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Long-Term Results Using "Nair Hospital Precision Carving" Technique of Rhinoplasty

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Abstract

Background and Objectives Convincing a patient who has undergone any aesthetic surgery to come for a long-term follow-up is extremely difficult. The result obtained after rhinoplasty usually stabilizes in the first year and it is unlikely to change after 2 years. The precision carving technique described in 2014 has been employed by us for the last several years. We wish to present long-term results (at least 2 years) obtained using this technique, now renamed as "Nair Hospital Precision Carving technique." The unfavorable effects of warping are most apparent in the dorsum. So, we have chosen to assess results of dorsal onlay grafts only. This article presents the long-term results obtained using favorable warping technique.

Materials and Methods We have followed up 45 patients in whom dorsal augmentation was done using rib grafts for various indications like aesthetic, reconstructive rhinoplasty and cleft lip nasal deformity. Grafts were carved using the precision carving technique.

Results All patients were assessed at 6 weeks, 6 months, and at subsequent follow-up period of 2 to 10 years and photographs were taken at each visit. There was no major complication and all patients were satisfied with the appearance.

Conclusion The Nair Hospital Precision Carving technique utilizes unbalanced yet controlled and precise carving to achieve a variety of natural shapes for the objectives of contour fill and framework reconstruction in rhinoplasty, thus ensuring good long-term results.

Keywords
- rhinoplasty
- precision carving technique
- dorsal onlay graft
- nair hospital
- aesthetic surgery
- framework reconstruction
- contour fill

Introduction

An Indian nose usually requires substantial amount of cartilage for volume replacement and framework reconstruction. An enhancement in nasal structure and function is best performed with the use of autologous cartilage.[1–4] Septal and conchal cartilage can provide small and moderate volume replacements while costal cartilage is the best option for large volume replacements.[4–8] This autologous cartilage can be used as diced, crushed, or compact grafts.

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The diced and crushed grafts yield to pressure from the skin-soft tissue envelope (S-STE) and cannot withstand functional stress. Hence, they cannot be used for framework reconstruction. On the contrary, compact grafts do not yield to pressure from S-STE and can be used as contour grafts as well as framework reconstruction. They also do not require a fascia to hold their shape. Despite these benefits, the compact grafts are criticized for their warping, difficulty in shaping, and absorption.[4,7–9] To negate this criticism, the precision carving technique was described.[10] We have been using this technique, renamed as "Nair Hospital Precision Carving (NHPC) technique" and we are presenting the long-term results obtained with this technique. With an accurately shaped compact cartilage graft and a stable framework, well-defined long-term results can be obtained. For detailed description of the technique, one may refer to the senior author's original article.[10] Although this technique can be used to carve different shapes, the effect of warping or deformity is most apparent in the dorsal graft. All the other grafts like spreader grafts, columella strut, etc. are hidden and one may not be able to conclusively assess the warping. Hence, for long-term assessment, we have focused only on patients who underwent dorsal augmentation.

It is a well-known fact that in aesthetic surgery, it is extremely difficult to have patients coming regularly for follow-up and rhinoplasty is no exception. Although we have used this technique in 126 patients, despite persistent and relentless efforts, we were able to convince only 45 of them to come for follow-up for a period beyond 2 years of surgery.

Even in published literature, only a few studies have reported long-term follow-up of rhinoplasty patients and those are usually for diced cartilage grafts.[11–13] We report our experience with the NHPC technique for compact costal cartilage grafts and its result beyond 2 years. We believe the result stabilizes by this period and qualifies to be termed as long-term result.

Materials and Methods

This study involved the retrospective evaluation of patients who had undergone rhinoplasty with compact cartilage grafts. All procedures contributing to this work comply with the ethical standards of the relevant national and institutional guidelines on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

The clinical evaluation was performed by inspection, palpation, and photographic documentation. Preoperative and postoperative photographs were taken using the same equipment: a Canon (Canon Inc., Tokyo, Japan) camera and an 18- to 135-mm lens; with the same exposure, magnification, lighting, and angle. Photographs were taken in frontal, lateral, oblique, and basal views. The patients were assessed postoperatively at 6 weeks, 6 months, and at subsequent follow-up beyond 2 years. Photographs were taken at each visit.

The Technique

Preparation of Compact Cartilage Grafts (►Supplementary Videos S1 and S2)

Supplementary Video S1: Precision Carving Technique

Online content including video sequences viewable at: https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0044-1787678.

Supplementary Video S2: Carving of costal cartilage to create dorsal onlay graft

Online content including video sequences viewable at: https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0044-1787678.

