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Use of the Autologous Membrane in Structured Rhinoplasty: An Alternative to Camouflaging and Filling

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Background: Rhinoplasty is one of the most challenging procedures in plastic surgery because the surgical modifications should attend to patient expectations and to the need for functional correction allied to aesthetics. Composed of leukocytes and platelet-rich fibrin, an autologous membrane has great potential for tissue repair. The purpose of this study was to assess the use of this membrane (associated or not associated with diced cartilage) as an alternative to techniques such as the camouflage and filling; correction of irregularities of the dorsum, nose tip, soft triangle, and K zone; filling in of dead space; skin camouflage; and an improvement in the healing process in primary or secondary rhinoplasties.

Methods: The membranes were obtained by centrifuging patients' peripheral blood before the rhinoplasty. At the time of use, the membrane was removed from the tube, separated from the clot, and used in the camouflage and filling process in patients operated on due to various indications: 19 associated with diced cartilage, and 4 sole. The authors present the clinical and photographic impressions of the immediate and late postoperative period, as well as the patients' opinions using a specific questionnaire.

Results: No patient had immediate or late postoperative complications. The use of leukocyte- and platelet-rich fibrin (L-PRF) was sufficient to carry out the camouflage and filling in all patients, and the patient declared satisfaction.

Conclusions: This membrane was shown to be an excellent surgical alternative to the camouflage and filling in rhinoplasty. In addition, it is rich in factors that can improve and accelerate regeneration of tissues. *(Plast Reconstr Surg Glob Open 2020;8:e3056; doi: 10.1097/GOX.0000000000003056; Published online 20 August 2020.)*

INTRODUCTION

The search for methods that could accelerate and improve the healing process, as well as the aesthetic and functional results, is a constant effort in plastic surgery.[1] The influence of blood cells as biomaterials applied to the human body has been researched for years. The autologous biomaterials, such as the autologous membrane, rich in leukocytes and platelets (leukocyte- and platelet-rich fibrin [L-PRF]), are considered more appropriate because they generate a smaller inflammatory response and rejection when compared with other types of biomaterials.[2] The application of L-PRF was first described by Choukroun et al,[3] in 2001 with a high potential for tissue repair. L-PRF is obtained from the autologous peripheral blood, collected immediately before the surgical procedure, with no addition of external factors.[4]

Composed of a matrix of fibrine (rich in fibronectin and vitronectin, platelets, leukocytes, and growth factors, which are essential in the inflammatory process and promote tissue regeneration), L-PRF increases the speed and quality of tissue repair.[5] L-PRF is considered a new generation of platelet concentrate, with advantages that justify its use in the medical practice.[6] Other characteristics of these membranes are their tumescence and tensile force, which allow them to be used for overlapping of tissues (isolated

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or in association with diced cartilage and bone) and for attachment using sutures.[7]

Rhinoplasty is considered one of the most challenging procedures in plastic surgery. The strategic position of the nose on the face and its aesthetic and functional importance require a broad mastery of nose anatomy and physiology. Special situations found in primary and secondary rhinoplasties, such as thin skin, the need to enlarge the nasal dorsum or only the radix, contour irregularities, the presence of dead space, reduction of vascularization, correction of the soft triangle, among others, require procedures that are mostly invasive and have a higher morbidity. Camouflage and filling-in techniques such as the use of the deep temporal fascia, the rectus sheath, cartilaginous grafting associated with synthetic materials, fibrin glue, acellular dermal matrix, and filling in with hyaluronic acid or fat are frequently used.[8–11] However, sometimes these techniques may involve incisions on other anatomic sites, with an increase in the surgical time and formation of scars (which can become hypertrophic, dyschromic, enlarged, or keloid scars), or may require either the use of costlier synthetic materials or a repetition of the procedures within short intervals of time.[12–14]

We found only a few articles evaluating the use of L-PRF in rhinoplasties in literature. Therefore, the purpose of this study was to describe and follow up for 12 months a series of cases in which the L-PRF membrane was used as an alternative to the camouflage and filling-in techniques used in primary or secondary rhinoplasties.

