

Comparison of Pre and Post Operative Nasal Anthropometric Measurements and Subjective Assessments in Adult Patients Undergoing Primary Rhinoplasty

Abir Chowdhury¹, Kapil Soni²

¹Senior Resident, MBBS, MS (Master of Surgery), Department of Otorhinolaryngology, Murshidabad Medical College and Hospital, West Bengal 742101

²Additional Professor, MBBS, MS, DNB, Department of Otorhinolaryngology, All India Institute of Medical Sciences, Jodhpur, Rajasthan 342005

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Corresponding Author: Dr. Abir Chowdhury

Conflict of interest: Nil

Abstract

Introduction: The nose takes an important part in establishing a beautiful appearance. Nose is also a prominent feature of the face. Anthropometry of facial symmetry and proportions is regarded as a factor of beauty in a particular population.

Aims & Objectives: To compare preoperative and postoperative anthropometric measurements based on an adult patient life-size photograph and subjective satisfaction using Rhinoplasty Outcome Evaluation score (ROE) preoperatively and postoperatively in adult patients undergoing Primary Rhinoplasty in north Indian population.

Materials: The study was comprised of patients aged 18 years or above with cosmetic and/or functional disorders requiring primary rhinoplasty and the sample size was 20 patients.

Result: According to the Rhinoplasty outcome evaluation score, 17 patients had excellent satisfaction, 2 patients had good satisfaction and 1 patient had acceptable satisfaction.

Conclusion: Patients belonging to lower socioeconomic background had less surgical expectations and were highly satisfied with the outcomes. According to our research, females had higher satisfaction than male after primary rhinoplasty.

Keywords: Rhinoplasty, Nasal anthropometry, Preoperative Assessment, Postoperative Outcome, Patient Satisfaction and Aesthetic surgery.

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Introduction

Anthropometry has evolved as a result of a growing interest in determining human anatomy variances [1]. The nose is the most prominent feature of the face, and it plays an important part in establishing a beautiful appearance. Anthropometry of facial symmetry and proportions is regarded as a factor of beauty in a particular population [2]. In rhinoplasty, patient selection is critical since, despite an excellent surgical result, a large percentage of patients may not be pleased [3]. Knowledge and analysis of anthropometric measures of the nose allow for quantitative analysis of the results, which is crucial for the surgeon and services related to rhinoplasty surgery. This study aims at the comparison of pre and post-operative nasal anthropometric measurements and subjective assessment in patients undergoing primary rhinoplasty.

Materials and Methods

Study Design: Prospective cohort study.

Study Population: The study was comprised of patients aged 18 years or above with cosmetic and/or functional disorders requiring primary rhinoplasty enrolled from the outpatient department of Otorhinolaryngology, All India Institute of Medical Sciences, Jodhpur. All patients were operated on by a single surgeon.

Inclusion Criteria

- Patients presented in the Department of Otorhinolaryngology at All India Institute of Medical Sciences, Jodhpur for primary rhinoplasty.
- Patients aged 18 years or above.

Exclusion Criteria

- Previous surgical interventions on the nose and face.
- Nasal deformities due to systemic diseases and congenital deformities.

Anthropometric analysis

Naso-frontal angle: With the eyes in forwarding gaze, the deepest region of the Naso-frontal angle should be between the top eyelash line and the supratarsal fold.

Because there are no established standards for evaluating the proper angle depth, the surgeon must rely on his or her aesthetic judgment to determine if the angle is too shallow or too deep [4].(Fig 1)

Naso-facial angle: It could play a role in how appealing a person's facial profile is perceived (Pearson and Adamson, 2004). The confluence of the face plane (glabella to pogonion) and the dorsal

plane of the nose (nasion to pronasale) forms the inner angle (Naini, 2011) (Fig 2).

Naso-labial angle: Naso-labial angle (NLA), as described by Guyuron, is measured by dropping a perpendicular line from the Frankfurt Horizontal line through the sub-nasale [5]. (Fig 3).

Nasal tip angle: Tip angle (TA) as described by Byrd and Hobar by dropping a perpendicular line from the Frankfurt Horizontal line through the alar crease junction [6]. (Fig 4)

Columellar lobule angle: The confluence of the columella and the infra-tip lobule forms the columellar-lobular angle. It is approximately 30 to 45 degrees for females [7]. (Fig 5).

Lobule to nostril ratio: When examining the opposite anomaly, large nostril/small lobule disproportion, Daniel discovered the optimal nostril/tip ratio to be 55:45 on the lateral view [8]. (Fig 6).