The NHPC technique is utilized to create precise and vector-neutral cartilage grafts of various sizes and shapes. The basic technique of unbalanced scoring can be used for both creation and neutralization of curvature and the precision lies in the number, the spacing, and the depth of incisions made. This change in curvature is very much predictable and depends upon the extent to which the surface is breached.

Unlike other techniques, this technique does not prevent the warping but the desired shape is obtained by allowing the graft to warp into a shape. So the graft is not cut into the final shape, but cut in a shape with anticipated curvatures to take the desired shape with warping phenomenon. This is made possible with multiple incisions and beveling so as to create or neutralize the curvature. Sufficient time must elapse before insertion of the carved graft so as to gauge the amount of warping and account for additional graft warping that may occur after final graft inset.

Following are the salient features of the technique. The complex details are described in the earlier article (10).

(1) *Straight grafts*: A relatively straight portion of rib (central or core) is chosen or a curved piece can be straightened. The axis of the graft is marked and few incisions are made at the point of maximum curvature to neutralize it. Subsequent cuts are made as and when required to straighten the graft.
(2) *Curved grafts*: A piece from the surface (peripheral) with no violation of outer side will automatically bend toward the outer side. Alternatively, a straight graft can be carved to create a curvature. Single incision will create an angulation whereas multiple incisions create curvature. Multiple spaced out incisions create a shallow curvature and multiple closer incisions creates an acute curvature.

Carving the Boat-Shaped Graft for Dorsal Augmentation

The technique to carve the onlay graft has been described in detail in the original article and here we would like to just touch upon it in short. The technique is based on use of precise incisions and beveling to create the desired shape (usually a boat) by using the phenomenon of warping to our advantage.

Preoperatively, the dimensions and volume of the graft were estimated by filling the defect with modeling clay or soap and preparing a template (►**Fig. 1**). The template can be put on a side-trolley for reference during the operation. If the piece is to be converted into a boat, the basal surface is sectioned in an oblique direction. This area will expand and create a projection. To remove this unwanted projection, the superior surface is also sectioned in an oblique plane so as to have a straight surface after expansion.

Nasal Dissection

All patients underwent the procedure under general anesthesia. Infiltrating solution (7 mL/kg of lignocaine 2% + adrenaline 1 in 100,000) was injected at the proposed incision site and around the dissection planes. Either by endonasal approach or by using open rhinoplasty approach with infracartilaginous and transcolumellar incision, the following maneuvers were performed—correction of septal deviation, neoseptum creation, tip defatting and tip plasty, compact graft insertion, etc. as and when indicated. The osteotomies were done with a 2-mm osteotome using percutaneous technique.

Fig. 1 A soap or a clay template is used to estimate the volume of cartilage needed.

Fixation

Pull-out sutures of 6-0 nylon are taken at superior and inferior end to maintain the position of the graft. This nonrigid fixation gives an option of maneuvering the graft during the postoperative period. The graft is further reinforced by taping and plaster of Paris splint is applied at the end of surgery. The splint is changed at 48 to 72 hours and the position of the graft is inspected. Any minor deviation/shift of the graft can be corrected at this stage. A fresh splint is then given which is kept for another 10 days.

Results

All procedures were uneventful. The technique was utilized in 126 patients for various indications (►**Table 1**).

In the first 2 years, 112 patients (88.9%) were seen. We could follow-up 45 patients (66.7%) beyond 2 years. Only 5 patients were seen after 10 years.

The results were evaluated taking into consideration patient satisfaction, graft displacement, warping/distortion of the graft, and volume of the graft.

Rhinoplasty Outcome Evaluation (ROE) scores were used to objectively assess the patient satisfaction. Around 75 patients experienced postoperative satisfaction of range 75 to 100% (based on ROE score, i.e., postoperative score range between 18 and 24) (►**Table 2**). We noticed two instances of minimal warping which was accepted by the patients and three instances of graft displacement which was managed by manipulation in the immediate postoperative period during plaster change. The aesthetic appearance was satisfactory and acceptable to the patients. We did not have any instance of infection or graft resorption. Donor site complications were minimal.