MATERIALS AND METHODS

This original study was approved by the Research Ethics Committee of the Institution under protocol number 81445417.0.0000.5154. All patients gave consent for surgery and medical imaging. From January 2017 to January 2018, 26 patients were submitted to open-structured rhinoplasty—aesthetic, and/or functional, primary, or secondary. Three cases were excluded from the study because we could not get L-PRF membranes of good quality. Thus, 23 patients were submitted to open-structured rhinoplasty, aesthetic, and functional, primary (14 cases, 61%), or secondary (9 cases, 39%). Patient ages varied from 14 to 50 years (average, 32 years). Five patients were men (21.7%), and 18 (78.3%) were women. As to ethnicity, 20 were white (87%), 2 were Afro-descendants (8.7%), and 1 was of Eastern descent (4.3%). The indications for rhinoplasty are described in Table 1. Most of the time, the same patient showed more than 1 indication for necessitating the surgery.

Table 1. Indication for Rhinoplasties Using Fibrine Rich in Platelets and Leucocytes, 2018–2019

Indication	n	Percentual
Septum deviation	17	73.9
Insufficiency of the internal nose valve	17	73.9
Insufficiency of the external nose valve	8	34.7
Trauma	3	13.0
Irregularities of the nose	8	34.7

Fig. 1. A tube showing the 3 phases obtained after blood centrifugation.

Attainment and Preparation of L-PRF

Before the anesthetic procedure, access was obtained on the cubital vein, contralateral to that used by the anesthetist, and 9 mL of blood was collected and stored into 4–6 disposable plastic tubes of 10 mL, with no preserving agents or anticoagulants. Then, the tubes were put in the spaces of the L-PRF centrifuge (Intra-Lock) and interleaved with tubes containing saline solution to counteract the weight. The centrifuge was programmed for 2700 rotations per minute for 12 minutes, as suggested in the methodology described by Choukroun et al.[15] After the completion of the centrifugation, 3 phases were distinctly identified in the tubes (Fig. 1): one at the bottom of the tube corresponding to the clot; an intermediary one, containing the L-PRF membrane; and a superficial one, containing the plasma deficient in platelets.

Unless needed, the tubes were maintained static for different periods (2–5 hours, depending on the length of the surgery). Collection and preparation of the membrane were not carried out during the surgery, nor by the vein access used by the anesthetist because we observed that, in these cases, the membrane was not formed or a more fragile membrane was formed, indicating that the time and dilution were the factors that interfered in the development of the membrane.

When needed, the membrane was taken out of the tube and separated from the clot by dissecting with the scissors (Fig. 2), and its tumescence force and tensile force were assessed. When the need was only for tissue

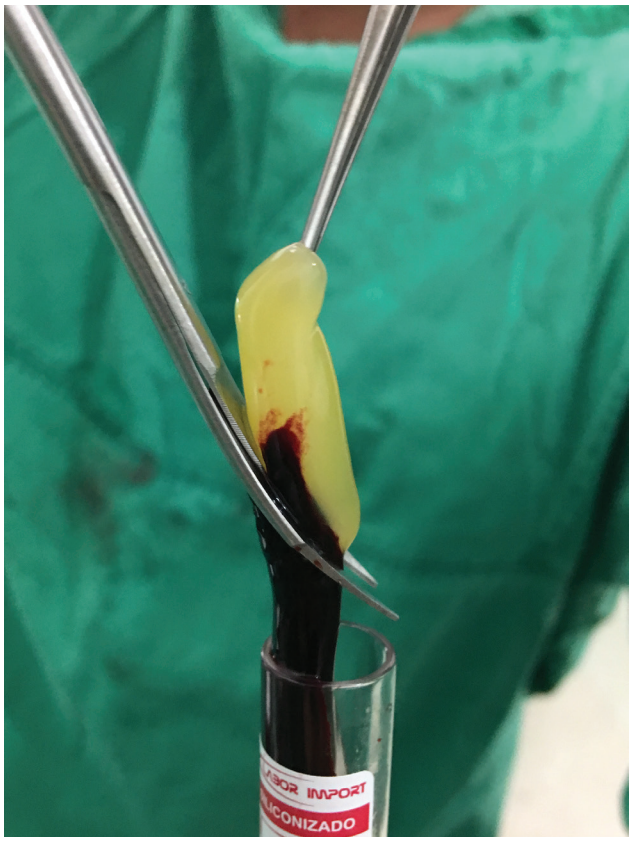

Fig. 2. The separation of the clot with the scissors.

coverage, with no filling-in effect, the tumescence of the membrane was reduced using light compression of the membrane between two pieces of sterile gauzes or by a stainless steel pressing system that accompanies the centrifuge kit (Xpression). We still use, in most cases, autogenous cartilage without previous storage, diced into pieces of 0.5–1.0 mm. The primary source of the cartilage is the nasal septum (22 cases) or costal cartilage (1 case).

