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Original Research Article

Satisfaction level among patients of rhinoplasty with autologous costal cartilage graft: a time-honored workhorse

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ABSTRACT

Background: Ear cartilage, septal cartilage and rib cartilage are all used in Rhinoplasty. For Indians, Rhinoplasty has generally been performed using autologous cartilage grafts for last few decades. But the trends have slowly shifted in the last decade. This study evaluates the satisfaction level in patients when costal cartilage graft is solely used for Rhinoplasty Surgeries and helps re-establishing its status as the irreplaceable cornerstone of structural and revision rhinoplasty.

Methods: This hospital based prospective cohort type of observational cohort study with a preoperative and postoperative assessment of patient satisfaction hospital based Prospective Cohort type of Observational study, included 44 patients with clinically and radiologically diagnosed nasal deformity who underwent Rhinoplasty using autologous costal cartilage grafts over a period of 3 years. Demographic characteristics of the patients were recorded and rhinoplasty outcome evaluation (ROE) questionnaire was used to assess patient satisfaction. Types of grafts used were spreader grafts, dorsal onlay grafts, columellar strut graft, alar batten grafts, radix grafts, lateral crural strut graft, alar rim graft, tip graft. The ROE questionnaire was completed by the patients during admission and 6 months after surgery during outpatient follow-up visit. Descriptive and analytic statistics were used for data analysis, with a significance level of $p<0.05$. Statistical analyses were performed using the IBM SPSS Statistics software, version 28.

Results: Out of all 44 patients, 26 were male (59%) and 18 were female (41%). Mean age of patients was 23.5years SD 7.049. On final assessment of ROE score we found 32 percent (n=14) patients gracefully accepted the results, 30 percent (n=13) were completely satisfied, 11 percent (n=5) were somewhat unsatisfied, 20 percent (n=9) were satisfied, 3 of them were completely unsatisfied and needed revision rhinoplasty later on. The overall satisfaction rate was 83.6% with $p<0.0001$). Comparing preoperative and postoperative ROE core, there was substantial improvement in ROE score which validates significant satisfaction level among patients.

Conclusions: Comparing preoperative and postoperative ROE score, there was striking improvement in ROE score which validates significant satisfaction level among patients. Increased satisfaction level among the patients establishes autologous costal cartilage graft to be a workhorse technique and is far from being obsolete in Rhinoplasty.

Keywords: Costal cartilage graft, Nasal deformity, ROE score, Rhinoplasty, Satisfaction level

INTRODUCTION

Nose is the central and most prominent feature of face. It has huge impact on facial harmony, balance and overall attractiveness. The skeleton of the external nose is made of both bony and cartilaginous components. Primary rhinoplasty procedures were continuous improved and have two main surgical approaches: structural rhinoplasty (resection/ reconstruction) and conservative (preservative rhinoplasty).[1,2] Rhino septoplasty is the surgery that changes the shape, size and proportion of the nose. The motivation and results of the rhinoseptoplastic surgery are anatomical (aesthetic) and functional (improve breathing).[3] The available biomaterials can be divided into two broad categories: autografts, which are derived from the patient and include cartilage, bone, fascia and dermis; and homografts, which are derived from tissues donated by members of the same species and include irradiated cartilage and acellular dermis. Alloplastic implants are synthetic implants (biocompatible polymers) with a variety of applications in plastic surgery. Ear cartilage, septal cartilage and rib cartilage are all used for rhinoplasty. For Indians, rhinoplasty has generally been performed using autologous cartilage grafts. But the trends have slowly shifted in the last decade. Septal cartilage and alloplastic materials are preferred unless it's a revision rhinoplasty. Cartilage is used for rhinoplasty of the nasal tip, while an alloplastic material, such as a silicone implant or Gore-Tex material, is employed for rhinoplasty of the nasal dorsum.[4]

Costal cartilage as a source of graft is easier to harvest, plenty in amount, non-immunogenic with minimal donor site morbidity. But it has set of complications which may be either donor site complications or surgical site complications. Donor site complications can be pleural injury, pneumothorax, chest deformity, scar hypertrophy or keloids. Surgical site complications directly related to costal cartilage can be cartilage warping, displacement, extrusion, visibility and palpability in thin skin patients and even partial or complete resorption over time.

