The Effect of Platelet-Rich Fibrin on Nasal Skin Thickness in Rhinoplasty

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Facial Plast Surg 2019;35:400–403.

Abstract

The study hypothesized the potential positive effects of platelet-rich fibrin (PRF) in postoperative rhinoplasty patients, such as better wound healing, less dead space, and less edema. The authors assessed PRF for nasal dorsum camouflage and studied its potential effects on nasal dorsal skin in rhinoplasty. Thirty-eight patients who underwent open approach primary rhinoplasty were categorized into two groups: nasal dorsal PRF group and control group. PRF membrane was used for nasal dorsum camouflage and laid over the bony dorsum and cartilage framework of the supratip area. Skin and subcutaneous soft tissue thickness were measured by linear superficial tissue ultrasound at the pre- and postoperative first week and the third month in both groups. Mean skin thickness over the supratip area was significantly higher in the control group in the first-week control. There were no significant differences in both first-week and third-month controls' nasal dorsum mean skin thickness measurements between the two groups. Regarding PRF complications, we encountered no complications in either group, including scarring, hematoma, infection, skin discoloration, and acne. The authors present the application of PRF membrane over the bony dorsum and cartilage framework of the supratip area. They observed its positive effect on postoperative edema, especially in the early postoperative period. Long-term investigations have to be performed to evaluate its potential effect on the rhinoplasty procedure. This was a level of evidence 3 study.

Keywords

- nasal dorsum camouflage
- platelet-rich fibrin
- rhinoplasty
- skin thickness

Reconstruction of the osseocartilaginous framework is unarguably the most important part of rhinoplasty. On one hand, underlying anatomical structures support the weight of skin–soft tissue envelope and directly affect the postoperative outcome; on the other hand, regardless of the surgical technique, elasticity and the thickness of the skin are two of the most important factors to consider for good postoperative aesthetic results. The thick-skinned rhinoplasty patients are considered as hard cases due to edema and other skin-related problems with undesirable outcomes. The main problem is the dead space formation. During rhinoplasty, the cutaneous flap is elevated under the superficial muscular aponeurotic system (SMAS). Between this fibrous layer and the osseocartilaginous framework, dissection results in a dead space prone to edema and scar formation. The thick-skinned patients have a higher tendency for dead space formation, and it can later be replaced with scar tissue resulting in long-lasting edema and poor cosmetic results.[1,2]

Many methods have been defined for the management of the thick-skinned rhinoplasty patient, and most of them require thinning out the skin–soft tissue envelope. According

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published online July 15, 2019

Issue Theme Highlights of the EAFPS 2019 Amsterdam Meeting; Guest Editors: Dirk Jan Menger, MD, and Gilbert Nolst Trenité, MD

DOI https://doi.org/10.1055/s-0039-1693436.
ISSN 0736-6825.

to recent reports, the topical use of the platelet concentrates has been associated with soft tissue regeneration and wound healing by facilitating angiogenesis and various additional phases, including cell recruitment, proliferation, remodeling, and differentiation.[3] Having positive effects on wound healing and scar formation, platelet concentrates can reduce both short- and long-term postoperative edema and result in a more favorable scar formation.

Nasal dorsum camouflage is frequently used as a method for both supporting skin–soft tissue envelope and correcting minor irregularities of the bony and cartilaginous nasal dorsum. Platelet-rich fibrin (PRF) is a second-generation platelet concentration that was defined as a natural fibrin matrix and favorable physiological architecture to support the healing process.[4]

The study hypothesized that the potential positive effects of PRF in wound healing might show similar benefits in postoperative rhinoplasty patients, such as better wound healing, less dead space, and less edema. In this study, we assessed the effect of PRF on nasal dorsum camouflage and studied its potential effects on nasal dorsal skin in rhinoplasty.

Material and Methods

This study was conducted between March 2018 and June 2018 at a tertiary academic center. All procedures that we performed in the study were in concordance with the ethical standards of the institutional and/or national research committee and the Declaration of Helsinki in 1964 and its subsequent amendments or comparable ethical standards. We obtained informed consent from all of the participants in the study.

Thirty-eight patients who underwent open approach primary rhinoplasty were categorized into two groups: nasal dorsal PRF group and control group. Age, gender, comorbidities, trauma, and previous functional complaints were neither inclusion nor exclusion criteria. The same senior surgeon performed all operations through an open approach. All patients were primary cases and had standard preoperative and postoperative facial photography for rhinoplasty. The nasal thermoplastic splint and nasal taping were removed at the end of the first postoperative week in both groups. There was an informed consent related to photography, including the permission for publication of all patients and the control group who were included in the study.

