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Camouflage of the Nasal Dorsum in Thin-Skinned Patients with Diced Cartilage Combined with a New Cross-Linked Hyaluronan (NCH) Gel and Blood: A New Method

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Abstract

Introduction Nasal dorsum irregularities after rhinoplasty are still one of the most common complaints among both surgeons and patients. In this study, we used a new cross-linked hyaluronan (NCH) gel and blood mixture as the stabilisation scaffold. Diced cartilage combined with the NCH gel and blood mixture was used for nasal dorsum camouflage.

Patients and Methods Fifty-two thin-skinned patients (29 females and 23 males) underwent primary rhinoplasty including nasal dorsum enhancement with diced cartilage combined with the NCH gel and blood mixture. The cartilage tissue was diced into small pieces; then, 1 cc NCH gel and blood were added into diced cartilage. The mixture was delivered onto the nasal dorsum via dorsal retractor.

Results After 1 year of follow-up, there were no irregularities in the nasal dorsum area observed, nor any displacement or absorbance of the camouflage material. No complications occurred.

Conclusion The use of diced cartilage combined with the NCH gel and blood is an effective, simple and safe method for nasal dorsum camouflage in thin-skinned patients in rhinoplasty. The NCH gel within the mixed graft also reduces adhesions at the osteotomy lines.

Level of Evidence IV This journal requires that authors assign a level of evidence to each article. For a full description of these evidence-based medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

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Keywords Camouflage · Diced cartilage · Cross-linked hyaluronan · Rhinoplasty

Introduction

Nasal dorsum irregularities after rhinoplasty are still one of the most common complaints among both surgeons and patients. Palpable or visible irregularities like notches, elevations or small asymmetries occur often and, especially in thin-skinned patients, these complications are one of the most frequent reasons for revision rhinoplasty. Camouflage of nasal dorsum irregularities is an important step in rhinoplasty to achieve a smooth and appropriately shaped nasal dorsum. Several materials including autologous and non-autologous grafts have been used for nasal dorsum camouflage. Cartilage has been used successfully as a camouflage material: it is an autologous graft, the infection rate is low, and it is easy to access from the septum, ear concha and rib [1, 2]. There are several cartilage-based nasal dorsum camouflage methods, including use of crushed cartilage, free diced cartilage, surgical-wrapped diced cartilage or diced cartilage combined with blood glue [2–5]. The use of diced cartilage resolves some problems that occur with solid materials, but there are unwanted results like graft distortion and migration, especially in thin-skinned patients. It is also difficult to evenly implant the loosely connected cartilage fragments. To avoid those problems, cartilage combined with other materials is used as a stabilisation scaffold. In this study, we used a new cross-linked hyaluronan (NCH) gel and blood mixture as the stabilisation scaffold. Diced cartilage combined with the NCH gel and blood mixture was used for nasal dorsum camouflage.

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Patients and Methods

Between January 2015 and December 2017, a total of 52 thin-skinned patients (29 females and 23 males) underwent primary rhinoplasty including nasal dorsum enhancement with diced cartilage combined with the NCH gel and blood mixture. Their ages ranged between 22 and 40 years (mean age 26.2 years). The clinical evaluation was performed by inspection, palpation and taking photographs of the patients. In the first year after the operation, patients were called for follow-up once every 3 months, and photographs were taken at each visit. Follow-up of patients continued for 1 year.

