

The comparison of 1-year results for mini and wide-size cap grafts applied to nasal tips

Z. OZTURK¹, N. BAYAR MULUK², O. OGUZ^{3,4}, F. KAYA⁵, R. DUNDAR⁶, C. CINGI⁵

¹Department of Otorhinolaryngology, Faculty of Medicine, Istanbul Nişantaşı University, Baypark Hospital, Otolaryngology Clinics, Istanbul, Turkey

²Department of Otorhinolaryngology, Faculty of Medicine, Kirikkale University, Kirikkale, Turkey

³Istanbul Nişantaşı University, Health Services Vocational School, Department of Audiology, Istanbul, Turkey

⁴Dr.Oğuzhan Oğuz Wellnose Clinic, Istanbul, Turkey

⁵Department of Otorhinolaryngology, Medical Faculty, Eskisehir Osmangazi University, Eskisehir, Turkey

⁶Department of Otorhinolaryngology, Medical Faculty, Bilecik Seyh Edebali University, Bilecik, Turkey

Abstract. – OBJECTIVE: In the present study, we evaluated patient satisfaction with cap grafts by Rhinoplasty Outcomes Evaluation (ROE) scores. Mini cap and wide cap grafts were applied.

PATIENTS AND METHODS: A total of 80 patients who underwent a rhinoplasty operation with cap graft application to the tip region were included in the study. According to the cap graft size, there were two groups: Group 1 consisted of 40 patients with cap graft size ≤ 7 cm (mini cap group). Group 2 comprised 40 patients with cap grafts ≥ 8 cm (wide cap group).

Patients in groups 1 and 2 underwent evaluations based on the following criteria at preoperative, postoperative-1st month, and postoperative-1st year intervals: (1) Rhinoplasty Outcomes Evaluation Questionnaire (ROE), (2) tip projection (cm), (3) nasal dorsum length (cm), (4) tip projection ratio (Goode), (5) nasofrontal angle, and (6) nasolabial angle.

RESULTS: Postoperative 1st-month and 1st-year ROE scores of the wide cap group were significantly higher than those in the mini cap group ($p < 0.05$). Preoperative tip projection ratio (Goode) values of the wide cap group were considerably higher than those in the mini cap group ($p < 0.05$). There were no significant differences between tip projection, nasal dorsum length, nasofrontal angle, and nasolabial angle values of the mini cap and wide cap groups ($p > 0.05$).

Correlation tests showed that as preoperative ROE scores decreased, postoperative-1st month and 1st-year ROE scores increased ($p < 0.05$). Postoperative 1st-month and postoperative 1st-year's ROE scores increased together ($p < 0.05$). In the wide cap group, postoperative 1st-month and postoperative 1st-year's ROE scores increased compared to the mini cap group ($p < 0.05$). As postoperative 1st-year nasolabial angle values increased, postoperative 1st-year ROE scores also increased ($p < 0.05$).

CONCLUSIONS: We found that patients who received wide-cap rhinoplasty had increased postoperative ROE scores and higher satisfaction rates during the first month and first year. Postoperative higher nasolabial angle values were related to higher ROE scores and patient satisfaction in the postoperative 1st year.

Key Words:

Cap graft, Mini cap, Wide cap, Rhinoplasty Outcomes Evaluation Questionnaire (ROE), Tip projection, Nasal dorsum length, Tip projection ratio (Goode), Nasofrontal angle, Nasolabial angle.

Introduction

The shape of the nasal tip significantly impacts the appearance of the nose, which is the face's focal point. A more natural nose look is valued in today's modern aesthetics. Previously, surgeons would often perform rhinoplasty procedures that involved reducing the alar cartilage in order to alter the shape of the nose's tip. It was often unavoidable to maintain projection and support at the tip. The tendency is toward a more robust nasal profile and a more natural, unoperated appearance¹.