Platelet-rich fibrin membrane was used for nasal dorsum camouflage. The PRF protocol used in the study was defined by Dohan et al.[4] A venous blood sample was taken without anticoagulant in 10-mL sterile tubes, which are immediately centrifuged at 3,000 rpm (approximately 400 g) for 10 minutes. After collection of the PRF as fibrin clot, it was shaped like a membrane with a perforated metallic plate (►**Fig. 1**). PRF membrane was laid over the bony dorsum and cartilage framework of the supratip area (►**Fig. 2**). Pitanguy and scroll ligaments were cut and excised in all cases.

Platelet-rich fibrin was applied randomly in a sequential manner regardless of the skin thickness. Skin and subcutaneous soft tissue thickness were measured by linear superficial tissue ultrasound at the pre- and postoperative first week and the third month in both groups (►**Fig. 3**). Nasal dorsum measurement was performed just superior to the rhinion and the thickest part in the supratip region.

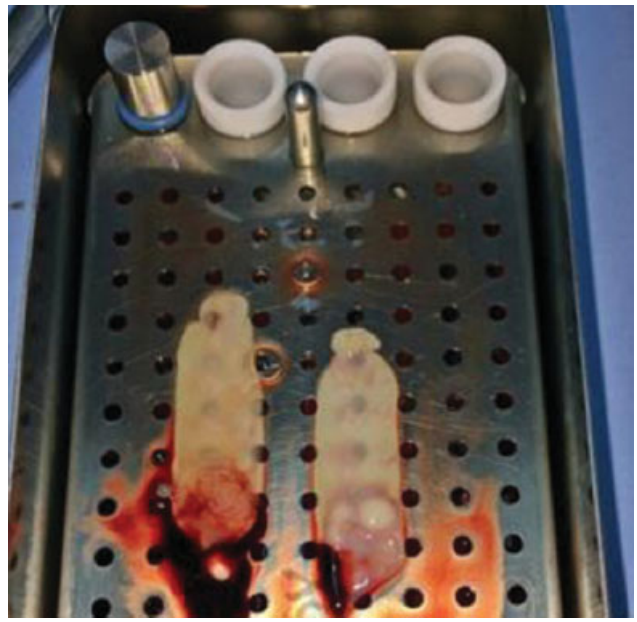

Fig. 1 Shaping the platelet-rich fibrin membrane with a perforated metal plate.

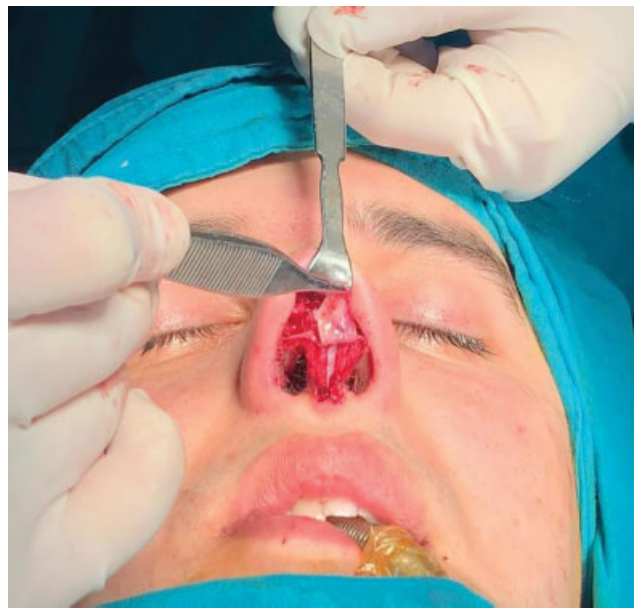

Fig. 2 Open approach rhinoplasty, laying the platelet-rich fibrin membrane under the cutaneous flap, from bony dorsum to the supratip.

Statistical Analysis

Statistical analysis was performed using computer software SPSS (version 22.0, SPSS Inc.). Independent and paired sample t-tests were used for the analysis of parametric variables. The Shapiro–Wilk test was used for determining the distribution pattern of the data. The distribution pattern of the mean skin thickness of all groups was parametric. Data were expressed as "mean ± standard deviation."

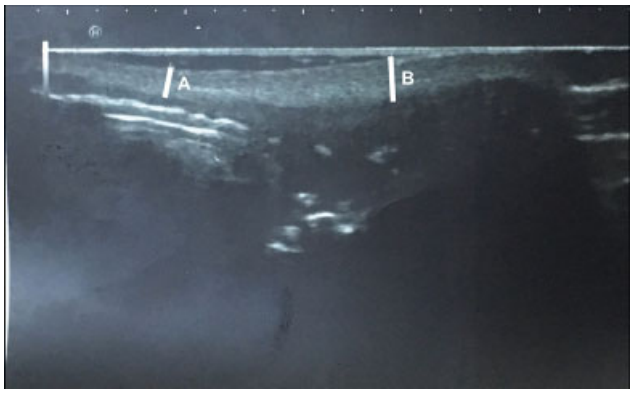

Fig. 3 Linear superficial tissue ultrasound view. (**A**) Skin thickness over the nasal dorsum. (**B**) Skin thickness over the supratip.