All rhinoplasties were performed through an open approach technique. Cartilage grafts were harvested from the septum, tragus or concha of the ear or rib. The cartilage tissue was diced into small pieces using a dermatome blade or No. 11 blade scalpel (Fig. 1). Then, 1 cc NCH gel (PureRegen® Gel Sinus, BioRegen Biomedical Co., Ltd., Changzhou, Jiangsu, China) was added into diced cartilage and blended until the mixture had a paste-like form (Figs. 2, 3). After that, peripheral venous blood was added into the mixture (Figs. 4, 5) to form a homogeneous pasty graft material. A dorsal retractor was used as an applicator, and the mixture was loaded onto it (Fig. 6). In patients who needed dorsal augmentation, a more viscous mixture was prepared. To achieve a more viscous mixture, the ratio of diced cartilage was increased. The mixture was delivered onto the nasal dorsum via a dorsal retractor (Fig. 6). After closing the open approach incision, the dorsum was gently shaped by hand to camouflage dorsal irregularities, the nose was taped with Steri-strips to prevent displacement of the mixture graft, and a thermal nasal splint was applied for 1 week. After 1 week, the thermal splint was removed carefully and the nose was taped with Steri-strips for another 1 week. Nose massage was not performed after the operation.

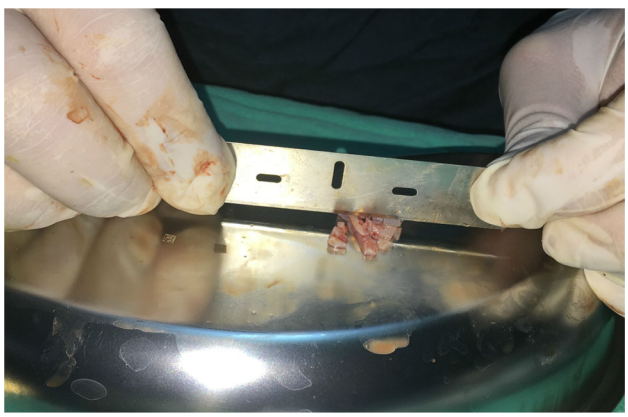

Fig. 1 Cartilage was diced into small pieces using a dermatome blade or No. 11 blade scalpel

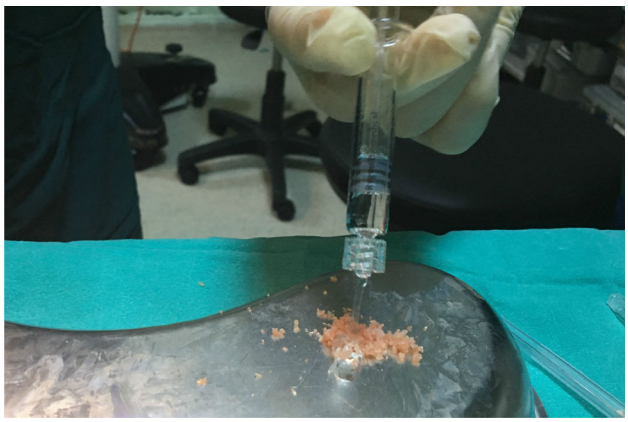

Fig. 2 One cc NCH gel (PureRegen® Gel Sinus) was added into diced cartilage

The patients were followed up for dorsal irregularities by inspection, palpation and taking photograph, at 3-month intervals after the operation.

Results

After 1 year of follow-up, there were no irregularities in the nasal dorsum area observed, nor any displacement or absorbance of the camouflage material. No complications occurred. There was an appropriate smooth contour at the nasal dorsum, and all patients were satisfied with the aesthetic result. In addition, no adhesions occurred at the osteotomy lines postoperatively. None of the patients required revision rhinoplasty.

Case Reports

Case 1

A 28-year-old Middle Eastern woman with thin skin presented with a dorsal hump (Fig. 7). She complained of high nasal dorsum and breathing problems. Preoperative examination revealed a septal deviation. An open approach technique was performed. The septum was straightened, and cartilage grafts were obtained from the septum. The nasal dorsum was lowered, and low-to-low lateral and transverse osteotomies were performed. Bilateral spreader grafts, a strut graft for nasal tip support and septocolumellar suture were performed. At the end of the operation, diced cartilage combined with NCH gel and blood was added onto the nasal dorsum for camouflage. After 1-year follow-up, no complications occurred and aesthetic results were satisfactory.