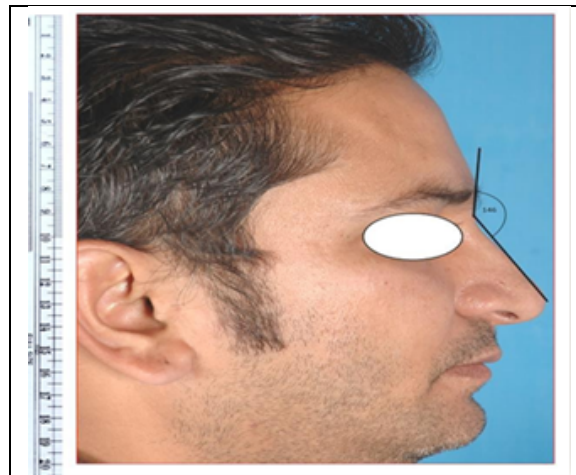


Figure 1:

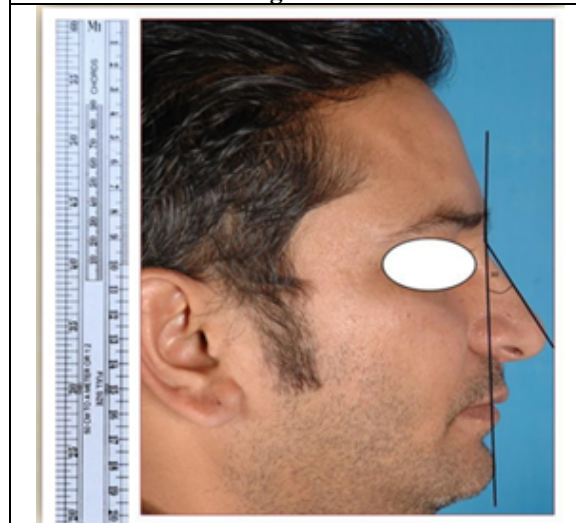


Figure 2:

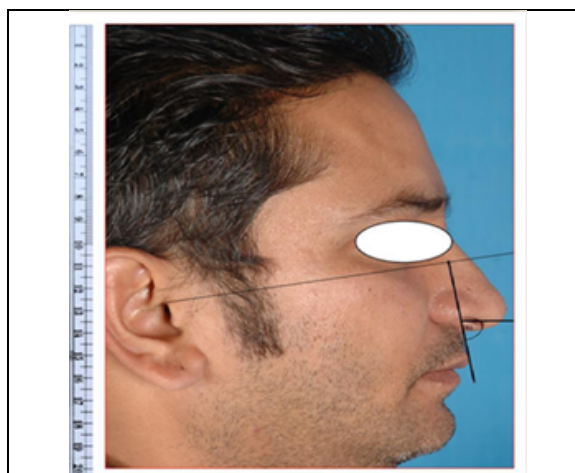


Figure 3:

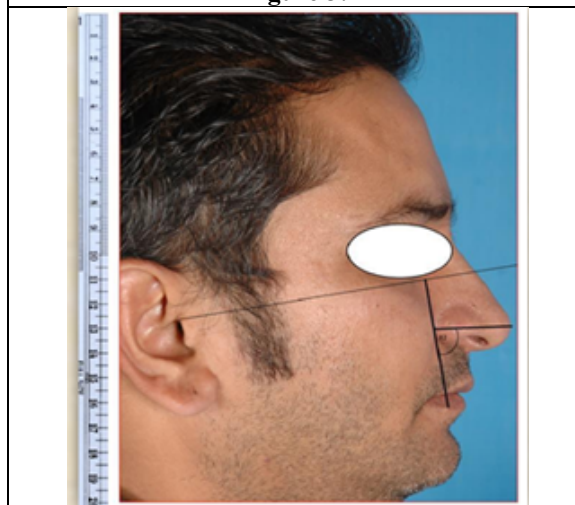


Figure 4:

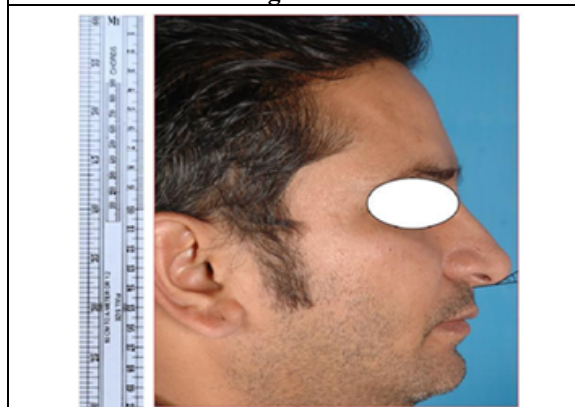


Figure 5:



Figure 6:

Rhinoplasty outcome evaluation (ROE) score:
The Rhinoplasty Outcomes Evaluation (ROE) questionnaire provided for the analysis of qualitative factors such as social, emotional, and psychological aspects. SenaEsteves et al. verified the ROE questionnaire with Portuguese respondents in 2013 [9].

