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Research Article

Investigation of Platelet-Rich Plasma (PRP) Effect On Inflammatory Findings in Septorhinoplasty

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Abstract

Objectives: In our study, we aimed to examine the effect of PRP on anti-inflammatory findings in septorhinoplasty (SRP).

Methods: One hundred sixty patients who underwent open septorhinoplasty (SRP) were divided into two groups: the control group and PRP groups. A total of 3 ccs of PRP was obtained by subjecting the blood through two separate centrifugation processes. At the end of the SRP operation, 3ccs of PRP was injected into the patients' osteotomy sites in the PRP group and the same amount of saline was administered to the patients in the control group. Pain, periorbital edema and ecchymosis scores of the patients were recorded on the 2nd, 8th, 24th hours, 3rd, 7th and 10th days after the operation. Besides, Rhinoplasty Outcome Evaluation (ROE) satisfaction questionnaire was applied to the patients before the operation and at the postoperative third month.

Results: In the PRP group, periorbital edema at the 8th, 24th, and third days was less compared to the control group; pain scores were also significantly lower at the 8th and 24th hours.

Conclusion: It was thought that PRP could reduce postoperative pain and periorbital edema in SRP surgeries. Further comprehensive studies may support the use of PRP in SRP surgeries.

Keywords: Septorhinoplasty, edema, ecchymosis, pain, platelet rich plasma

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Septorhinoplasty surgery (SRP) is a common procedure in otolaryngology clinics with its importance regarding nasal functioning and cosmetics.[1]

In SRP surgeries, the inflammatory process begins as a result of bone structure and soft tissue damage. In this process, the amount of extracellular fluid increases due to hyperalgesia and vasodilation, leading to edema and ecchymosis.[2] Therefore, pain, periorbital edema, and ecchymosis are expected problems at the end of the operation. However, this negatively affects patients' quality of life and may even cause them to abandon the operation.[3]

It was shown that patient satisfaction increases with interventions such as hypotensive anesthesia, appropriate dissection, and cold application that aim to reduce these problems.[4] But more effective methods are still needed.

Platelet-rich plasma (PRP) is obtained from autologous blood and is used clinically to accelerate wound healing. PRP has been shown to have an anti-inflammatory effect in recent years.[5,6] Besides, it is thought that it may help to remove edema at an early stage by its rich growth factor content and increasing angiogenesis.[7]

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In this study, we aimed to show the effect of PRP, which has an anti-inflammatory effect, on postoperative pain, periorbital edema, and ecchymosis that can be seen after SRP surgery.

Methods

Before starting the study, approval no. 2018/58 was obtained from the Ethics Committee of Bolu Abant İzzet Baysal University Faculty of Medicine. Between June-2018 and June-2019, patients aged 18-65 years who were admitted to the Bolu Abant İzzet Baysal University Medical Faculty Hospital Department of Otorhinolaryngology and Head and Neck Surgery with complaints of nasal obstruction and deformity and had SRP indication were included in the study. An informed consent form was obtained from all patients. Exclusion criteria were determined as revision cases, non-compliance with follow-up, history of corticosteroid and derivative drug use (within the last two weeks), history of bleeding diathesis or use of anticoagulant drugs, and females in menstrual period.

The patients were divided into two groups as the PRP group and the control group, randomly. The patients were not informed about the group they were in.

Preparation of PRP

30 cc of venous blood was drawn from the patients in the PRP group into three sterile tubes containing sodium citrate to prepare PRP. It was centrifuged at 1300 rpm for 10 minutes in the centrifuge device. After this procedure, the blood was separated into three layers: platelet-poor plasma at the top, platelet and buffy coat (BC) layer in the middle, and red blood cells in the bottom layer. After the first centrifugation, the upper and middle layers in the tube were transferred to another sterile tube. Then, it was centrifuged once again at 2000 rpm for 10 minutes. After this procedure, weak plasma from the platelet was removed from the surface of the separated plasma in the tube with an injector. The remaining 3 ccs (1 cc from each tube) fluid formed the PRP.

Surgical Technique

All operations were performed by a single surgery with open technique, and hump resection and lateral osteotomies were performed. Conventional osteotoms were used in all operations. At the end of the operation, 1 cc of PRP was injected into three different areas as both lateral osteotomy and hump resection area in the PRP group, while the same amount of saline was applied to the control group. The duration of the operation, the total amount of bleeding, and the mean blood pressure were recorded. The amount of bleeding was calculated approximately according to the blood accumulated in the aspiration tube and wetting of the gauze patches (slightly wet: 3-5 mL, very wet: 10 mL). The amount of saline used for washing was taken into account. Mean blood pressure measurement was calculated by averaging the values measured every 5 minutes during the operation.