Evaluated Outcomes

The results of the application of L-PRF were evaluated using 2 methods: the author's clinical observation and the patient's perception. The clinical assessment and the physical examination by the authors were accompanied by photographic registers during immediate and later pre- and postsurgery periods, with the latter defined as the period starting from the third month. Improvements were evaluated concerning the quality of the skin, the camouflage effect, and the filling-in of specific areas, such as soft triangles, K zone, radix, and areas with secondary depression. As from the 3rd, 6th, and 12th months, the patients were questioned concerning their tactile perception of nose palpation (sensation of irregularity, tenderness, and rigidity of the nose tip) and the subjective assessment of the appearance after surgery. This was based on the patients' perception using a specific questionnaire, the Rhinoplasty Outcome Evaluation applied in the later postoperative period. [**See appendix, Supplemental Digital Content 1**, which displays the Rhinoplasty Outcome Evaluation questionnaire, **http://links.lww.com/PRSGO/B452**.] The questionnaire consists of 6 questions, all of them with 5 direct responses, scored by a 0–4 scale, in which 0 represents the most negative response and 4 indicates the most positive response. Thus, adding the points obtained, dividing the same by 24, and multiplying by 100, we have the percentage (degree) of patient satisfaction after surgery.[16] The questionnaire was sent via mail so that patients could answer with the highest degree of impartiality possible, with no other opinions or constraints due to being in the presence of the professional who was responsible for the surgery. Data were analyzed using descriptive statistics.

RESULTS

The L-PRF was used for the coverage of the osteocartilaginous dorsum, mainly the K zone with secondary irregularities to scrapings or osteotomies; filling in of the dead space, especially in the transition of the tip to the dorsum; filling in of the soft triangle and radix associated with diced cartilage; and for the effect of camouflage on a thin skin with reduced vascularization signs (Fig. 3). Another use of the membrane was the suture to soft or cartilage tissues due to its tensile force. In 3 cases, we used only the L-PRF membrane, and in 19 cases, it was associated with diced cartilage.

No patients showed phlogistic signs, such as erythema, heat, pain, or secretion draining during the postoperative, immediate, or later period. The color of the skin was standard, especially on the columella, the place where a discrete ecchymosis can be noticed during the first 24 hours. The use of L-PRF was sufficient and satisfactory for the correction of irregularities on the dorsum and the K zone, producing an adequate camouflage and increase in the thickness and quality of the soft tissues and nasal lining, both in the immediate postsurgical period and in the later postsurgical period, that is, after 6 and 12 months (Fig. 4). Among the 8 patients operated due to irregularities on the dorsum, only 1 showed hypocorrection in the transition region from the tip of the nose to the dorsum (supratip), but this did not result in a complaint by the patient after 6 and 12 months (Fig. 5). The process of filling in the soft triangle associated with the diced cartilage was shown to be efficient in all patients, and the result lasted even after 1 year (Fig. 6). Six patients of secondary rhinoplasty and 3 of primary rhinoplasty had an extremely thin skin, with a sharp marking of the osseocartilaginous contour. The camouflage was effective in the immediate postoperative period and lasted even after 6 and 12 months (Fig. 7).

The sensitivity on the nose tip returned on average after 2 months postoperatively. Usually, the patients complain about this in the immediate postoperative period, and in some cases, it can extend up to 6 months.[17]

In secondary rhinoplasties, alar retractions associated with thin skin were treated with grafts, and L-PRF was added over them to give a good effect of camouflage and to reduce further fibrosis, and the result lasted even after 1 year of observation (Fig. 8). As to the questionnaire for the assessment of the patient's satisfaction with the result of the surgery, the lowest percentual of satisfaction was 62.5% and

Fig. 3. Membrane placement and follow-up. A, The coverage of the dorsum and K zone. B, The filling-in of the dead space and camouflage. C, The filling-in of the soft triangle associated with diced cartilage.

