors at the injection site through activating the biological pathways rather than by serving as a vehicle for the direct delivery of presynthesized growth factors.

Many mechanisms were postulated to explain the mode of action of PRP in modulation of skin

texture. Amini et al., [22] reported that PRP contains a mixture of growth factors and fibrin that stimulate collagen synthesis, cell proliferation and epidermal thickening which improves skin appearance, elasticity, texture and homogeneity. Furthermore, Galindo-Moreno et al., [23] reported that PRP contains varying amounts of VEGF, PDGF, TGF- β 1, FGF, IGF-1 and EGF. These growth factors are well known for their influence on different stages of healing processes, acceleration of tissue regeneration and neocollagenesis with subsequent tightening and strengthening of the skin. The improvement of skin homogeneity that develop after PRP treatment usually associated with increase in skin volume. PDGF has a significant role in blood vessel formation and in the synthesis of collagen and components of the extracellular matrix, including hyaluronic acid. Hyaluronic acid has been shown to increase skin tone and volume, improving its texture [24].

In the current study, subject satisfaction scores correlated in considerable degree with the results as 50% were satisfied and 50% were markedly satisfied. These results were in agreement with El-Nehrawy, et al., [13] as they found that patient's satisfaction was very high (100%) ranging from satisfied to very satisfied in different types of facial wrinkles received single PRP intradermal injection.

Conclusion:

Single treatment with autologous PRP is well tolerated and can produce a significant correction of wrinkles, with no need for downtime. It was found that the efficient treatment is more obvious with younger patients and those with less severe grades of wrinkles. For future recommendations, Further studies on larger scale population to confirm our results and comparative studies of PRP injection versus other modalities of facial rejuvenation.

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تقييم فاعلية حقن البلازما الغنية بالصفائح الدموية لتجديد شباب الوجه

المقدمة: تجديد خلايا الوجه من الأساليب المستخدمة في إستعادة شباب البشرة. لذلك تتطور بشكل سريع بالنسبة للأطباء والمرضى للوصول لطرق أكثر أماناً وفعاليتها.

الغرض من الدراسة: تقييم فاعلية حقن البلازما الغنية بالصفائح الدموية لإزالة تجاعيد الوجه وتجديد شباب البشرة.

المرضى وطرق البحث: سوف تجرى الدراسة على ٢٠ شخص يعانون من تجاعيد الوجه. وسيتم إختيارهم من المترددين على العيادات الخارجية لقسم الجلدية والتناسلية جامعة طنطا:

حقن البلازما الغنية بالصفائح الدموية بعد تحضيره من عينة دم من نفس الشخص وتحضير البلازما الغنية بالصفائح منها بجهاز الطرد المركزي ثم تعرض البلازما إلى عامل التجلط لتنشيط عوامل النمو بها مثل كالسيوم جلوكونات.

١- حقن البلازما في منطقة التجاعيد في كلا الجانبين.

٢- متابعة الحالات بعد شهرين.

٣- أيه آثار جانبية سيتم تسجيلها في زيارات المتابعة.

قد أظهرت نتائج هذه الدراسة ما يلي:

- كان هناك إنخفاض نو دلالة إحصائية في القيم المتوسطة ل معدل درجة التجاعيد في نهاية فترة المتابعة بالمقارنة بما قبل حقن البلازما .
- كان هناك تحسن نو دلالة إحصائية في تجانس ملمس ولون الجلد في جميع المشاركين في نهاية فترة المتابعة بالمقارنة بما قبل حقن البلازما .
- كان هناك تحسن إحصائي كبير في مقياس الدرجات الخمس نقاط في نهاية فترة المتابعة بالمقارنة بما قبل حقن البلازما .

الإستنتاج: يعتبر حقن الجلد بإستخدام البلازما الغنية بالصفائح الدموية من الطرق الفعالة والأمنة في علاج تجاعيد الوجه دون الحاجة للتدخل الجراحي.