It is essential to evaluate nasal tip projection in light of both the nasal dorsum and the face as a whole. Any procedure to alter the nose's appearance will result in a more significant or unchanged nose tip protrusion. Decisions on the surgical procedures should consider whether the nasal tip is to be kept in its current position or moved. When modifying the nasal skeleton, it's essential to consider the skin and soft tissue envelope and the restrictions it places on alterations to

the skin's topography. Because changes in nasal tip projection are inextricably linked to tip rotation and length changes, the intricacy of nasal tip dynamics must also be carefully studied².

Examining the nasal profile in great detail allows for assessing nasal tip projection. Various techniques of measuring tip projection have been documented, including those of Goode, Crumley, Simons, Byrd, and Baum¹. Although imperfect, these techniques complement the ideal naso-facial angle-based indirect assessment of tip projection¹.

The Powell-Humphries aesthetic triangle evaluates the nasal tip projection relative to other facial angles³. Specifically, they advocate for an 80-95-degree angle between the horizontal plane and a vertical line traced from the glabella to the pogonion. The nasofrontal angle is defined as the point where a line passing through the center of the nasion and tangent to the glabella also passes through the center of the nasal dorsum (1) (the nasal dorsal line should cross any dorsal hump to prevent distortion of the angle)¹.

The current study used the Rhinoplasty Outcomes Evaluation (ROE) ratings to assess patient satisfaction with cap grafts. Grafts, both little and broad, were used.

Patients and Methods

This retrospective and multicentric study was conducted in the Otolaryngology Departments of Eskişehir Osmangazi University, Kirikkale University, and Bilecik Şeyh Edebali University; Otolaryngology Clinics of Baypark Hospital and Dr. Oğuzhan Oğuz Wellnose Clinic according to the rules outlined in the Declaration of Helsinki. Ethics committee approval was taken from T.R. Bilecik Şeyh Edebali University, Non-Invasive Clinical Research Ethics Committee (Date: 05.12.2023, Number: 8/6). It is not necessary to obtain informed consent as the data has been evaluated retrospectively.

Subjects

A total of 80 patients who underwent rhinoplasty operation with cap graft application to the tip region were included in the study. The patients were selected from those who applied to the Otolaryngology Departments of Eskişehir Osmangazi University. In all patients, open rhinoplasty steps were followed. According to the cap graft size, there were two groups: Group 1 consisted of 40 patients with cap graft size ≤ 7 cm (mini cap group). Group 2 comprised 40 patients with cap grafts ≥ 8 cm (wide cap group). The mean age of

the patients was 25.97 ± 6.68 years (ranging from 18 to 48) in group 1 and 24.65 ± 5.91 years (ranging from 17 to 40) in group 2.

Inclusion Criteria

Patients who underwent cap graft application.
At least 1-year follow-up evaluation of the patients.

Exclusion Criteria

The study did not include patients who did not come for 1-year follow-up.

Methods

All patients in groups 1 and 2 were evaluated following the criteria written below at preoperative, postoperative-1st month, and postoperative 1st-year (Figures 1 and 2):

1. The ROE Form: six questions on this scale probe your physical, emotional, and social well-being. The ROE asks patients to assess the appearance and function of their nose, emotional confidence, desire for change, and how their nasal appearance affects their personal, social, and professional lives. Each of the six questions is graded on a scale from 0 (the most negative) to 4 (the most positive) points. The scaled instrument score is calculated by dividing the overall score by 24 and multiplying the result by 100. The scale runs from 0 to 100, with 0 indicating the least satisfied patients and 100 the most satisfied ones⁴⁻⁶.
2. Tip projection (cm).
3. Nasal dorsum length (cm).
4. Tip projection ratio (Goode): as the nasion (N), alar base-cheek junction (A), and tip defining point (T) were found, the Goode ratio was defined as AT/NT ⁷⁻⁹.
5. Nasofrontal angle.
6. Nasolabial angle.