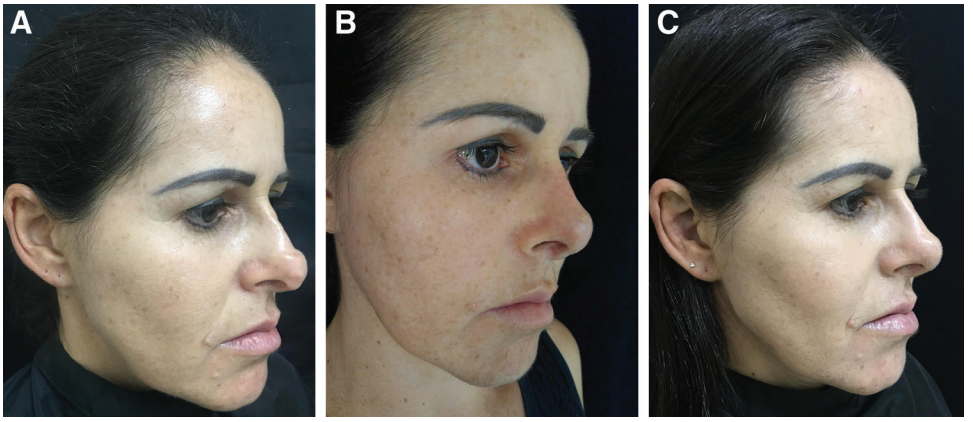

Fig. 4. Membrane placement and follow-up. A, A preoperative view of the patient. B, The patient after a postoperative period of 6 months, with the camouflage effect proportioned by the membrane alone. C, The patient after a postoperative period of 12 months, showing the maintenance of the result.

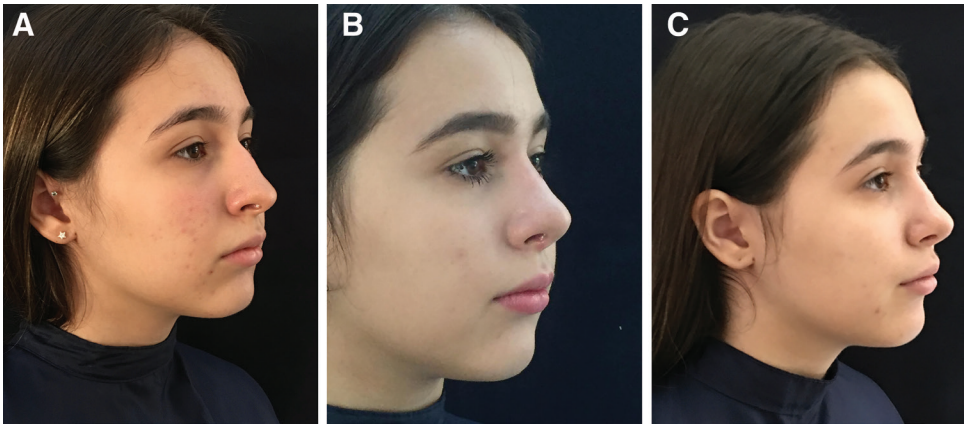

Fig. 5. Membrane placement and follow-up. A, A preoperative view of the patient. B, The patient after a postoperative period of 6 months, with the filling in of the nose tip using membrane associated with diced cartilage. C, The patient after a postoperative period of 12 months, with the filling in of the nose tip using light reabsorption.

the highest was 100% (Figs. 9 and 10). The criterion for improvement in breathing (Question #2 of the ROI) was the one that received the lowest marks, especially in the first 6 months, probably due to the edema verified in this period, especially in the cases in which septum was used as grafting (Fig. 11). Four patients mentioned that they breathed little up to the third month. The criteria appearance of the nose was that which received the highest marks, in which all the patients declared satisfaction (Fig. 12).

