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A modified technique for autologous dorsal nasal augmentation rhinoplasty

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Abstract. – OBJECTIVE: Autologous dorsal cartilage grafts are usually the first choice for nasal augmentation. We aimed to describe a modified technique for autologous dorsal nasal augmentation rhinoplasty.

PATIENTS AND METHODS: The study group consisted of a retrospective review of patients who underwent augmentation rhinoplasty surgery and were treated with diced cartilage in platelet-rich plasma (PRP) in the last five years at King Abdulaziz University Hospital. Gender, age, smoking history, saddle nose etiology, complications, mean duration of surgery, mean duration of hospital stay, morbidity, mortality, and surgical technique used were assessed and analyzed. The outcome of this technique was compared with other techniques used for augmentation rhinoplasty published in the current literature.

RESULTS: A selective, retrospective analysis was conducted on patients undergoing rhinoplasty between 2017 and 2022. A total number of 30 patients' files were reviewed; of those, eight patients were males, and 22 were females. The average age of the participants was 33, with a minimum of 19 years and a maximum of 55. The indications for surgery are listed in Table II. Cartilage graft was harvested from the concha in 14 patients, from the septum in eight patients, and from both sites in eight. Male and female samples are shown in Figures 1 and 2. We have only observed graft resorption in two female cases, and none of the patients had any complications.

CONCLUSIONS: We have assessed the patients who underwent rhinoplasty with the modified technique for autologous dorsal augmentation. The combination of diced cartilage and PRP yielded good results with a low resorption incidence; when done correctly, no complications were observed.

Platelet-rich plasma (PRP) contains a greater volume of platelets and Platelet-Derived Growth Factors, which exert multiple actions on different aspects of reparative and regenerative tissue phenomena. Augmentation rhinoplasty using PRP offers stabilization and enclosure of diced cartilage without the risks of hypersensitivity or disease transmission.

Key Words:
Cartilage push-down with bony cap, Preservation method, Rhinoplasty.

Introduction

Augmentation rhinoplasty is one of the most challenging topics in nasal surgery that needs good preoperative planning and communication with the patient[1]. Various surgical methods were described for this purpose. The modified autologous dorsal nasal augmentation rhinoplasty technique utilizes diced cartilage and fascia, incorporating a Platelet Rich Plasma (PRP) autologous carrier[2]. This technique is a modification of Daniel and Calvert's technique[2] that uses diced cartilage and fascia grafts. Erol[3,4] first popularized diced cartilage in dorsal nasal augmentation in a large series using the named "Turkish delight" technique.

Erol's technique consisted of a combination of diced autologous cartilage wrapped in oxidized regenerated cellulose (Surgicel; Ethicon Inc, Somerville, NJ, USA). Despite excellent results demonstrated by Erol, some[3] have criticized the technique as not being easily reproducible and noting higher rates of cartilage resorption using similar techniques. Also, Surgicel has been associated with chronic inflammation, and animal studies4 have shown a lack of proliferation of cartilage grafts wrapped in Surgicel. Another technique variation was described by Bullocks et al[5], using diced cartilage in an autologous scaffold created from Platelet Rich Plasma (PRP) and Platelet-Poor Plasma (PPP). PRP contains growth factors, and PPP acts as fibrin glue[5]. In our clinical experience, this technique carries various potential limitations, including visible and palpable skin irregularities along the surface of diced cartilage, the limited extent of overall dorsal augmentation, and cartilage graft displacement[6-8]. To overcome these limitations, we have preferred techniques combining

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diced cartilage and deep temporal fascia grafts, as first described by Daniel and Calvert[2]. While we have had overall clinical success using Daniel and Calvert[2] techniques, we also have noted graft resorption, which may be due to fascia grafts impeding the imbibition of cartilage grafts. To minimize graft resorption and skin irregularities while still achieving good nasal augmentation, we have employed the following technique, which combines diced cartilage fascia grafts with PRP[9,10].

Patients and Methods

The study group consisted of a retrospective review of patients who underwent augmentation rhinoplasty surgery and were treated with diced cartilage in PRP in the last five years at King Abdulaziz University Hospital. Gender, age, smoking history, saddle nose etiology, complications, mean duration of surgery, mean duration of hospital stay, morbidity, mortality, and surgical technique used were assessed and analyzed. The outcome of this technique was compared with other techniques used for augmentation rhinoplasty published in the current literature.