Patient feedback is considered paramount in assessing results of rhinoplasty because the results are inextricably bound to their personal identity, psychological well-being and individual expectations rather than just technical measurements of distance, ratios and angles. The primary objective of this study is to challenge the prevailing misconception among contemporary rhinoplasty surgeons that autologous costal cartilage is becoming an obsolete modality in the shadow of alternative modern graft materials. Re-establishing its status as the irreplaceable cornerstone of structural and revision rhinoplasty is the goal of this study.

METHODS

It's a hospital based prospective cohort type of observational cohort study with a preoperative and postoperative assessment of patient satisfaction carried out in the department of plastic and reconstructive surgery of R. G. Kar Medical College and Hospital, Kolkata. Authors performed rhinoplasty using various shapes and sizes of autologous costal cartilage grafts on 44 patients over a period of 3 years from February 2023 to February 2026 of which 26 were male and 18 were female patients. Mean age of patients of both sexes was 23.5 years, SD 7.049. Types of grafts used were spreader grafts, dorsal onlay grafts, columellar strut graft, alar batten grafts, radix grafts, lateral crural strut graft, alar rim graft, tip graft.

Study population

Patients within age group of 10 years to 35 years with congenitally deformed nose, nasal trauma causing the deformity or wish for aesthetic correction of nose, who require autologous costal cartilage graft for rhinoplasty.

Sampling technique

A non-probability consecutive sampling was employed. The eligible patients presented during the mentioned period who fulfilled the inclusion and exclusion criteria were recruited until the required sample size was achieved.

Sample size calculation

$Z2\ P(1-P)/d^2$,

Z=Standard normal variate, At 5% Type 1 error ($p<0.5$),

P=Expected proportion in population based on previous studies (Less than 3% by previous studies)

d=Absolute error on precision (Considering 5% in this study)

$1.962\times0.3\ (1-0.03)\ /0.052 =44.71$

44 patients were identified, operated on and followed up for more than 6 months during the study period. Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics Version 28 and descriptive statistics were presented in the form of frequency, percentage, mean and standard deviation. Preoperative and postoperative ROE scores were compared using paired Students's t-test. Comparisons between open and closed rhinoplasty groups were performed using independent Student's t-test. A p value of less than 0.05 was considered statistically significant.

The ROE is a validated questionnaire developed to assess patient satisfaction and the final results of rhinoplasty.[5-7] It is primarily used to evaluate the effects of aesthetic aspects on quality of life, in addition to functional outcomes. It comprises 6 questions: 5 about nose shape and 1 about nasal breathing. Each question is scored from 0 to 4, where 0 represents the most negative answer and 4

represents the most positive answer. The sum of the score is divided by 24 and multiplied by 100 to obtain a score ranging from 0 to 100. A lower score indicates lower satisfaction levels.

Ethical consideration

The present study was approved by the institutional review board of the ethical committee of R. G. Kar Medical College, Kolkata, India in accordance with the Declaration of Helsinki. Informed consent was obtained from all study participants before the commencement of the ROE questionnaire and parental informed consent was obtained for participants of less than 18 years of age. All participants were introduced to the rationale of the study before filling out the ROE questionnaire and were informed about preoperative, intraoperative and postoperative considerations and that their participation was voluntary. Their data would be recorded anonymously, would remain confidential and used for research purposes only. They were assured that everything is free of charge and they may quit whenever they wanted. Informed consent form had all the above information mentioned along with risks and complications associated with the surgery.

Inclusion criteria

Cleft nasal deformity, patients with nasal deformity following trauma. Patients who needed aesthetic correction of nose. Age group: 10 years to 35 years.

Exclusion criteria

Nasal malignancy patients, patients who are operated using other autologous grafts, patients who are operated using alloplastic material were excluded.