DISCUSSION

The beneficial effects resulting from the use of growth factors and the application of L-PRF have been widely

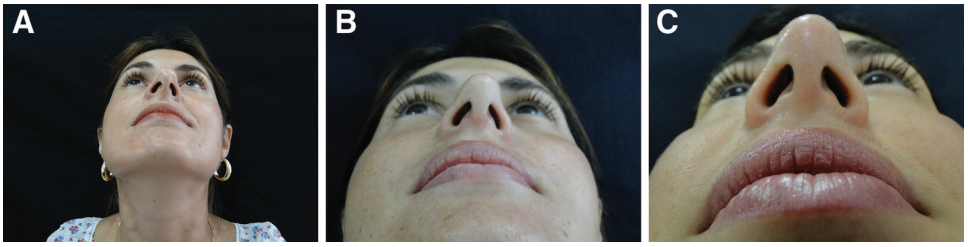

Fig. 6. Membrane placement and follow-up. A, A preoperative view of the patient. B, The patient after a postoperative period of 6 months showing the filling in effect of the soft triangle. C, The patient showing maintenance of the result with 1 year.

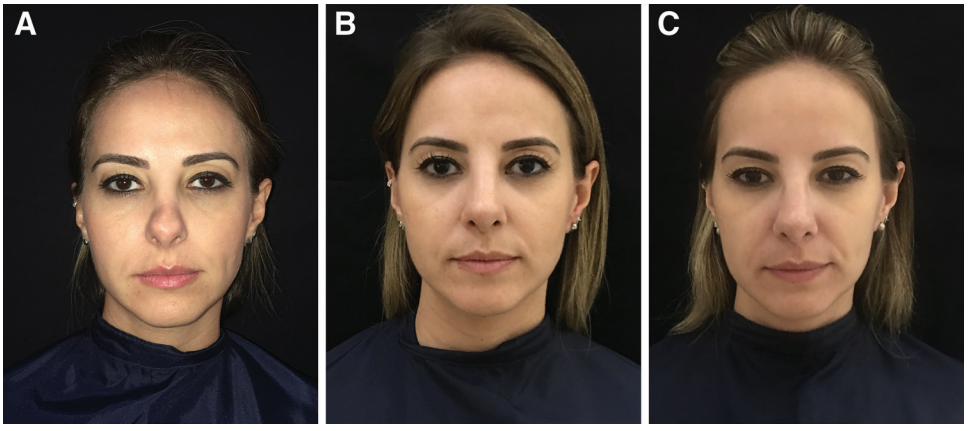

Fig. 7. Membrane placement and follow-up. A, A preoperative view of the patient. B, The patient after a postoperative period of 6 months showing the effects of the membrane and diced cartilage in the skin camouflage and supratip filling. C, The patient after a postoperative period of 1 year showing the result.

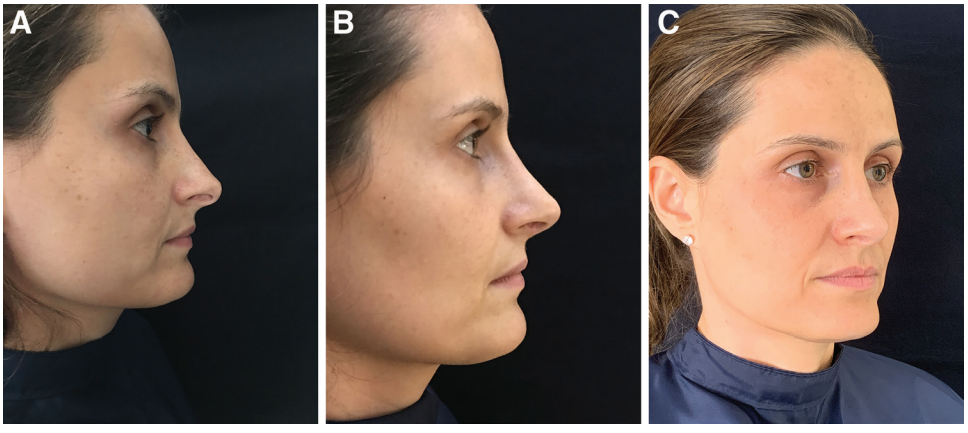

Fig. 8. Membrane placement and follow-up. A, A preoperative view of the patient. B, The patient after a postoperative period of 6 months, with the correction of alar retraction with lower lateral cartilage support covered by the membrane alone. C, The patient showing the maintenance of the correction.