Statistical Analysis

We used SPSS version 20 (IBM Corp., Armonk, NY, USA) software to analyze the data, obtaining a mean age of 32.63 years for males and 33.32 years for females, with no significant difference between the two groups (t=-0.346, p=0.732). We also used Kaplan-Meier methods to analyze graft survival, although additional data on graft harvesting and resorption timing would be needed for a complete analysis. A p-value lower than 0.05 was considered statistically significant.

Results

A selective, retrospective analysis was conducted on patients undergoing rhinoplasty between 2017 and 2022.

A total number of 30 patients' files were reviewed; of those, eight patients were males, and 22 were females (Table I). The average age of the participants was 33, with a minimum of 19 years and a maximum of 55. The indications for surgery are listed in Table II. Cartilage graft was harvested from the concha in 14 patients, from the septum in eight patients, and from both sites in eight. Male and female samples are shown in Figures 1 and 2. We have only observed graft resorption in two female cases, and none of the patients had any complications.

The most common reason for rhinoplasty in this sample was secondary rhinoplasty (n=17, 56.7%), followed by congenital (n=6, 20.0%) and post-traumatic (n=5, 16.7%) reasons. Ethnic reasons accounted for only 2 cases (6.7%). Additionally, it is noteworthy that none of the patients in this study experienced any complications following rhinoplasty. This critical finding highlights the procedure's safety and the surgical team's expertise.

Discussion

The advantages of diced cartilage in augmentation rhinoplasty are that diced cartilage pieces have no visible edges, do not carry the risk of warping, can be easily molded to resurface irregularities, and allows the use of all the cartilage fragments that are usually discarded[1,2]. Moreover, diced cartilage grafts revascularize faster due to the increased surface area available. Solid costal cartilage grafts have been used[2] extensively for nasal augmentation, but the disadvantages are resorption, stiffness, graft visibility, donor site pain, suboptimal shape, and warping. The advantages of wrapping the diced cartilage in a fascia graft sleeve are that the fascia helps camouflage skin irregularities, provides high tensile strength, and is a durable graft material with cell-supportive properties acting like a scaffold for tissue integration[5,7]. When histologically comparing isolated cartilage grafts with diced cartilage grafts wrapped in Surgicel and deep temporal fascia in rats, it was observed[8,9] that the cartilage wrapped in Surgicel contained the minimum cartilage cells.

Table I. Indications for grafting.

	Group 1 (Male)	Group 2 (Female)	p-value
Mean age	32.62	33.32	0.73
Standard Deviation	10.407	9.781	

In contrast, those wrapped in fascia showed higher viability. An exciting technique was described for nasal dorsum augmentation using rectus abdomens fascia in secondary cases requiring costal cartilage grafts, with the advantage of a single donor site area[10]. However, the fascia grafts integrate well into tissues but could impede the imbibition of cartilage grafts, leading to cartilage graft resorption[11]. For that reason, the use of PRP as a regenerative component was included in this technique. Wrapping diced cartilage in hyaluronic acid also improved cartilage survival compared with oxidized regenerated cellulose, but hyaluronic acid increases costs. Kim et al[10] compared histologically the viability of diced cartilage wrapped in the autogenous fascia to diced cartilage wrapped in AlloDerm® in a rabbit model, reporting superior results with AlloDerm. One significant disadvantage of AlloDerm is the increased cost of the procedure. Platelet-rich plasma (PRP) is a portion of the plasma with a platelet concentration above the baseline obtained by centrifugation. The plasma fraction contains a greater volume of platelets and platelet factors, exerting multiple actions on tissue repair[10].

Platelet-Derived Growth Factors (PDGFs) are bioactive proteins in platelets' alpha granules that stimulate cellular proliferation and differentiation to promote reparative and regenerative tissue phenomena[11]. Each platelet contains 50 to 80 alpha granules formed during megakaryocyte maturation. PDGFs include transforming growth factor-beta (TGF-β), platelet factor 4 (PF4), interleukin 1 (IL-1), platelet-derived angiogenic factor (PDAF), vascular endothelial growth factor (VEGF), epidermal growth factor (EGF), platelet-derived endothelial growth factor (PDEGF), epithelial cell growth factor (ECGF), insulin-like growth factor (IGF), osteocalcin, osteonectin, fibrinogen, fibronectin, and thrombospondin[11-14].