A 28-year-old gentleman presented with septal collapse and difficulty in breathing (►**Fig. 2**). Neoseptum was created with an L-truss. Other grafts included bilateral lateral wall buttress graft, columella strut graft, and dorsal onlay graft. Lateral osteotomies and tip plasty were also performed. A good structural and aesthetic restoration was achieved. In this case, a convex masculine profile was contoured and the 10-year result is as shown. One may notice the other signs of

Table 1 Distribution of cases as per indication and gender

Indications	Number of patients		
	Male	Female	Total
Aesthetic (Augmentation/fill)	48	32	80
Reconstructive (soft tissue + cartilage)	13	6	19
Cleft lip nose deformity	16	11	27
	77	49	126

Table 2 Postoperative patient satisfaction range based on ROE score with number of patients in each range

Postop ROE percentage improvement range	Number of patients
0–25	0
25–50	15
50–75	36
75–100	75

Abbreviation: ROE, Rhinoplasty Outcome Evaluation.

Fig. 2 A 28-year-old with septal collapse underwent a septal reconstruction and an onlay graft for projection. The result is maintained even after 10 years. The signs of aging on his face can be made out, but the nasal configuration, projection, and proportions are maintained.

aging that have set in, but the nose appears aesthetic and proportionate.

A 25-year-old with defect of lobule, columella, and membranous septum secondary to dog bite in childhood (►**Fig. 3**). In this instance, the costal cartilage was used to provide support adding grafts for alar cartilages, the dorsum, spreader graft for the right side of the septum, and a columellar strut. This assembly was covered by a forehead flap at the same sitting. The result at 6 years postoperative is shown.

A 26-year-old gentleman with a cleft lip nose deformity desired an aesthetic improvement (►**Fig. 4**). An assembly of grafts including ala and alar base grafts, columellar strut, and dorsal onlay graft was utilized. Lateral osteotomies and tip plasty were also performed. An aesthetic profile was achieved with good tip projection and well-defined dorsal lines and the 3-year result is as shown (see Figure).

A 30-year-old gentleman had posttraumatic deformity of the nose (►**Fig. 5**). He had severe depression of the dorsum and collapse of the right lateral wall. He underwent reconstructive rhinoplasty with paramedian forehead flap in the first stage followed by framework reconstruction using compact costal grafts. Lateral buttress graft, columella strut graft, and dorsal onlay graft were used. A good dorsal projection with correction of lateral wall deformity was achieved. The long-term result at 2 years is as shown.

A 28 years old male had reduced projection of dorsum and increased width of the bridge. He was operated for cosmetic correction (►**Fig. 6**) and we used the costal cartilage graft to

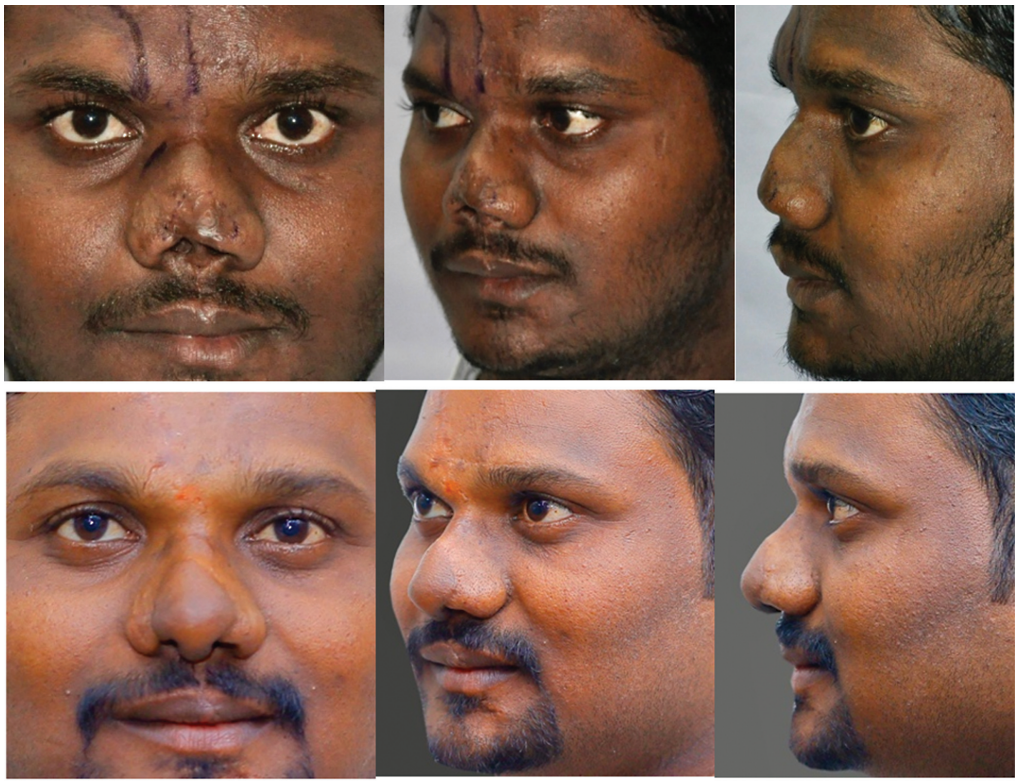

Fig. 3 A 25-year-old with defect of lobule, columella, and membranous septum. Costal cartilage carved for onlay graft, alar cartilages, and columellar strut. The recreated defect with restored cartilage framework in place and a paramedian forehead flap has been transferred to cover the framework. The result seen at 6 years after surgery is aesthetically pleasing.