Statistical Analysis

The data collected in this study were analyzed using the SPSS for Windows 16.0 software (SPSS Inc., Chicago, IL, USA). Mann-Whitney U test, independent samples *t*-test, Spearman's rho efficient test, and Pearson correlation test were used. A value of $p < 0.05$ was considered statistically significant.

Results

The mini-cap group had 13 males (32.5%) and 27 females (67.5%). In the wide cap group, there were 13 males (32.5%) and 27 females (67.5%) ($p=1.000$, $\chi^2: 0.000$).



Figure 1. Case 1: A patient with mini cap applied: preoperative and postoperative-1st year view.



Figure 2. Case 2: A patient with wide cap applied: preoperative and postoperative-1st year view.

ROE Scores and Measurement Values at Preoperative, Postoperative-1st Month, and 1st Year

Postoperative-1st month and 1st-year ROE scores of the wide cap group were significantly higher than those in the mini cap group ($p < 0.05$) (Table I).

Preoperative tip projection ratio (Goode) values of the wide cap group were significantly higher than those in the mini cap group ($p < 0.05$) (Table I).

There were no significant differences between mini cap and wide cap groups for tip projection,

nasal dorsum length, nasofrontal angle, and nasolabial angle values at each of the preoperative, postoperative-1st month, and postoperative-1st year ($p > 0.05$) (Table I).

Correlation Test Results

As preoperative ROE scores decreased, postoperative-1st month and 1st-year ROE scores increased ($p < 0.05$) (Table II).

There was a positive correlation between the postoperative 1st month and postoperative 1st-year's ROE scores ($p < 0.05$) (Table II); they increased together ($p < 0.05$) (Table II).

Table I. ROE scores and measurement values at preoperative, postoperative-1st month and 1st year.

		Mini cap (≤ 7 cm) (n=40)			Wide cap (≥ 8 cm) (n=40)			
		Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	<i>p</i>
Age*		25.97	24.50	6.68	24.65	23.00	5.91	0.412
Preop	ROE score*	7.10	6.00	2.97	5.97	5.50	2.57	0.109
	Tip projection (cm)**	1.50	1.40	0.53	1.54	1.55	0.55	0.757
	Nasal dorsum length (cm)*	2.41	2.02	0.84	2.37	2.46	0.83	0.516
	Tip projection ratio (Goode)**	0.62	0.61	0.04	0.64	0.64	0.05	0.034
	Nasofrontal angle**	134.84	136.55	8.80	134.84	136.20	7.34	0.997
Postop-1 st month	Nasolabial angle**	93.14	93.40	8.70	92.78	94.70	8.66	0.853
	ROE score**	16.25	16.00	4.02	18.52	18.50	3.69	0.010
	Tip projection (cm)**	1.48	1.57	0.49	1.55	1.58	0.55	0.557
	Nasal dorsum length (cm)*	2.3070	2.37	0.79	2.32	2.46	0.80	0.802
	Tip projection ratio (Goode)**	0.64	0.65	0.04	0.65	0.65	0.04	0.125
Postop-1 st year	Nasofrontal angle**	142.04	142.05	7.50	141.60	141.20	7.79	0.798
	Nasolabial angle**	101.98	101.15	8.95	100.83	100.60	8.52	0.558
	ROE score**	16.02	16.50	4.72	19.1750	19.50	4.24	0.002
	Tip projection (cm)*	1.46	1.55	0.48	1.5498	1.61	0.55	0.424
	Nasal dorsum length (cm)*	2.28	2.36	0.76	2.3165	2.51	0.79	0.893
	Tip projection ratio (Goode)**	0.6393	0.63	0.03	0.6550	0.65	0.04	0.097
	Nasofrontal angle**	141.45	141.05	6.97	141.87	141.45	7.20	0.792
	Nasolabial angle**	97.52	97.20	7.61	98.30	98.35	7.40	0.641

p*-value shows the results of Mann-Whitney U test. *p*-value shows the results of independent samples *t*-test.