Fig. 3 NCH gel and diced cartilage were blended until the mixture had a paste-like form

Fig. 4 Blood was added to the diced cartilage and the NCH gel mixture

Fig. 5 Diced cartilage combined with the NCH gel and blood

Fig. 6 Mixture was delivered onto the nasal dorsum via a dorsal retractor

Case 2

A 24-year-old Balkanian woman presented with a dorsal hump and low rotation (Fig. 8). The nasal skin was thin. An open approach technique was performed. The septum was straightened, and cartilage grafts were obtained from the septum. The nasal dorsum was lowered, and low-to-low lateral and transverse osteotomies were performed. Bilateral spreader grafts, lateral stealing sutures for tip rotation and a strut graft for tip support were performed. At the end of the operation, diced cartilage combined with NCH gel and blood was added onto the nasal dorsum for camouflage. After 1-year follow-up, no complications occurred and the patient was satisfied with the aesthetic results.

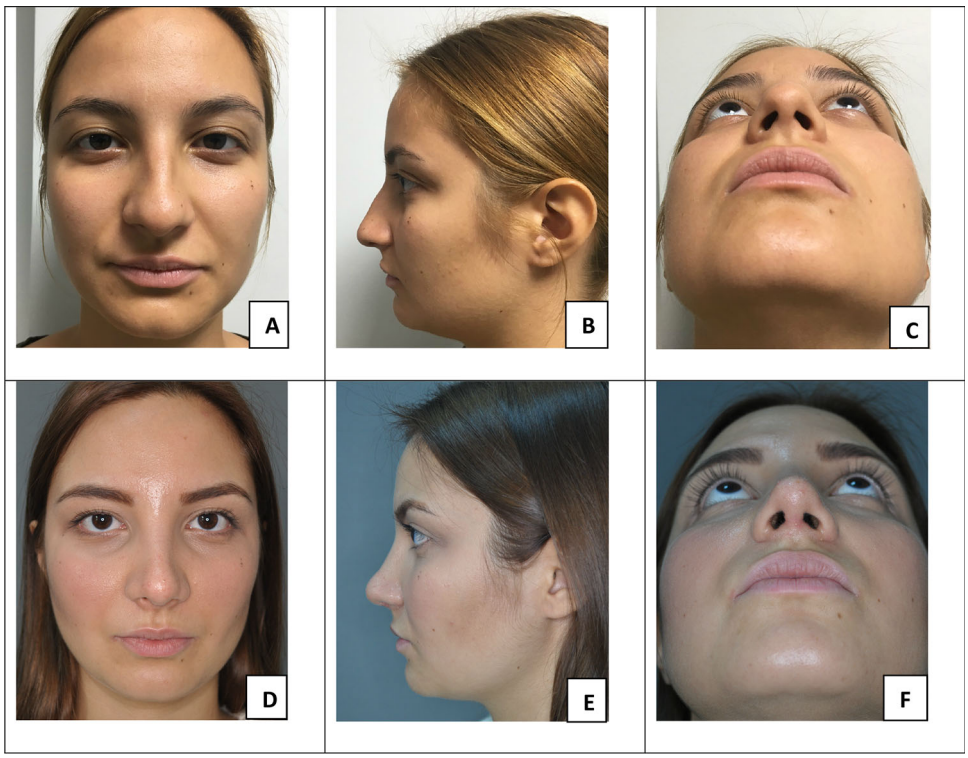

Fig. 7 Views of a 28-year-old Middle Eastern thin-skinned female. **a–c** Preoperative views. **d–f** 1-year postoperative views