Fig. 4 A 26-year-old with cleft lip nasal deformity desirous of better looking nose underwent correction and augmentation using onlay graft carved with the Nair Hospital Precision Carving technique. Maneuvers included osteotomies, septoplasty, columella lengthening, and maxillary augmentation. The result at 3 years postsurgery looks natural, with hardly any stigma of cleft nasal deformity.

Fig. 5 Forehead flap was used to cover the reconstructed ala lateral wall ala and dorsum. Result at 2 years shows minimal warping, but overall aesthetics and proportions have been restored.

improve the dorsal projection and restore the dorsal aesthetic lines. Osteotomy helped to reduce the width of the nose. The 3-year result is as shown.

Discussion

There are inherent stresses within the cartilage.[14,15] The centrifugal interstitial growth compresses the peripheral layer against the unyielding perichondrium flattening the peripheral cells whereas the cells in the core are oval.[15] Once the perichondrium is removed, the flat cells are free to expand causing the cartilage to bend. We call this phenomenon as warping. The NHPC technique utilizes warping to the advantage of the surgeon rather than being considered a disadvantage. Warping happens in a controlled and precise manner and the graft warps into the desired shape. A variety of natural shapes can be achieved with this technique. So, it is the precise cartilage carving and the ensuring predictable warping that shapes the graft.

The desired shape is obtained usually in 45 minutes and is allowed for near-complete expression of warping before they are inserted and secured in position.[16–18] It is a good practice to get around 95% of the straightening on table, as the rest will occur over time. It does require experience and clinical judgment to decide how much is 95% and how much more is expected; but the room for error is less. The few instances of warping that we encountered were early in our learning curve. Once we gained the experience, there were no further instances of warping. Second, the cuts have to be well planned, and precise in depth and spacing. That is why we name this maneuver "precision carving."[10] Our grafts have two unique qualities. They are precisely shaped by replicating the template shape, beveling the ends and edges, creating a groove on the undersurface, and polishing the graft. And the graft is vector-neutral in the end with near-complete expression of warping.

The costal cartilage provides abundant volume which is required in difficult situations like revision rhinoplasty, severe saddle nose, and cleft lip nose.[4,10] In a saddle nose, the desired augmentation may be more than a centimeter, while in a cleft lip nose, the cartilage is required at multiple locations, including the alar base to correct the retruded maxillary platform.

Fig. 6 A 28 years old male had reduced projection of dorsum and increased width of the bridge. He was operated for cosmetic correction (►**Fig. 6**) and we used the costal cartilage graft to improve the dorsal projection and restore the dorsal aesthetic lines. Osteotomy helped to reduce the width of the nose. The aesthetic result achieved and the projection gained is maintained at the 3-year follow-up.

The Turkish delight technique (diced cartilage wrapped in surgical) or diced cartilage wrapped in fascia is devoid of warping and has produced excellent results.[3,11,19] These grafts can provide mild to moderate dorsal augmentation (2–8 mm) and camouflage minor contour deformities.[3] These grafts are used as filler material and cannot be used for structural reconstruction (ala, spreader graft, or columellar strut).[3,19–21]

Indian patients usually require structural reconstruction and the "visibility" of the graft edges is not an issue under the thick S-STE.[10] Hence, our technique is best suited for large volume compact grafts in patients with loss of projection inherently or due to trauma.

The appearance is natural and long lasting with few complications. The patients in our series had good outcome as the preoperative shape and the volume of the graft were replicated intraoperatively. We did not encounter cartilage absorption (volume loss) or warping except for the two instances early in our learning curve. Only few studies have reported long-term results following the use of compact grafts albeit with low sample size.[12,13] Yilmaz et al followed up 38 patients with a mean follow-up period of 27.4 months and Gurley et al followed up 32 patients with an average interval follow-up of 7.9 years.[12,13] Ours study reports such a large series of 45 patients with a long-term follow-up.