In the wide cap group, postoperative-1st month and postoperative 1st-year's ROE scores increased compared to the mini cap group ($p<0.05$) (Table II).

As postoperative-1st-year nasolabial angle values increased, postoperative 1st-year ROE scores also increased ($p<0.05$) (Table II).

Discussion

Tip projection can be evaluated about several anatomical landmarks (such as the subnasale, the alar-facial groove, a line from the nasion, or the glabella). Goode's approach is one of the most practical ways to measure the tip's projection. In

Table II. Correlation test results.

		ROE scores			
			Preop*	Postop-1 st month**	Postop-1 st year**
Preop	ROE Scores*	r		-0.291	-0.295
		p		0.009	0.008
Postop-1 st month	ROE Scores**	r	-0.291		0.753
		p	0.009		0.000
Postop-1 st year	ROE Scores**	r	-0.295	0.753	
		p	0.008	0.000	
Cap graft (Code 1: Mini cap, Code 2: Wide cap)*		r	-0.180	0.270	0.350
		p	.110	0.015	0.001
Preop	Tip projection (cm)**	r	0.020	0.149	0.027
		p	0.860	0.189	0.813
	Nasal dorsum length (cm)*	r	-0.013	0.108	0.012
		p	0.910	0.339	0.914
	Tip projection ratio (Goode)**	r	0.030	-0.032	-0.054
		p	0.790	0.776	0.635
	Nasofrontal angle**	r	0.037	-0.068	0.026
		p	0.744	0.551	0.820
	Nasolabial angle**	r	0.112	0.043	0.098
		p	0.322	0.703	0.386
Postop-1 st month	Tip projection (cm)**	r	-0.068	0.202	0.062
		p	0.547	0.072	0.586
	Nasal dorsum length (cm)*	r	-0.028	0.129	-0.010
		p	0.806	0.256	0.927
	Tip projection ratio (Goode)**	r	-0.101	0.081	0.107
		p	0.374	0.478	0.343
	Nasofrontal angle**	r	-0.107	0.075	0.126
		p	0.344	0.508	0.265
	Nasolabial angle**	r	-0.071	0.145	0.197
		p	0.529	0.198	0.080
Postop-1 st year	Tip projection (cm)**	r	-0.073	0.212	0.075
		p	0.519	0.059	0.508
	Nasal dorsum length (cm)*	r	-0.021	0.133	0.004
		p	0.852	0.240	0.975
	Tip projection ratio (Goode)**	r	-0.052	0.005	0.039
		p	0.650	0.964	0.731
	Nasofrontal angle**	r	-0.117	0.053	0.108
		p	0.301	0.638	0.341
	Nasolabial angle**	r	-0.085	0.188	0.283
		p	0.455	0.094	0.011
Follow-up time (years)*		r	0.018	0.016	-0.043
		p	0.873	0.889	0.704
Age*		r	0.010	0.129	0.113
		p	0.927	0.254	0.319
Gender (Code 1: Male, Code 2: Female)*		r	0.138	-0.013	0.084
		p	0.222	0.911	0.458

*p-value shows the results of Spearman's rho efficient test. **p-value shows the results of the Pearson correlation test.

most noses, the ratio of the distance from the nasion to the nasal tip to a line drawn along the alar-facial groove is between 0.55 and 0.60. The nasal tip is deemed over-projected if it is more than this distance from the alar-facial groove. The tip is under-projected if the distance is less than 0.55-0.60¹.

The current study found that the ROE scores of the broad-cap group were considerably higher than those of the micro-cap group in both the first month and the first year after surgery. The broad cap group had better preoperative tip projection ratio (Goode) values than the tiny cap group. Mini and wide caps did not differ significantly regarding tip projection, nasal dorsum length, nasofrontal angle, or nasolabial angle.

Correlation studies indicated that when preoperative ROE scores declined, postoperative-1st month and 1st-year ROE scores increased. The return on investment (ROI) rate improved in the first month and the first year after surgery. The broad-cap group had higher ROE ratings one month and one year after surgery than the micro-cap group. First-year postoperative ROE scores improved along with nasolabial angle values.