Table II. Indications for grafting.

Indication	Number
Secondary rhinoplasty due to an unpleasant previous result	17
Congenital Deformity	6
Post-traumatic Deformity	5
Ethnic features	2
Total	30

These factors are released from the alpha granules in response to platelet activation by platelet aggregation inducers. It was concluded that the viability of chondrocytes, the content of fiber in the matrix, and the peripheral tissue changes were higher in the cartilage embedded in the platelet-rich fibrin matrix group[6,13]. Kim et al[10] demonstrated that platelet-rich fibrin improves the viability of diced cartilage grafts in a rabbit model. Manafi et al[13] showed that PRP effectively increased cartilage grafts' survival and regeneration capacity in rabbit models.

Also, other grafts and fillers were described to reshape the nose[14-17]. Tasman[14] described a technique for nasal augmentation using a diced cartilage glue graft with Tisseel (Baxter International Inc., IL, USA) and without fascia. The manufacturer of Tisseel cautions that the fibrin sealant may induce hypersensitivity or allergic reactions and carries a risk of transmitting infectious agents because it is derived from pooled human plasma. PRP has

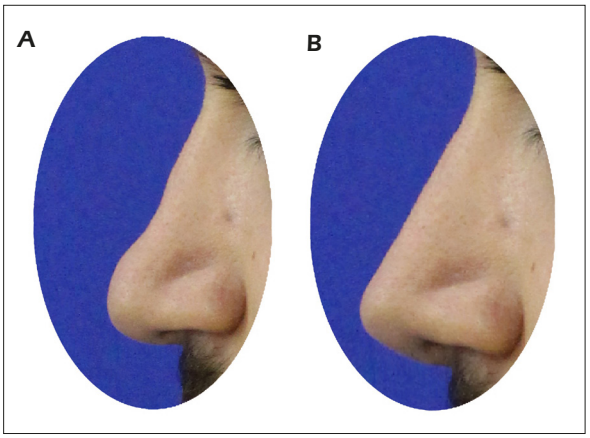

Figure 1. A male patient: autologous dorsal nasal augmentation rhinoplasty. Preoperative (**A**) and postoperative (**B**) profile views.

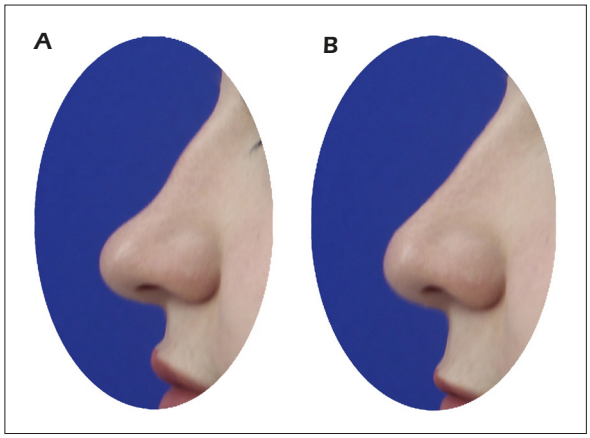

Figure 2. A female patient: autologous dorsal nasal augmentation rhinoplasty. Preoperative (**A**) and postoperative (**B**) profile views.

advantages over the use of commercial tissue glue. PRP and PPP, in addition to having a biological glue effect, have a regenerative effect and lower cost[5,14].

Conclusions

We have assessed the patients who underwent rhinoplasty with the modified technique for autologous dorsal augmentation. The combination of diced cartilage and PRP has yielded good results with a low resorption incidence; when done correctly, no complications are observed.

Platelet-rich plasma (PRP) contains a greater volume of platelets and Platelet-Derived Growth Factors, which exert multiple actions on different aspects of reparative and regenerative tissue phenomena. Augmentation rhinoplasty using PRP offers stabilization and enclosure of diced cartilage without the risks of hypersensitivity or disease transmission.

Ethics Approval

Ethics Committee approval was obtained from King Saud University (2022-124).

Conflict of Interests

The author declares no potential conflicts of interest concerning this article's research, authorship, and publication.

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Informed Consent

The patients were anonymized. The identity information was not included, so only informed consent was obtained from the participants.

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