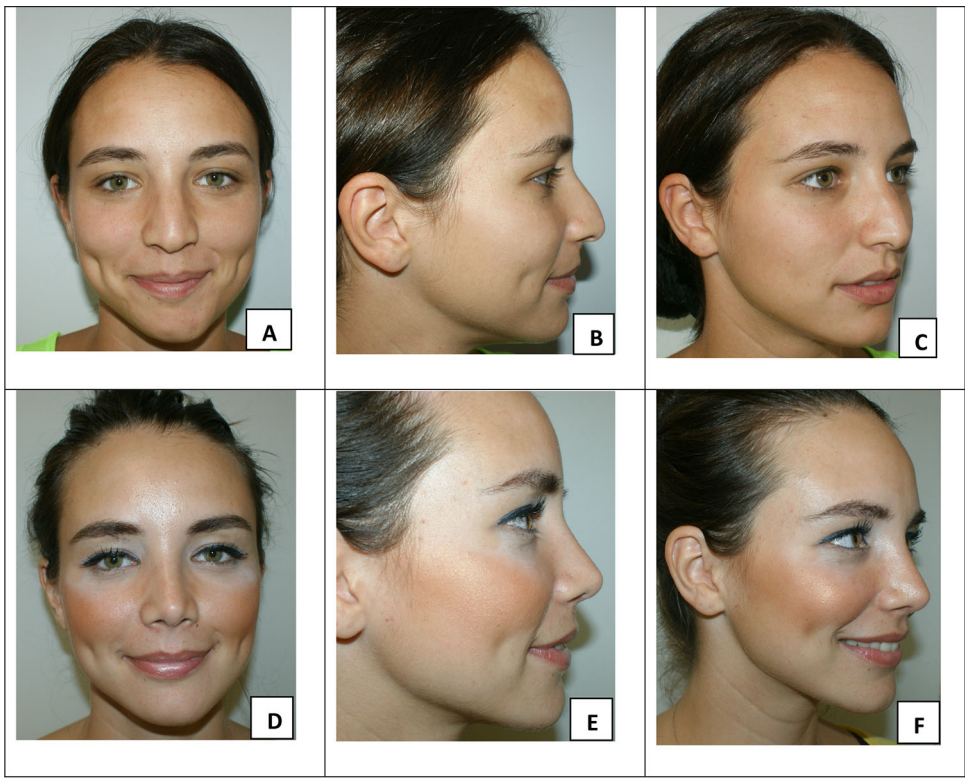

Fig. 8 Preoperative and 1-year postoperative views of a 24-year-old Balkanian thin-skinned female. **a–c** Preoperative views. **d–f** 1-year postoperative views

Case 3

A 26-year-old Middle Eastern male patient presented with a dorsal hump, deviated nasal dorsum and nasal septum deviation (Fig. 9). The nasal skin was thin. An open approach technique was performed. The septum was straightened, and cartilage grafts were obtained from the septum. The nasal dorsum was lowered, and low-to-low

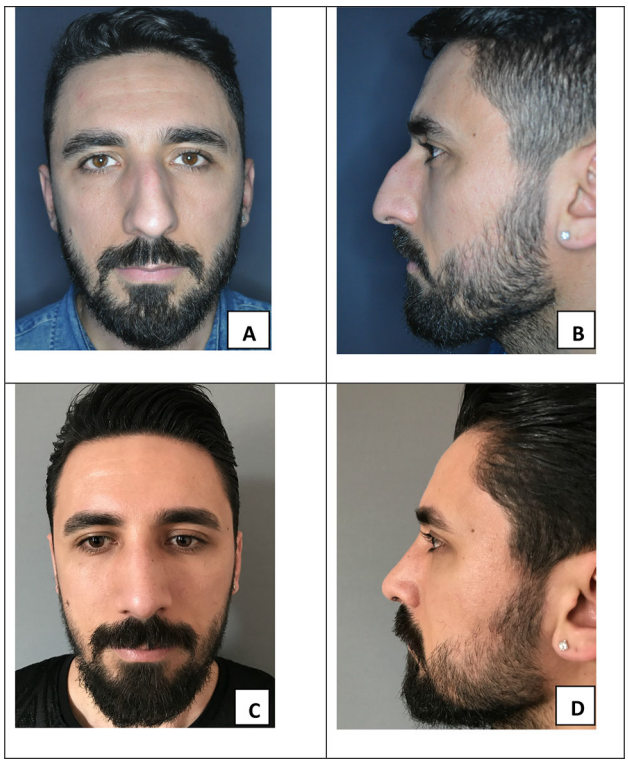

Fig. 9 Preoperative and 1-year postoperative views of a 26-year-old Middle Eastern thin-skinned male. **a**, **b** Preoperative views. **c**, **d** 1-year postoperative views