A modified large-cap graft might be used to get the right amount of projection out of your nose. The large-cap transplant is more robust and adaptable than individual cartilage fragments. The large-cap transplant was simple to sculpt into each patient's desired form. Tip projection could be adjusted easily by adjusting the thickness of the large-cap graft. Second, the perichondrium was hidden by a well-polished surface of the large-cap graft, making the nose tip look more natural. The large-cap graft was securely fastened to the lateral crus, which provided excellent support for the dome. This approach proved practical and beneficial for improving the tip profile of individuals with thin skin with a pinched look at the tip or evident tip bifidity after trans-domal sutures¹⁰. Poor tip definition, asymmetric tip abnormalities, tip contracture, delicate/insufficient nasal skin, and a short nose, mainly due to prior rhinoplasties, are all excellent candidates for a large-cap graft¹⁰.

Graft tips are crafted with finely beveled edges in the shape of a triangle, trapezoid, or shield. The distinguishing features and highlights of the tip are emphasized using grafts, and tips with hereditary or postsurgical abnormalities are given a more natural appearance. If significant undermining develops during primary delivery or an open route, the graft may need to be sutured¹.

The cap graft was a tiny cartilage graft implanted between the nasal domes and immediately

fitted to the tip of an L-shaped silicone implant to limit the danger of tip extrusion¹¹. Several problems, including abnormalities, malposition, displacement, resorption, and warping, became apparent as expertise with cap grafts expanded^{10,12}.

Large-cap graft's primary weakness is its inability to significantly alter the look of a long, thin nose by rotating the tip. The large-cap graft would gradually sink with time and cause the nose to look longer without the stiff support of an expanded columellar strut, which is the conventional approach for increasing nasal tip rotation. In addition, the large-cap graft method needs help defining the lobular-columellar angle and making a clean infra-tip break¹⁰.

The graft's top and lower surfaces were sliced gradually over time to achieve the desired dorsal height. The maximum amount of cartilage may be employed using this method of carving, which helps to prevent the graft from being too thin because of the unnecessary removal of tissue from the graft's periphery¹⁰.

Conclusions

Patient satisfaction with the rhinoplasty¹³⁻¹⁶ improved in the first postoperative month and the first year when a wide cap was used. Increased nasolabial angle after surgery was associated with better outcome ratings (ROE) and greater patient satisfaction in the first year following surgery.

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Conflict of Interest

The authors have no conflict of interest to declare.

Ethics Approval

Ethics committee approval was taken from T.R. Bilecik Şeyh Edebali University, Non-Invasive Clinical Research Ethics Committee (Date: 05.12.2023, Number: 8/6).

Informed Consent

Informed consent was not necessary since the data were evaluated retrospectively. Nevertheless, patients provided consent for the publication of their photos for academic purposes.

Authors' Contributions

Zeynel Öztürk: Planning, designing, literature survey, active intellectual support. Nuray Bayar Muluk: Planning, designing, literature survey, statistical analysis, writing, active in-

tellectual support, submission. Oğuzhan Oğuz: Planning, designing, literature survey, active intellectual support. Furkan Kaya: Planning, designing, literature survey, data collection, active intellectual support. Rıza Dündar: Planning, designing, literature survey, active intellectual support. Cemal Cingi: Planning, designing, literature survey, data collection, active intellectual support, English editing.

ORCID ID

Zeynel Öztürk: 0009-0009-4422-8537
Nuray Bayar Muluk: 0000-0003-3602-9289
Oğuzhan Oğuz: 0009 0002 7019 1386
Furkan Kaya: 0000-0001-7216-5187
Rıza Dündar: 0000-0002-4052-0997
Cemal Cingi: 0000-0003-3934-5092 .

Availability of Data and Materials

All data for this study are presented in this paper.

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