RESULTS

Common nasal deformities that we found in the hospital are saddle nose (n=23; 52%), broad nose (n=19; 43%), bulbous tip (n=16; 36%), septal deviation (n=16; 36%), nasal valve collapse (n=12; 27%), crooked nose (n=11; 25%), tip deviation (n=9; 20%), tip ptosis (n=8; 18%), alar flaring (n=7; 16%) and alar rim retraction (n=5; 11%). There are different types of incisions to approach in rhinoplasty like intercartilagenous incision, transcartilagenous incision, infracartilagenous or marginal incision, hemitransfixation, Killians incisions etc. But the mainly classify them to two approaches open and closed type. Open rhinoplasty involves an external incision across the columella, allowing the surgeon to lift the nasal skin and have a direct view of the underlying structures. This approach is particularly beneficial for complex cases requiring significant structural modification. Whereas in closed rhinoplasty incisions are intranasally placed with no visible scar on columella unlike open technique. In the institution we mostly practice open technique (n=28; 64%) as it gives better access to underlying structures than closed technique (n=16; 36%). Most of the approaches were open rhinoplasty due its better visibility and accessibility to nasal structures. Authors followed up each patient every month. In the process took a questionnaire to assess their level of satisfaction with the result after 6 months of surgery and found that 32 percent (n=14) people gracefully accepted the results, 30 percent (n=13) were completely satisfied, 11 percent (n=5) were somewhat unsatisfied, 20 percent (n=9) were satisfied, 3 of them were completely unsatisfied and needed revision rhinoplasty later on. The overall satisfaction rate was 83.6% with $p<0.0001$).

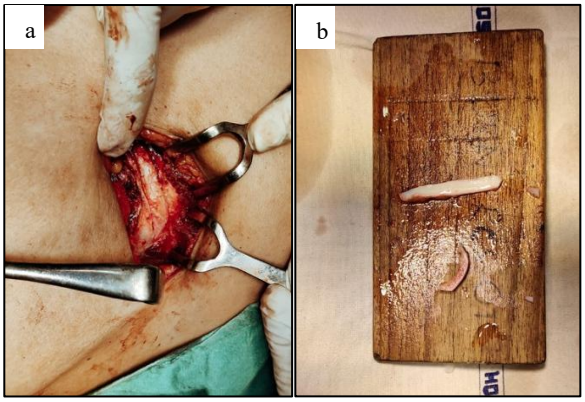


Figure 1 (a, b): Costal cartilage harvest exposure of desired costal cartilage, prepared dorsal nasal and Alar rim grafts before placement.

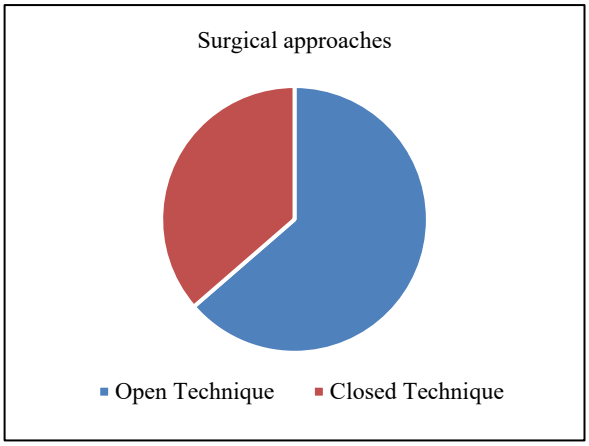
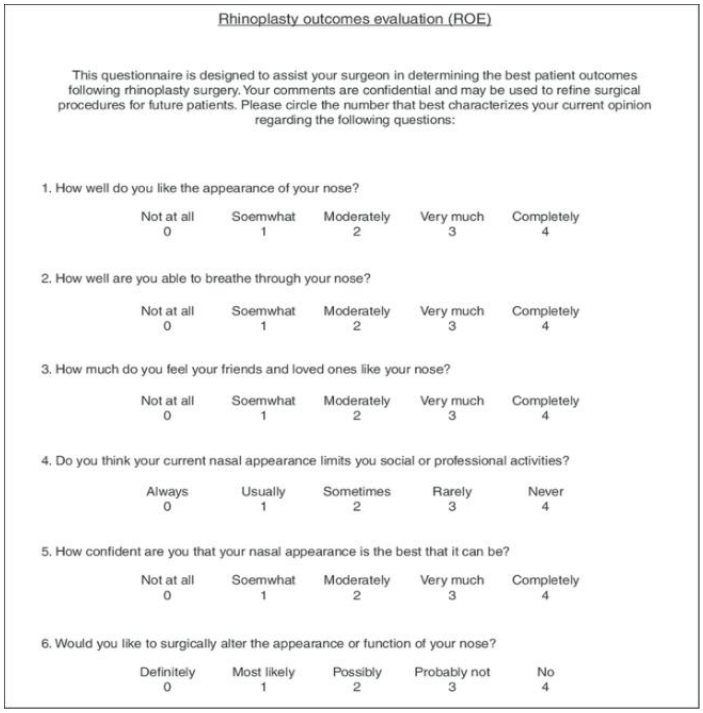