proved. Due to the improvement and acceleration in tissue regeneration, especially the bone and cartilage, it is widely used in oral and maxillofacial reconstructive surgery, including periodontal procedures, implants, and the use of grafting.[18] The most essential bioactive molecules found in the L-PRF are the platelet-derived growth factor, vascular endothelial growth factor, insulin-like growth factor, epidermal growth factor, transforming growth factor-beta 2, and bone morphogenetic protein 2. These molecules are generally liberated in 7–14 days, precisely when the angiogenesis reaches a peak and the tissue growth starts.[19]

Some well-established clinical applications are the filling-in of dental alveolus, covering and protection of diced cartilage graftings and those in a block, lifting of the maxillary sinus floor, treatment of membrane perforations on the sinus floor elevation, treatment of dehiscences and fenestrations associated with the use of growth

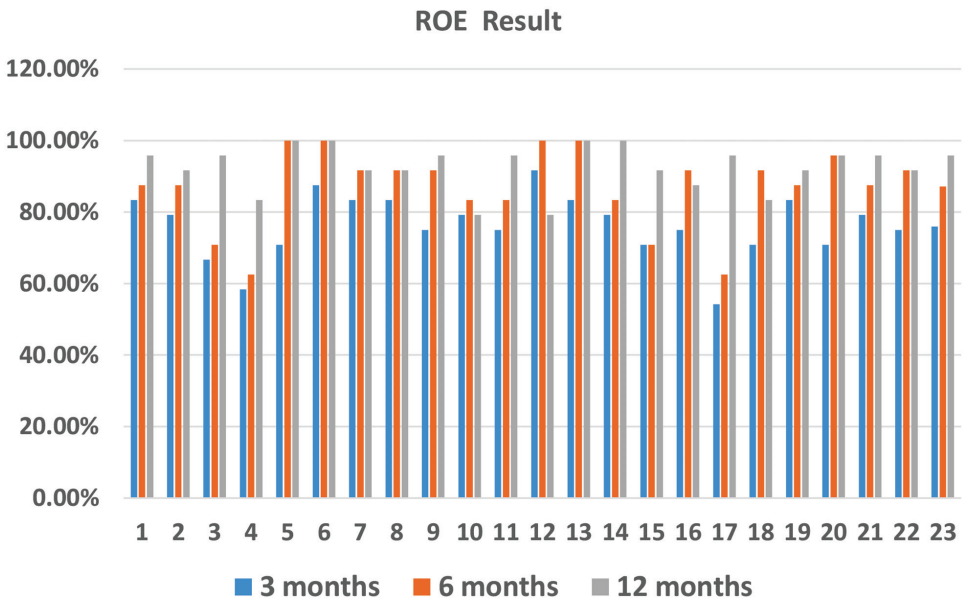

Fig. 9. Rhinoplasty Outcome Evaluation (ROE) results after 3, 6, and 12 months.

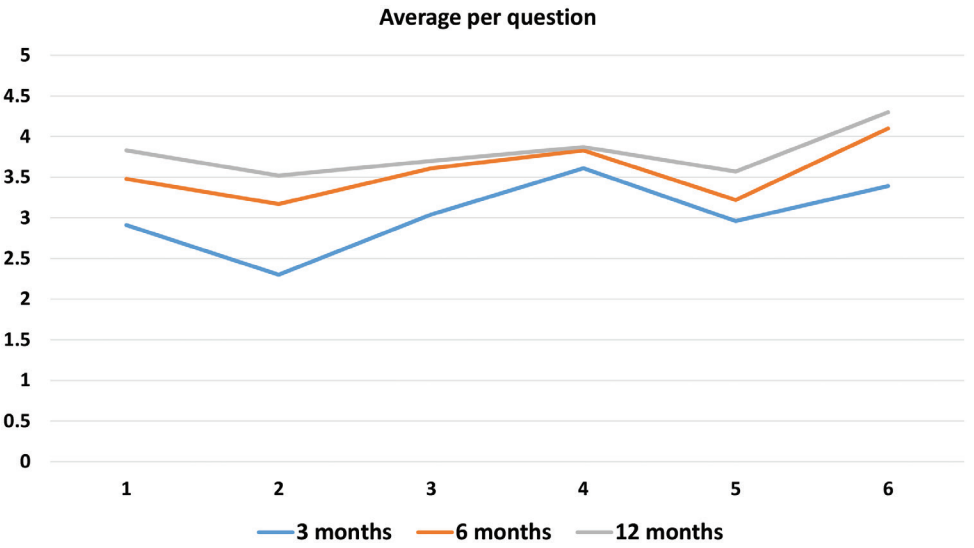

Fig. 10. Average per question of rhinoplasty outcome evaluation (ROE) results of patient after 3, 6, and 12 months.