lateral and transverse osteotomies were performed. Bilateral spreader grafts, lateral stealing sutures for tip rotation and a strut graft for tip support were performed. At the end of the operation, diced cartilage combined with NCH gel and blood was added onto the nasal dorsum for camouflage. After 1-year follow-up, no complications occurred and the patient was satisfied with the aesthetic results.

Discussion

Nasal dorsum irregularities are one of the most important complications of rhinoplasty, especially in thin-skinned patients, which causes dissatisfaction for patients. Camouflage of the nasal dorsum is an important and easy way to overcome nasal dorsum irregularities. There are several methods and materials for dorsum camouflage. Diced cartilage is one of the most widely used materials for nasal dorsum camouflage, and it has been employed in several ways. Limberg [6] injected free diced cartilage by syringe into the nasal dorsum. Following unsuccessful results, this technique was neglected for many years. Erol [3] has used injections of compressed diced cartilage in a total of 3182 patients and has followed up the patients for 12 years. They claim that injection of diced cartilage saves time and produces good results. However, instability or displacement of the diced cartilage presents a serious problem postoperatively. To overcome this, temporalis fascia [7], Surgicel (Turkish delight) [5] and AlloDerm [8] have been used for wrapping the diced cartilage. However, this is a time-consuming method because of the need for preparation of the wrapped graft, and additional surgery is needed to harvest a fascia graft. AlloDerm is an expensive material, and Surgicel increases inflammatory reactions. Berghaus et al. [9] wrapped diced cartilage in a fibrinogen–thrombin-coated collagen patch called TachoSil® and used it for dorsal augmentation. Cerkes and Basaran [10] wrapped diced cartilage in rectus abdominis fascia, but this requires a second incision and the incision scar on the belly is an undesirable result of the technique. Equine pericardium membrane has also been used for preventing dorsal irregularities [1]. Although equine pericardium membrane is a good material for camouflage, it is absorbable, and unpredictable resorption may be problematic postoperatively, besides the potential immunorejection to the xenogenic material.

Daniel evaluated three methods of using diced cartilage: diced cartilage, diced cartilage wrapped in fascia and diced cartilage covered with fascia [11]. He declared that pieces of diced cartilage without fascia can be placed in the radix or peripyriform area and the most common problems were overcorrection, visibility and junctional step-offs. Even so, using diced cartilage in rhinoplasty surgery is very useful and complications are relatively minor.

Synthetic materials, such as gelatine film [12] and Gore-Tex [13], can be used for nasal dorsum camouflage. However, absorbable materials are typically not useful due to their unpredictable results, and the use of non-absorbable materials increases the rate of infection. Permacol collagen implants are indicated for soft tissue reinforcement. Chang and Kong [14] used Permacol for nasal dorsum augmentation and claimed that the implant material was safe to use because of its low complication rate.

Toriumi [15] used microfat-infused soft tissue for augmentation. He harvested autologous fat using liposuction cannula, filtered it through a filter and then injected this filtered microfat into the costal perichondrium or temporalis fascia. The microfat-infused soft tissue was placed over the nasal dorsum to achieve nasal dorsum augmentation. He declared that autologous costal cartilage was useful for major nasal dorsum augmentation and microfat-infused soft tissue was preferable for lesser degrees of augmentation and camouflage.