Figure 2: Surgical approaches, it shows open technique was most commonly used (64%).

In the study, the mean preoperative total ROE score for open technique was 34.09±4.75 and close technique was 36.67±3.49 and the mean postoperative ROE score was 83.25±3.45 for open and 85.75±3.79 for closed technique, the difference being statistically significant ($p<0.05$). The rate of increase of scores was 144.21% in open technique and 133.84% in closed techniques of rhinoplasty. Thus, there was notable improvement in ROE score, implying a high index of satisfaction in the patients.



Rhinoplasty outcomes evaluation (ROE)

This questionnaire is designed to assist your surgeon in determining the best patient outcomes following rhinoplasty surgery. Your comments are confidential and may be used to refine surgical procedures for future patients. Please circle the number that best characterizes your current opinion regarding the following questions:

1. How well do you like the appearance of your nose?

Not at all 0 | Soemwhat 1 | Moderately 2 | Very much 3 | Completely 4

2. How well are you able to breathe through your nose?

Not at all 0 | Soemwhat 1 | Moderately 2 | Very much 3 | Completely 4

3. How much do you feel your friends and loved ones like your nose?

Not at all 0 | Soemwhat 1 | Moderately 2 | Very much 3 | Completely 4

4. Do you think your current nasal appearance limits you social or professional activities?

Always 0 | Usually 1 | Sometimes 2 | Rarely 3 | Never 4

5. How confident are you that your nasal appearance is the best that it can be?

Not at all 0 | Soemwhat 1 | Moderately 2 | Very much 3 | Completely 4

6. Would you like to surgically alter the appearance or function of your nose?

Definitely 0 | Most likely 1 | Possibly 2 | Probably not 3 | No 4

Figure 3: Rhinoplasty outcome evaluation (ROE) questionnaire.[5]

Table 2: Distribution of approaches of incision for rhinoplasty.

Sl. No	Types of approach	Numbers	%
1	Open rhinoplasty	28	64
2	Closed rhinoplasty	16	26

Table 3: Rhinoplasty outcome evaluation scores of the patients comparing preoperative and postoperative scores.

Questions 1 to 6	Time	0		1		2		3		4	
		N	%	N	%	N	%	N	%	N	%
How well do you like the appearance of your nose?	Before rhinoplasty	19	43	11	25	14	32	0	0	0	0
	After 6 months	0	0	0	0	2	5	23	53	19	43
How well are you able to breathe through your nose?	Before rhinoplasty	2	5	7	16	20	45	6	14	9	20
	After 6 months	0	0	0	0	2	5	8	18	34	77
How much do you feel your friends and loved one like your nose?	Before rhinoplasty	10	23	14	32	18	41	2	5	0	0
	After 6 months	0	0	0	0	1	2	17	39	26	59
Do you think your current nasal appearance	Before rhinoplasty	2	5	6	14	11	25	11	25	14	32
limits your social or professional activities?	After 6 months	0	0	2	5	1	2	1	2	40	90
How confident are you that your nasal appearance is the best it can be?	Before rhinoplasty	28	64	13	29	3	7	0	0	0	0
	After 6 months	0	0	1	2	5	11	4	9	34	77
Would you like to surgically alter the appearance or function of your nose?	Before rhinoplasty	0	0	0	0	0	0	3	7	41	93
	After 6 months	0	0	0	0	1	2	4	9	39	89

Table 4: Evaluation of post rhinoplasty quality of life using rhinoplasty outcome evaluation score.