factors, treatment of gingivitis, and radicular covering in periodontal surgeries. Subsequently, other applications were described in ear, nose, and throat afflictions and plastic surgery, and in trauma surgery, orthopedics, and sport medicine.[20–22] L-PRF may function as a sole grafting material (not requiring a donor site or other biomaterials) and, when used in association with other biomaterials, it potentializes their effects.[23,24]

The use of this concentrate in plastic surgery has excellent potential for expansion and application in various procedures. In the reparation of chronic ulcers of the lower limbs, it showed the ability to accelerate the healing.[23–26] Especially in structured rhinoplasty, L-PRF may constitute a valuable resource, as this surgery has the advantage of involving a small area of the body surface, in which small and refined gains in the healing quality can lead to aesthetic and functional results that are lasting and satisfactory. Techniques that use diced cartilage with or without membrane coverings, such as temporal or abdominal fascia or synthetic materials, show intercurrences such as hypocorrections and hypercorrections, infections (apart from hypertrophic scars in the donor sites), and the need for revisions, and a longer surgery period.[27,28] Filling-in using hyaluronic acid may have disadvantages, apart from the cost, the absorption, or, as an extreme complication, secondary skin necrosis, and vascular embolization.[29]

Similarly, Tapia and Santamaria[30] used L-PRF associated with cartilage to fill in and camouflage the nasal dorsum in 7 patients and subjectively assessed the degree of patient satisfaction and whether graft reabsorption

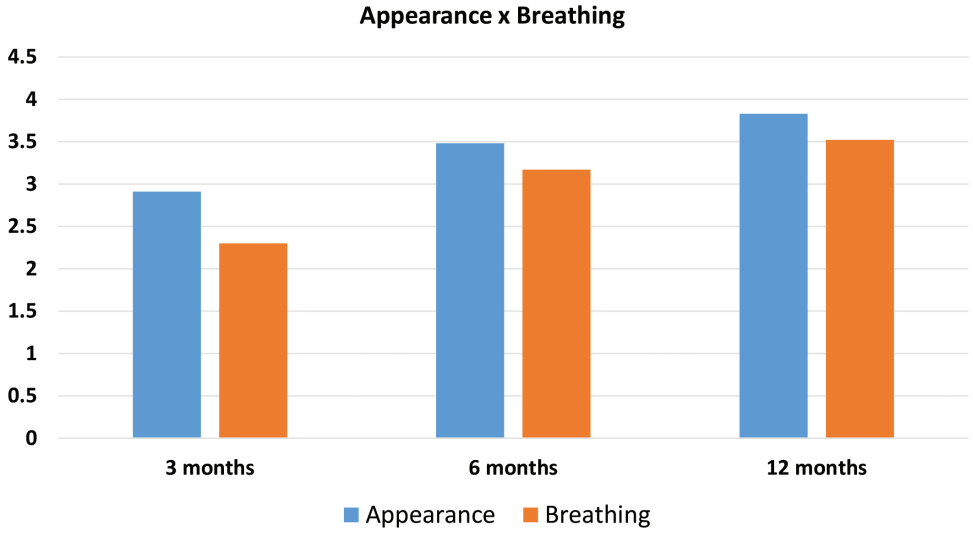

Fig. 11. Appearance and breathing results of patients after 3, 6, and 12 months.