Guerra [16] used posterior auricular fascia as a graft material for radix and dorsum augmentation. Hodgkinson [17] also used posterior auricular fascia for volume fill and camouflage of the nasal dorsum in secondary rhinoplasty. They declared that harvesting multiple grafts through one

incision is advantageous, provides good results for dorsal camouflage and is an acceptable alternative to temporalis fascia and dermis.

Conchal cartilage is favoured in nasal tip surgery, but the use of it in dorsal augmentation is not that common. Kim and Jang [18] used diced conchal cartilage with perichondrial attachment in dorsal nasal augmentation. They declared that diced conchal cartilage with perichondrial attachment was a valuable graft for dorsal nasal augmentation.

Yang et al. [19] performed augmentation rhinoplasty using cross-linked human acellular dermal matrix. They used human acellular dermal matrix for both augmentation and camouflage of nasal dorsum. They claimed that cross-linked human acellular dermal matrix had advantages of both autogenous and alloplastic materials.

Karaaltın et al. used autologous fascia lata grafts for camouflage [20, 21]. They harvested fascia lata from the tensor fascia lata muscle at the right lateral thigh and used it alone or in combination with cartilage. An autologous fascia lata graft provides good cover, but the need for additional surgery and thereby the trauma is a disadvantage of this method besides the prolonged time of surgery.

Kreutzer et al. [4] compared the outcome of three different camouflage techniques. In the first group, they only used diced cartilage for camouflage on the nasal dorsum. In the second group, they used fascia alone or fascia combined with diced cartilage for camouflage on the nasal dorsum. In the third group, they used diced cartilage in a fascia technique. They found that the revision rates were lowest in the first group and highest in the third group.

Öreroğlu et al. [2] used a mixture of bone dust, diced cartilage and blood for camouflage and augmentation of the nasal dorsum. They used blood glue as a transport scaffold. Preparation of the mixture and delivery thereof onto the nasal dorsum is easy, inflammation is minimal, and the results are good. Codazzi et al. [22] used a similar technique: they combined diced cartilage with warm blood. They put the blood-filled syringe in a bowl full of hot water for 2 min. Thus, they shortened the time required for the stabilisation of the graft paste.

Kovacevic et al. [23] embedded cartilage scales in platelet-rich fibrin (PRF) and used it for dorsal nasal augmentation. They claimed this method as a reliable alternative to other existing procedures for dorsal augmentation. Castro-Govea et al. [24] used diced and crushed cartilage embedded in an autologous fibrin matrix from peripheral blood for dorsal nasal augmentation. This is a simple method not only for augmentation, but also for smoothening irregularities of the nasal dorsum.

Cárdenas and Carvajal [25] injected fat deposited as sediment over the osseocartilaginous framework at the beginning of the operation and at the end of the operation before the application of the splint. Fat injection onto the nasal dorsum in the subcutaneous space is an easy way for camouflage and to obtain smooth contours on the nasal dorsum.

In this study, we introduce a new method for nasal dorsum camouflage. We used diced cartilage combined with blood and the NCH gel, PureRegen® Gel Sinus. PureRegen® Gel Sinus contains no xenogenic proteins, is a high-viscosity material and persists at the application site for 2–3 weeks [26]. The NCH gel is a biocompatible molecule that exists in the extracellular matrix. Thus, it does not induce an immune response, nor increase the rate of infection. Indeed, there are reports, indicating that hyaluronic acid is able to modulate the inflammatory reaction, reduce oedema and therefore minimise pain. The high viscosity of the NCH gel firmly holds the diced cartilage fragments without dropping off during the implantation process. The use of diced cartilage combined with the NCH gel and blood for camouflage of the nasal dorsum in rhinoplasty proved to be a simple, safe and effective method. Due to the viscosity of the NCH gel, it is simple to deliver a mixture of diced cartilage and the NCH gel onto the nasal dorsum, where this enables stabilisation of the diced cartilage graft. Multiple clinical studies demonstrated that NCH gel reduces postoperative adhesion formation at the surgical site [27]. In rhinoplasty, adhesions occur in the skin on osteotomy lines postoperatively. The mixture of diced cartilage and the NCH gel reduces adhesions at the osteotomy lines. The blood clot contains growth factors including VEGF, TGF-β, PDGF, FGF and EGF that are known to play important roles in the healing response [28]. The growth factors improve the tissue repair and cartilage proliferation. In thin-skinned patients, postoperative nasal dorsum irregularities are a common problem. We applied our technique in 52 thin-skinned patients and followed up the patients for 1 year. No patient experienced any serious complications postoperatively, and the results were satisfying. All of the patients' opinions regarding the outcomes were positive, and none has required a revision operation. Based on our results, we believe that using diced cartilage combined with NCH gel and blood for nasal dorsum camouflage is an effective, easy and time-saving method.