Results

The mean ages of PRF and control groups were 27.3 years (range 20–38 years) and 27.5 years (range 18–37 years), respectively. There were 11 males and 8 females in the PRF group and 10 females and 9 males in the control group.

The mean preoperative nasal dorsum and supratip skin thicknesses were 1.55 ± 0.48 and 2.32 ± 0.54 mm in PRF group and 1.57 ± 0.44 and 2.41 ± 0.56 mm in the control group (►**Figs. 4** and **5**). No significant difference was present regarding mean preoperative nasal dorsum and supratip skin thickness measurements between the two groups ($p > 0.05$). In the first-week ultrasound controls, mean nasal dorsum and supratip skin thicknesses were 2.39 ± 0.84 and 4.08 ± 1.23 mm in the PRF and 2.66 ± 0.67 and 4.76 ± 0.87 mm in the control group. In the third-month ultrasound controls, mean nasal dorsum and supratip skin thicknesses were 1.65 ± 0.49 and 2.44 ± 0.68 mm in the PRF and 1.80 ± 0.43 and 2.75 ± 0.39 mm in the control group. Both mean nasal dorsum and supratip thicknesses were significantly higher in the first week and the third month compared with the preoperative measurements in both groups ($p < 0.05$). Regarding the first-week control, mean supratip skin thickness was significantly lower in the PRF group ($p < 0.05$). However, no significant difference was found regarding mean nasal dorsum skin thickness measurements in the first week and the third month ($p > 0.05$).

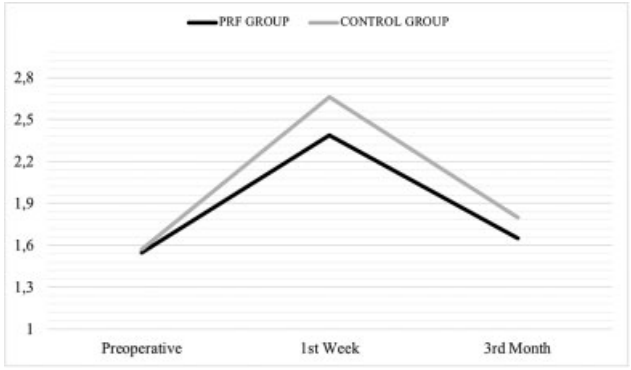

Fig. 4 The mean thickness over the nasal dorsum skin in the platelet-rich fibrin group and the control group.

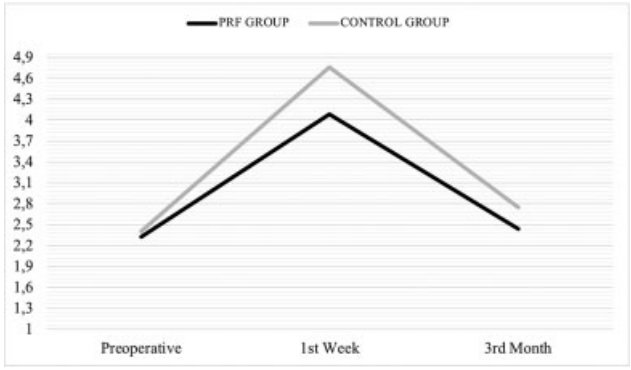

Fig. 5 The mean thickness over the supratip in platelet-rich fibrin group and the control group.

No complications including scarring, hematoma, infection, skin discoloration, and acne were encountered in neither of the groups.

Discussion

Postoperative edema is an important rhinoplasty outcome, especially during the first months of recovery. This may require months to resolve particularly in patients with thick skin, and this period can be challenging for both surgeons and patients.

Surgical trauma is the main reason for postoperative edema. Osteotomy, dissection of the subcutaneous tissue, and manipulation of the skin are the critical traumatic factors of the rhinoplasty procedure. Meticulous dissection on the sub-SMAS plan and avoiding harmful manipulation are the primary surgical rules for minimally invasive rhinoplasty surgery.[5] Additionally, subperichondrial dissection, repair of the subcutaneous ligaments, and use of powered instruments may help decrease the postoperative edema. Corticosteroids have been found useful in decreasing edema and ecchymosis during the initial weeks.[6,7] However, complications associated with steroid use are the main disadvantage for routine clinical use. Additionally, different pharmacological agents were tested to reduce postoperative edema.[5,8]