After the surgery, ice application was given to all patients for the same amount of time, and the bedhead was adjusted to 45 degrees. While the Visual Analogue Scale (VAS) graded between 0-10 was used to measure the pain intensity of the patients on the 2nd, 8th, 24th hours, 3rd, 7th, and 10th days after surgery; Yücel modification of Kara and Gökalan scoring was used to evaluate periorbital edema and ecchymosis.[3, 8] Also, the ROE (Rhinoplasty Outcome Evaluation) questionnaire was applied in the preoperative period and at the 3rd month postoperatively to evaluate the patients' satisfaction with the operation. A single observer carried out all evaluations. The study design was planned as a single-blind study.

Statistical Analysis

Descriptive statistics of both groups were obtained by using frequency analysis. The normal distribution of the continuous numerical data was tested by Kolmogorov Smirnov. When comparing the PRP group and the control group, Student's t-test was used for normally distributed continuous data for periorbital edema scale, periorbital ecchymosis scale, VAS, ROE, and Mann-Whitney U test was used for abnormally distributed continuous data. Categorical variables were compared with the chi-square test. A value of $p<0.05$ was considered significant. All statistical analyzes were performed with SPSS v.22.0 analysis.

Results

In the PRP group, 41 patients were female, and 39 were male. In the control group, 28 patients were female, and 52 were male. While the mean age of the patients in the PRP group was 31.01±1.06, it was 29.34±1.19 years in the control group. No statistically significant difference was found between the groups in terms of mean age ($p=0.08$) and gender distribution ($p=0.06$) (Table 1).

No significant difference was found between the groups regarding arterial blood pressure, amount of bleeding during the surgery, and operation duration (Table 2).

Table 1. Comparison of Groups Age and Gender (Mean±SD)

	TZP group	Control group	p
Age (Mean± SD)	31.01±1.06	29.34±1.19	0.08
Gender, n (%)			0.06
Female	41 (51.2)	28 (35)	
Male	39 (48.8)	52 (65)	

Table 2. Intergroup Comparison of Mean Blood Pressure and Amount of Bleeding (Mean±SD)

	TZP group	Control group	p
Average Blood Pressure (mm/Hg)	86.6±0.9	85.2±0.9	0.33
Amount of Bleeding (cc)	122.5±4.0	119.2±3.6	0.53
Duration of Operation (min.)	160.3±3.2	157.1±2.9	0.40

Mann-Whitney U test.

While no significant difference was found between the groups regarding periorbital edema scores at the postoperative 2nd hour, 7th day, and 10th day; periorbital edema scores at the 8th hour, 1st day, and 3rd day were significantly lower in the PRP group than in the control group (Table 3).

Periorbital ecchymosis scores were lower in the PRP group at the 2nd hour, 8th hour, 1st day, 3rd day, 7th day, and 10th day postoperatively, but this difference was not statistically significant (Table 3).

While no significant difference was found between the groups in terms of pain scores at the postoperative 2nd hour, 3rd day, 7th day, and 10th day, pain scores at the 8th and 24th hours were significantly lower in the PRP group than in the control group (Table 3).

Table 3. Comparison of the Groups in terms of Periorbital Edema, Pain and Periorbital Ecchymosis Scores (Mean±SD)

	TZP group	Control group	p
Periorbital Edema			
2. H.	2.1±0.1	2.2 ± 0.1	0.35
8. H.	2.3±0.1	2.9± 0.1	0.00*
24. H.	2.5±0.1	3.1±0.1	0.00*
3. Day	1.9±0.1	2.2±0.1	0.01*
7. Day	1.6±0.1	1.8±0.1	0.13
10. Day	1.3±0.1	1.4±0.1	0.59
Pain Scores			
2. H.	4.4±0.2	4.9±0.2	0.11
8. H.*	3.9±0.2	4.7±0.2	0.01*
24. H.*	3.7±0.2	4.5±0.2	0.02*
3. Day	2.0±0.2	2.5±0.2	0.10
7. Day	1.0±0.1	1.2±0.2	0.31
10. Day	0.4±0.1	0.7±0.1	0.16
Periorbital Ecchymosis			
2. H.	2.3±0.1	2.4±0.1	0.55
8. H.	2.9±0.1	3.0±0.1	0.42
24. H.	2.3±0.1	3.1±0.1	0.25
3. Day	2.1±0.1	2.2±0.1	0.37
7. Day	1.7±0.1	1.8±0.1	0.84
10. Day	1.4±0.1	1.5±0.1	0.70

Mann-Whitney U test (*p<0,05).

Table 4. Comparison of the Groups in terms of ROE Questionnaire (Mean±SD)

	TZP group	Control group	p
Preoperative Total Score	9.4±0.3	9.5±0.2	0.61
Postoperative Total Score	18.0±0.2	18.1±0.2	0.94

Mann-Whitney U test.