Conclusion

The use of diced cartilage combined with NCH gel and blood is an effective, simple and safe method for nasal dorsum camouflage in rhinoplasty. The NCH gel within the mixed graft also reduces adhesions at the osteotomy lines.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent A written informed consent was obtained from all patients.

References

1. Marianetti TM, Grussu F, Cervelli D, Gasparini G, Pelo S (2014) Equine pericardium membrane to prevent dorsal irregularities in rhinoplasty. Ann Plast Surg 73(2):128–130. https://doi.org/10.1097/SAP.0b013e31827100fa
2. Öreroğlu AR, Çakir B, Akan M (2014) Bone dust and diced cartilage combined with blood glue: a practical technique for dorsum enhancement. Aesthet Plast Surg 38(1):90–94. https://doi.org/10.1007/s00266-013-0256-4
3. Erol OO (2017) Injection of compressed diced cartilage in the correction of secondary and primary rhinoplasty: a new technique with 12 years' experience. Plast Reconstr Surg 140(5):673e–685e. https://doi.org/10.1097/PRS.0000000000003815
4. Kreutzer C, Hoehne J, Gubisch W, Rezaeian F, Haack S (2017) Free diced cartilage: a new application of diced cartilage grafts in primary and secondary rhinoplasty. Plast Reconstr Surg 140(3):461–470. https://doi.org/10.1097/PRS.0000000000003622
5. Erol OO (2000) The Turkish delight: a pliable graft for rhinoplasty. Plast Reconstr Surg 105(6):2223–2229
6. Limberg AA (1961) The use of diced cartilage by injection with a needle: part 1. Clinical investigations. Plast Reconstr Surg 28(5):523–536. https://doi.org/10.1097/00006534-196111000-00001
7. Guerrerosantos J, Trabanino C, Guerrerosantos F (2006) Multifragmented cartilage wrapped with fascia in augmentation rhinoplasty. Plast Reconstr Surg 117(3):804–812. https://doi.org/10.1097/01.prs.0000200068.73092.5d
8. Gryskiewicz J (2008) Dorsal augmentation with AlloDerm. Semin Plast Surg 22(2):090–103. https://doi.org/10.1055/s-2008-1063568
9. Berghaus A, San Nicoló M, Jacobi C (2017) Use of a fibrinogen-thrombin sponge in rhinoplasty. HNO. https://doi.org/10.1007/s00106-017-0414-0
10. Cerkes N, Basaran K (2016) Diced cartilage grafts wrapped in rectus abdominis fascia for nasal dorsum augmentation. Plast Reconstr Surg. https://doi.org/10.1097/PRS.0000000000001876
11. Daniel RK (2008) Diced cartilage grafts in rhinoplasty surgery: Current techniques and applications. Plast Reconstr Surg. https://doi.org/10.1097/PRS.0b013e31818d2104
12. Kamer FM, Parkes ML (1977) Gelatin film. A useful adjunct in rhinoplastic surgery. Arch Otolaryngol 103(11):667–670
13. Stoll W (1991) The use of polytetrafluoroethylene for particular augmentation of the nasal dorsum. Aesthet Plast Surg 15(1):233–236. https://doi.org/10.1007/BF02273864
14. Chang C, Kong WK (2014) Clinical effectiveness and safety of collagen sheet for dorsal augmentation in rhinoplasty. J Craniofac Surg. https://doi.org/10.1097/SCS.0000000000000892