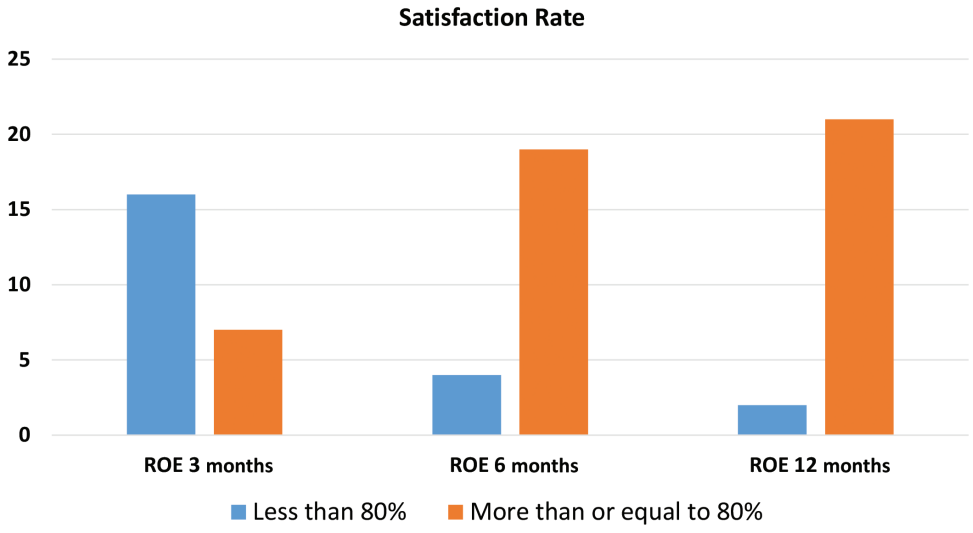

Fig. 12. Patient satisfaction rate after 3, 6, and 12 months.

occurred over a period that varied from 17 to 24 months. In this small number of cases, the authors also considered the use of L-PRF to be safe and effective.

Choukroun et al[15] evaluated the histologic effects of the use of PRF on the maturation of bone allografts in implant dentistry and observed that, despite the reabsorption of PRF, there was the presence of neoformed bone and connective tissue, indicating a real biologic effect. Gode et al[31] also described the use of L-PRF in primary rhinoplasties and evaluated camouflage and edema. They did not observe membrane resorption after 3 months of surgery using ultrasound to measure the thickness of the subcutaneous and soft tissues. They also observed a decrease in edema, particularly in the immediate postoperative period, with the use of L-PRF.

Diced cartilage is one of the most frequently used techniques for camouflage in rhinoplasty, with varying degrees of resorption in the postoperative period. The association of diced cartilage with an injectable fraction of PRF, a technique different from that used in our study, showed a reduction in the resorption of cartilage and an increase in viability and maintenance of the shape of the nasal dorsum.[32]

The use of other methods in rhinoplasty may equally offer similar or even superior results,[32] but the practicality of L-PRF makes it an excellent alternative. The L-PRF membrane is strong, elastic, and flexible, as well as having a favorable architecture to uphold the healing process. The immunobiologic properties of this material may favor the short-term results due to the factors that improve and accelerate the tissue regeneration, and in long term, assuring security and functional and aesthetic improvement to patients submitted to rhinoplasty.[18,19]

Associating the findings of the literature that state a real effect on connective tissue formation despite PRF's resorption[15] with those of maintaining the camouflage results

after 3 months, the membrane's detection on ultrasound,[31] the reduction in cartilage's resorption with PRF, and the consistence of our clinical results for up to 12 months, we consider the use of the L-PRF membrane in rhinoplasty an alternative option. Also, growth factors present in L-PRF have already improved and accelerated healing.[18]

The authors emphasize its easy obtainment and application, its abundant availability, apart from the low cost, the option to decrease surgery time when compared with the removal of tissues from other anatomic sites with immediate reparation of the same, and avoidance of scars in other anatomic sites. The cost generated for obtaining the membranes is only that of the centrifuge and the accessories for blood collection, which, when compared with the use of synthetic materials, becomes minimal. We believe that evaluation for a period exceeding 12 months and even experimental studies analyzing the integration of the membrane with the structures, the amount and type of the inflammatory infiltrate, and the cytokines involved and fibrosis would be valuable in the future.

CONCLUSIONS

Despite the subjective evaluation, the use of L-PRF in structured primary or secondary rhinoplasties seems a viable alternative because of its easy obtainment and application, abundant availability, low cost, shorter surgery time requirement than needed for the removal of tissues from other anatomic sites, with the possibility of immediate reparation of the same, avoiding scars in other places. Apart from these characteristics, it is an autologous membrane rich in factors that can improve and accelerate the regeneration of tissues after rhinoplasty, and its high restoring power is one of the determining factors for the expansion of its use.

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PATIENT CONSENT

Patients provided written consent for the use of their images.

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