Platelet concentrates have been widely used in the last two decades, especially in dental and orthopaedic procedures. Since many growth factors and cytokines are available in PRF, its clinic effects on tissue healing have been defined for many clinic procedures. Furthermore, fibrin matrix is simple, cheap, and easy to prepare.[3] Sclafani and Saman reported the injection of PRF along to the osteotomy lines to reduce postoperative ecchymosis and edema.[9] Kovacevic et al reported a study regarding the use of PRF in rhinoplasty procedure, a new autologous scaffold that is combined with cartilage for nasal dorsum augmentation.[10] In our study, we investigated potential effects of PRF on postoperative edema and wound healing with an objective measurement technique. According to the results of this study, the difference between pre- and postoperative third-month mean nasal dorsum and supratip skin thicknesses were 0.1 and 0.12 in the PRF group and 0.23 and 0.34 in control group, respectively. There was no significant difference between the PRF group and the control group on the third-month control. This

indicates a clinically insignificant difference regarding postoperative edema between the two groups.

Mean skin thickness over the supratip area was significantly higher in the control group in the first-week control. The potential positive effects of PRF on wound healing and inflammation have been shown to reduce postoperative inflammation, especially in the early postoperative period. Thus, PRF may help reduce postoperative edema in rhinoplasty patients, especially in the first weeks following surgery. Since the thickest part of nasal dorsal skin is the supratip area, it is thought that the effect of PRF was more potent in this region. Additionally, in the long run, despite statistical insignificance, mean skin thickness was closer to preoperative measurements in the PRF group compared with the control group.

Ultrasonography with the high-frequency probe has been used effectively for measuring the skin thickness over the nasal dorsum in the previous studies.[11] In our study, we used ultrasonography as an objective evaluation method for measuring postoperative skin thickness. Our study is the first study that reports the potential positive effects of PRF on postoperative edema after rhinoplasty. Further studies are warranted to search for the potential benefits of platelet concentrates in rhinoplasty.

Conclusion

The positive effect of PRF on tissue recovery is a well-known entity, but the benefits and use of this autologous fibrin matrix on the outcome of rhinoplasty have not been thoroughly investigated. This study presents the application of PRF membrane over the bony dorsum and cartilage framework of the supratip area. We observed its positive effect on postoperative edema, especially in the early postoperative period. Long-term investigations have to be performed for its potential effect on the rhinoplasty procedure.

Conflict of Interest
None.

References

1 Hafezi F, Naghibzadeh B, Nouhi A. Management of the thick-skinned nose: a more effective approach. Ann Otol Rhinol Laryngol 2006;115(06):444–449
2 Cobo R, Camacho JG, Orrego J. Integrated management of the thick-skinned rhinoplasty patient. Facial Plast Surg 2018;34 (01):3–8
3 Miron RJ, Fujioka-Kobayashi M, Bishara M, Zhang Y, Hernandez M, Choukroun J. Platelet-rich fibrin and soft tissue wound healing: a systematic review. Tissue Eng Part B Rev 2017;23(01):83–99
4 Dohan DM, Choukroun J, Diss A, et al. Platelet-rich fibrin (PRF): a second-generation platelet concentrate. Part I: technological concepts and evolution. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006;101(03):e37–e44
5 Ong AA, Farhood Z, Kyle AR, Patel KG. Interventions to decrease postoperative edema and ecchymosis after rhinoplasty: a systematic review of the literature. Plast Reconstr Surg 2016;137 (05):1448–1462
6 Kargi E, Hoşnuter M, Babucçu O, Altunkaya H, Altinyazar C. Effect of steroids on edema, ecchymosis, and intraoperative bleeding in rhinoplasty. Ann Plast Surg 2003;51(06):570–574
7 Gurlek A, Fariz A, Aydogan H, Ersoz-Ozturk A, Eren AT. Effects of different corticosteroids on edema and ecchymosis in open rhinoplasty. Aesthetic Plast Surg 2006;30(02):150–154
8 Koşucu M, Omür S, Beşir A, Uraloğlu M, Topbaş M, Livaoğlu M. Effects of perioperative remifentanil with controlled hypotension on intraoperative bleeding and postoperative edema and ecchymosis in open rhinoplasty. J Craniofac Surg 2014;25(02): 471–475
9 Sclafani AP, Saman M. Platelet-rich fibrin matrix for facial plastic surgery. Facial Plast Surg Clin North Am 2012;20(02): 177–186, vi
10 Kovacevic M, Riedel F, Wurm J, Bran GM. Cartilage scales embedded in fibrin gel. Facial Plast Surg 2017;33(02):225–232
11 Tasman AJ, Helbig M. Sonography of nasal tip anatomy and surgical tip refinement. Plast Reconstr Surg 2000;105(07):2573–2579, discussion 2580–2582