Technique	n	Mean±SD preoperative scores	Mean±SD scores 6 months after rhinoplasty	P value within group	The rate of increase of scores (%)	P value between group
Open	28	34.09±4.75	83.25±3.45	<0.001	144.21	<0.001
Closed	16	36.67±3.49	85.75±3.79	<0.001	133.84	<0.001

DISCUSSION

Rhinoplasty is most common but complex aesthetic surgical procedure performed all over the world and request for it is increasing day by day due to increasing incidences of facial trauma and social media awareness among the public mostly the younger individuals. Most of the patients getting operated have history of trauma or congenital defects like cleft lip. Aesthetic rhinoplasty can be performed on younger individuals as early as 18 years of age in the country. The motivation for the rhinoplasty surgery is anatomical (aesthetic) and functional (improve breathing).

Rhinoplasty outcomes can be improved significantly by the use of different maneuvers and biomaterials. The two central issues of inadequate structural integrity and volume can be restored using a variety of grafts and implants. The costal cartilage is available in abundance, undergoes minimal postoperative resorption when not morselized or crushed excessively and is relatively easy to carve.[8,9] Grafts can be harvested simultaneously during rhinoplasty exposure by a second surgeon, minimizing operative time.[10] Costal cartilage can be refrigerated, carved meticulously at the surgeon's leisure and trans planted within several days with good long-term viability.[11]

Both abundant and versatile, costal cartilage can supply the plastic surgeon with ample cartilage for essentially any structural deficiency of the nose.[9-12] Costal cartilage autografts have the disadvantage of significant donor-site morbidity including iatrogenic pneumothorax, chest wall deformities caused by unpredictable scarring, persistent postoperative pain, longer anesthesia times and incisional dehiscence or infection.[13-16] It should be noted that costal cartilage should be used with caution in the older patient, as progressive calcification renders it less likely to warp but more difficult to sculpt in many cases.[8,11,17]

A study by Alharethy et al had most common deformity as broad nasal dorsum (n=163, 65.7%), followed by a bulbous nasal tip (n=154, 62.1%) and deviation of the nose (n=150, 60.5%). They had deviation more common in males than in females (69% versus 53.3%, p=0.012) with the odds of deviation almost twice as great in males as in females (OR=1.95).[7] Males were also significantly more likely to have under projection of the nasal tip (OR=3.6, p=0.004) and asymmetric tip definition (OR=2.65, p=0.009). A study by Alotaibi et al dorsal hump deformity was the most prevalent deformity, affecting 59.0% of participants, followed closely by external nasal deviation at 54.6%.[18] According to study by Saraf et al the mean preoperative total ROE score was 32.17±5.38 and mean postoperative total ROE score was 87.11±5.39, the difference being statistically significant (p=0.0039).[19] In a study by Ayadhi et al the mean ROE satisfaction score after rhinoplasty was 59.49±19.85. More than one-half of the participants (n=37) scored more than 50%. Satisfaction was higher in the open approach group (144.21%) compared to closed approach group (133.84%), with these findings are corroborating with those reported by Yeung et al, Rhee et al, Sinha et al and Yadav et al.[20-24]

The foremost limitation of this study is its relatively small sample size of 44 patients, which may affect the statistical power and generalizability of the results to larger or more diverse populations. The study was conducted at a single tertiary care center, limiting external validity. Secondly, we didn't include other kind of grafts or implants to compare their distinct levels of satisfaction of each among patients.

CONCLUSION

There is significant satisfaction level among patients with aesthetic and functional outcome following Rhinoplasty using costal cartilage as graft only. This study clearly demonstrates that costal cartilage remains one of the constant and reliable sources of grafts for Rhinoplasty. It is far from obsolete despite having advanced implants and various modern surgical techniques.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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