The ROE questionnaire, which consists of six questions and has been validated in Portuguese, was used (five about nose shape and one about nasal breathing). Each question was graded on a scale of 0 to 4, with 0 representing the most negative and 4 representing the most favourable. The sum of the scores was divided by 24 and

multiplied by 100 to generate a value that ranged from 0 to 100. A lower score suggests that you are more dissatisfied. A difference between post-operative and pre-operative evaluations that are positive implies that the patient has improved after treatment.

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) Somewhat (1) Moderately (2) Very much (3) Completely (4)
2. How well are you able to breathe through your nose? Not at all (0) Somewhat (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) Somewhat (1) Moderately (2) Very much (3) Completely (4)
4. Do you think your current nasal appearance limits your 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) Somewhat (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)

Female

Table 1: Distribution of meanNaso-frontal Angle

Naso- frontal Angle	N (Valid)	N (Missing)	Mean	Median	S.D	Range	Minimum	Maximum
Pre op	5	0	146.6	150	5.3	12	138	150
Post op 1 month	5	0	145.6	149	5.1	10	140	150
Post op 3 months	3	2	142.7	140	6.4	12	138	150
Post op 6 months	5	0	145.6	150	6.1	12	138	150

Table 2: Distribution of meanNaso-labial Angle

Naso-labial Angle	N (Valid)	N (Missing)	Mean	Media n	SD	Rang e	Minimum	Maximum
Pre op	5	0	81.8	83	15.4	39	57	96
Post op 1 month	5	0	96.6	95	11.4	29	87	116
Post op 3 months	3	2	102	97	12.3	23	93	116
Post op 6 months	5	0	96.2	93	11.7	30	86	116

Table 3: Distribution of mean Nasal tip angle

Nasal tip angle	N (Valid)	N (Missing)	Mean	Median	SD	Range	Minimum	Maximum
Pre op	5	0	93.4	94	6.1	15	85	100
Post op 1 month	5	0	100.4	101	6.1	15	95	110
Post op 3 months	3	2	103.3	100	5.8	10	100	110
Post op 6 months	5	0	99.6	100	6.6	17	93	110

Table 4: Distribution of mean Naso-facial Angle

Naso-facial Angle	N (Valid)	N (Missing)	Mean	Median	S.D	Range	Minimum	Maximum
Pre op	5	0	27.6	25	4.3	10	25	35
Postop 1 month	5	0	32.4	35	3.6	7	28	35
Postop 3 months	3	2	32.3	34	3.8	7	28	35
Postop 6 months	5	0	30.2	28	4.4	9	26	35

Table 5: Distribution of mean Columellar Lobule Angle

Columellar Lobule Angle	N (Valid)	N (Missing)	Mean	Median	SD	Range	Minimum	Maximum
Pre op	5	0	39.2	35	15	37	28	65
Post op 1 month	5	0	32	35	8	19	19	38
Post op 3 months	3	2	30.7	30	7	14	24	38
Post op 6 months	5	0	33	35	6	14	24	38

Table 6: Distribution of mean Lobule to Nostril ratio

Lobule to nostril ratio	N (Valid)	N (Missing)	Mean	Median	SD	Range	Minimum	Maximum
Pre-op	4	1	1.09	1.1	0.5	1.17	0.50	1.67
Post-op 1 month	4	1	1.2	1.2	0.2	0.36	1.14	1.50
Post-op 2 months	3	2	1.11	1	0.19	0.33	1	1.33
Post-op 6 months	4	1	1.16	1.2	0.1	0.33	1	1.33

Male**Table 7: Distribution of mean Naso-frontal Angle**

Naso-frontal Angle	N (Valid)	N (Missing)	Mean	Median	SD	Range	Minimum	Maximum
Pre-op	15	0	135.3	137	13.6	49	103	152
Post-op 1 month	14	1	137.1	136	9	29	121	150
Post-op 2 months	7	8	136.9	133	8.7	24	124	148
Post-op 6 months	15	0	139.2	138	9	30	122	152

Table 8: Distribution of mean Naso-labial angle

Naso-labial angle	N (Valid)	N (Missing)	Mean	Median	SD	Range	Minimum	Maximum
Pre-op	15	0	85.2	87	9.2	31	69	100
Post-op 1 month	14	1	90.4	90.5	4.8	17	81	98
Post-op 3 months	7	8	88.6	88	7.3	22	78	100
Post-op 6 months	13	0	89.6	89	6.7	25	75	100

Table 9: Distribution of mean Nasal tip angle

Nasal tip angle	N (Valid)	N (Missing)	Mean	Median	SD	Range	Minimum	Maximum
Pre-op	15	0	92.1	90	7.2	25	82	107
Post-op 1 month	14	1	95.3	95	4.1	13	90	103
Post-op 3 months	7	8	94.3	92	4.4	10	90	100
Post-op 6 months	15	10	94	93	4.2	15	87	102