15. Toriumi DM (2017) Dorsal augmentation using autologous costal cartilage or microfat-infused soft tissue augmentation. Facial Plast Surg. https://doi.org/10.1055/s-0037-159914
16. Guerra AB (2014) Postauricular fascia in augmentation rhinoplasty. Ear Nose Throat J 93(6):212–218
17. Hodgkinson DJ (2017) The versatile posterior auricular fascia in secondary rhinoplasty procedures. Aesthet Plast Surg. https://doi.org/10.1007/s00266-017-0824-0
18. Kim JH, Jang YJ (2015) Use of diced conchal cartilage with perichondrial attachment in rhinoplasty. Plast Reconstr Surg. https://doi.org/10.1097/PRS.0000000000001227
19. Yang CE, Kim SJ, Kim JH, Lee JH, Roh TS, Lee WJ (2018) Usefulness of cross-linked human acellular dermal matrix as an ımplant for dorsal augmentation in rhinoplasty. Aesthet Plast Surg. https://doi.org/10.1007/s00266-017-0996-7
20. Karaaltn MV, Batoglu-Karaaltn A, Orhan KS, Demirel T, Guldiken Y (2012) Autologous fascia lata graft for contour restoration and camouflage in tertiary rhinoplasty. J Craniofac Surg 23:719–723. https://doi.org/10.1097/SCS.0b013e31824dbb92
21. Karaaltin MV (2013) Fascia lata graft for nasal dorsal contouring in rhinoplasty. Adv Aesthet Rhinoplasty Art Sci New Clin Tech. https://doi.org/10.1007/978-3-642-28053-5_39
22. Codazzi D, Ortelli L, Robotti E (2014) Diced cartilage combined with Warm blood glue for nasal dorsum enhancement. Aesthet Plast Surg. https://doi.org/10.1007/s00266-014-0355-x
23. Kovacevic M, Riedel F, Wurm J, Bran GM (2017) Cartilage scales embedded in fibrin gel. Facial Plast Surg. https://doi.org/10.1055/s-0037-1598184
24. Castro-Govea Y, Del Valle SA, Kardasch VC, Eparza EP, Costilla OV (2015) Diced and crushed cartilage plus autologous fibrin matrix obtained by a simple process for dorsal augmentation of the Mestizo nose. Facial Plast Surg. https://doi.org/10.1055/s-0035-1549038
25. Cárdenas JC, Carvajal J (2007) Refinement of rhinoplasty with lipoinjection. Aesthet Plast Surg 31(5):501–505. https://doi.org/10.1007/s00266-006-0136-2
26. Matheny KE, Tseng E, Carter KB, Cobb WB, Fong KJ (2014) Self-crosslinked hyaluronic acid hydrogel (PureRegen Gel Sinus) in ethmoidectomy: a randomized, controlled trial. Otolaryngol Head Neck Surg 151(1 Suppl):P127. https://doi.org/10.1177/0194599814541627a306
27. Liu C, Lu Q, Zhang Z et al (2015) A randomized controlled trial on the efficacy and safety of a new crosslinked hyaluronan gel in reducing adhesions after gynecologic laparoscopic surgeries. J Minim Invasive Gynecol 22(5):853–863. https://doi.org/10.1016/j.jmig.2015.04.011
28. Fortier LA, Barker JU, Strauss EJ, McCarrel TM, Cole BJ (2011) The role of growth factors in cartilage repair. Clin Orthop Relat Res. https://doi.org/10.1007/s11999-011-1857-3