No significant difference was found between the groups regarding preoperative (p=0.61) and postoperative (p=0.94) ROE questionnaire scores (Table 4).

Discussion

Postoperative periorbital edema, ecchymosis, and pain create the main concerns of patients in an operation with aesthetic results such as septorhinoplasty and cause dissatisfaction in both the patient and the surgeon in the postoperative period. Even if it is temporary, it can negatively affect the aesthetic results. Studies are showing that patient satisfaction increases with interventions aiming to eliminate such problems.[4]

Various applications are performed during and after the operation to reduce pain, periorbital edema, and ecchymosis. The benefits of steroid administration,[9] postoperative cold application,[10] and central facial and total nasal block application have been demonstrated.[11] Other cautions include hypotensive anesthesia, dissection in the appropriate plan, application of infiltration anesthesia to those areas just before osteotomies, pressure on osteotomy areas, and head elevation.[12-14] These applications are carried out to prevent the negative situations experienced after SRP, but studies are needed on this subject since there is no permanent solution yet.

The inflammation process begins due to osteotomies, soft tissue, and vascular damage during the SRP operation. COX enzyme expression increases. When this enzyme increases in the environment, PGE-2 release increases, causing algesia, vasodilation and extravasation, resulting in pain and edema.[15,16] In the in-vitro wound model, it was shown that the IL-1 level starts to increase at the 24th hour, peaks at the 72nd hour, and decreases towards the end of the 1st week.[17] Another cytokine released from macrophages is TNF-α. This cytokine starts to increase in the environment at the wound site at the 12th hour, reaching its highest value at the 72nd hour.[17] Studies are showing that HGF in the content of PRP, which is four times more than in normal blood, suppresses these cytokines and alleviates the renal inflammatory response, and protects against inflammation in the lung and liver injuries.[18, 6, 5, 15, 16] There are also studies in which PRP application is used in surgical procedures to reduce inflammatory findings such as pain, edema, and ecchymosis.[19, 20]

After SRP operations, it was observed that pain developed at the most 24 hours, and periorbital edema and ecchymosis developed at the most on the 2nd day.[10, 11] In our study, the significant difference observed in periorbital edema and pain scores between the groups were observed during those mentioned times. The anti-inflammatory effect of PRP may be observed during the period when inflammation is at its top level.

In the study conducted by Kazakos et al.,[21] PRP was applied to the wound site in patients with acute wounds (open fracture, closed fracture with skin necrosis), and pain scores were significantly lower in the PRP group on the 7th, 14th and 21st days. In another study,[22] PRP was applied to the tonsils at the end of the pediatric tonsillectomy operation, but no significant difference was found in the postoperative pain values. These different results may be due to the different application techniques and evaluation times of PRP.

In our study, periorbital ecchymosis scores were lower in the PRP group than in the control group at all evaluation times, but this difference was not statistically significant. Periorbital ecchymosis develops in hemorrhages that occur as a result of damage to the periosteum, angular artery, and soft tissues while performing lateral osteotomies in addition to the extravasation of blood during the inflammation process. It was shown that there is a direct relationship between the amount of bleeding during the operation and the postoperative periorbital ecchymosis.[23] In our study, there was no significant difference in the amount of bleeding between the two groups.

In a study examining the effect of PRP on ecchymosis, PRP was applied before the site was closed after blepharoplasty. Although the postoperative ecchymosis scores were not significant, they were found to be lower on the PRP applied side.[24] In another study, a statistically significant decrease in ecchymosis values was noted when PRP was applied to patients who underwent rhytidectomy.[25] This may be explained with the use of an external thermal splint reducing venous return and preventing the drainage of the accumulated blood during the operation, or the presence of different variables than inflammation in the mechanism of ecchymosis. Therefore, additional studies are needed.

In our study, there was no significant difference between the preoperative and postoperative ROE values of both groups, which might be due to the decrease in IL-1 and TNF-α in the environment at the end of the 1st week that could not be evaluated in the ROE performed at the 3rd month. Another reason may be that the questionnaire used evaluates not only the aesthetic results but also the functional results.

Conclusion

PRP, a low-cost intervention with no side effects, is used by many clinics and has been shown to have a significant positive effect on periorbital edema and pain in SRP operation, but not on periorbital ecchymosis. Therefore, adding PRP to the surgical plan in SRP operations may come to the fore. Additional studies are needed for further evaluation.

It may be more appropriate to use a scale that evaluates earlier results in the evaluation of the PRP effect on patient satisfaction instead of a questionnaire such as ROE that detects late effects.

Disclosures

Ethics Committee Approval: Approval numbered 2018/58 was received from the Bolu Abant İzzet Baysal University Faculty of Medicine Ethics Committee.

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Conflict of Interest: None declared.

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