Conclusion

The NHPC technique utilizes unbalanced yet controlled and precise carving to achieve a variety of natural shapes for the objectives of contour fill and framework reconstruction in rhinoplasty. It is unique and different from the other techniques as it does not prevent warping, instead allows good warping to express itself. With this technique, cartilage warping can be made predictable and used to our advantage, making it a friend rather than a foe, thus helping to give consistent long-term results.

Note

The study was done in adherence to the Declaration of Helsinki protocol. Proper preprocedure consents were taken for surgery, documentation, and research purposes. Data storage was performed inconsistence with good clinical practice guidelines.

Authors' Contributions

U.B., A.P., A.H., A.S., and M.P. performed the surgeries. A.P., A.H., and A.S. wrote the manuscript. G.M., S.R., and P.M. collected the data.

Conflict of Interest

None declared.

References

1 Daniel RK. Radix and dorsum. In: Mastering Rhinoplasty. Berlin: Springer; 2010:67–100
2 Daniel RK, Sajadian A. Secondary rhinoplasty: management of the overresected dorsum. Facial Plast Surg 2012;28(04):417–426
3 Daniel RK. Rhinoplasty: dorsal grafts and the designer dorsum. Clin Plast Surg 2010;37(02):293–300
4 Daniel RK. Rhinoplasty: septal saddle nose deformity and composite reconstruction. Plast Reconstr Surg 2007;119(03):1029–1043
5 Daniel RK. Rhinoplasty and rib grafts: evolving a flexible operative technique. Plast Reconstr Surg 1994;94(05):597–609, discussion 610–611
6 Sherris DA, Kern EB. The versatile autogenous rib graft in septorhinoplasty. Am J Rhinol 1998;12(03):221–227
7 Lovice DB, Mingrone MD, Toriumi DM. Grafts and implants in rhinoplasty and nasal reconstruction. Otolaryngol Clin North Am 1999;32(01):113–141
8 Sheen JH. Tip graft: a 20-year retrospective. Plast Reconstr Surg 1993;91(01):48–63
9 Endo T, Nakayama Y, Ito Y. Augmentation rhinoplasty: observations on 1200 cases. Plast Reconstr Surg 1991;87(01):54–59
10 Bhat U, Garg S, D'Souza EJ, Agarkhedkar N, Singh IA, Baliarsing AS. Precision carving of costal cartilage graft for contour fill in aesthetic and reconstructive rhinoplasty. Indian J Plast Surg 2014;47(01):25–35
11 Erol OO. Long-term results and refinement of the Turkish delight technique for primary and secondary rhinoplasty: 25 years of experience. Plast Reconstr Surg 2016;137(02):423–437
12 Gurley JM, Pilgram T, Perlyn CA, Marsh JL. Long-term outcome of autogenous rib graft nasal reconstruction. Plast Reconstr Surg 2001;108(07):1895–1905, discussion 1906–1907
13 Yilmaz M, Vayvada H, Menderes A, Mola F, Atabey A. Dorsal nasal augmentation with rib cartilage graft: long-term results and patient satisfaction. J Craniofac Surg 2007;18(06):1457–1462
14 Fry H, Robertson WV. Interlocked stresses in cartilage. Nature 1967;215(5096):53–54
15 Fry H. Cartilage and cartilage grafts: the basic properties of the tissue and the components responsible for them. Plast Reconstr Surg 1967;40(05):526–539
16 Harris S, Pan Y, Peterson R, Stal S, Spira M. Cartilage warping: an experimental model. Plast Reconstr Surg 1993;92(05): 912–915
17 Adams WP Jr, Rohrich RJ, Gunter JP, Clark CP, Robinson JB Jr. The rate of warping in irradiated and nonirradiated homograft rib cartilage: a controlled comparison and clinical implications. Plast Reconstr Surg 1999;103(01):265–270
18 Gunter JP, Clark CP, Friedman RM. Internal stabilization of autogenous rib cartilage grafts in rhinoplasty: a barrier to cartilage warping. Plast Reconstr Surg 1997;100(01):161–169
19 Erol OO. The Turkish delight: a pliable graft for rhinoplasty. Plast Reconstr Surg 2000;105(06):2229–2241, discussion 2242–2243
20 Daniel RK, Calvert JW. Diced cartilage grafts in rhinoplasty surgery. Plast Reconstr Surg 2004;113(07):2156–2171
21 Kelly MH, Bulstrode NW, Waterhouse N. Versatility of diced cartilage-fascia grafts in dorsal nasal augmentation. Plast Reconstr Surg 2007;120(06):1654–1659