Table 10: Distribution of mean Naso-facial Angle

Naso-facial Angle	N (Valid)	N (Missing)	Mean	Median	SD	Range	Minimum	Maximum
Pre-op	15	0	30.5	30.5	5.3	19	23	42
Post-op 1 month	14	1	31.7	30.5	5.3	17	23	40
Post-op 2 months	7	8	32	30	4	12	28	40
Post-op 6 months	15	0	30.6	30	5.2	17	23	40

Table 11: Distribution of mean Columellar Lobule Angle

Columellar Lobule Angle	N (Valid)	N (Missing)	Mean	Median	SD	Range	Minimum	Maximum
Pre-op	15	0	30.5	30.5	3.2	12	26	38
Post-op 1 month	14	1	27.3	27.3	4.4	18	20	38
Post-op 2 months	7	8	28.4	28.4	5.3	18	20	38
Post-op 6 months	15	0	28.7	30	4.6	18	20	38

Table 12: Distribution of mean Lobule to Nostril ratio

Lobule to nostril ratio	N (Valid)	N (Missing)	Mean	Median	SD	Range	Minimum	Maximum
Pre-op	15	0	1.2	1	0.4	1.29	0.71	2
Post-op 1 month	14	1	1.2	1.1	0.2	0.75	0.75	1.5
Post-op 2 months	7	8	1.2	1.3	0.2	0.6	1	1.6
Post-op 6 months	15	0	1.1	1	0.2	0.75	0.75	1.5

Table 13: Comparison of Individual Patient Responses to Rhinoplasty Outcome Evaluation (ROE) Questionnaire before and After Surgery

	Patient	Like Appearance of Nose (Q1)	Breath Through Nose (Q2)	Friends Like Your Nose (Q3)	Nose Limits Social/Professional (Q4)	Confidence in Best Appearance (Q5)	Want Surgical Change (Q6)	Total ((24)	% Score
Before Surgery	A	1	0	1	0	1	0	3/24	12.5
	B	0	2	0	1	1	0	4/24	16.6
	C	0	1	1	1	1	0	4/24	16.6
	D	2	0	2	2	0	0	6/24	25
	E	0	4	0	0	0	0	4/24	16.6
	F	0	4	0	0	1	0	5/24	20
	G	0	0	0	0	1	0	1/24	4.16
	H	0	2	1	0	1	0	4/24	16.6
	I	2	3	2	2	2	0	11/24	45.8
	J	0	2	0	0	0	0	2/24	8.33
	K	0	1	1	2	0	0	4/24	16.6
	L	1	0	2	2	1	0	6/24	25
	M	1	0	2	1	2	1	7/24	29.1
	N	0	2	0	1	1	0	4/24	16.6
	O	0	0	0	1	0	1	2/24	8.33
	P	1	1	2	2	1	0	7/24	29.1
	Q	0	1	2	1	1	0	5/24	20
	R	0	2	0	0	1	0	3/24	12.5
	S	2	0	2	2	1	0	7/24	29.1
	T	0	4	0	0	0	0	4/24	16.6
After Surgery	A	3	4	3	4	3	4	21/24	87.5
	B	4	3	3	4	4	3	21/24	87.5
	C	4	4	4	4	4	4	24/24	100
	D	3	4	3	3	4	3	20/24	83.33
	E	4	4	4	4	4	4	24/24	100
	F	2	4	0	0	2	2	10/24	41.66
	G	4	4	4	4	4	4	24/24	100
	H	3	4	4	4	4	4	23/24	95.8
	I	2	3	2	2	3	3	17/24	70.8
	J	4	3	3	4	4	4	22/24	91.6
	K	3	4	4	4	4	3	22/24	91.6
	L	3	3	2	2	3	1	14/24	58.3
	M	3	4	2	3	3	4	19/24	79.1
	N	4	4	4	4	4	4	24/24	100
	O	3	4	4	4	3	3	21/24	87.5
	P	4	4	4	4	4	4	24/24	100
	Q	4	4	4	4	4	4	24/24	100
	R	4	4	4	4	4	4	24/24	100
	S	3	4	3	3	3	3	19/24	79.1
	T	4	4	4	4	4	4	24/24	100

Out of total patients 75% were male and 25% were female

Table 14: Comparison of ROE Score % preoperatively and 6 months postoperatively in male patients using paired sample t-test

		Mean	N	SD	t-value	p-value
ROE Score %	Preoperative	20.41	15	10.61	10.593	0.0005 *
	6 months postoperative	84.98	15	17.24		

* Statistical Significance at $p < 0.05$ level

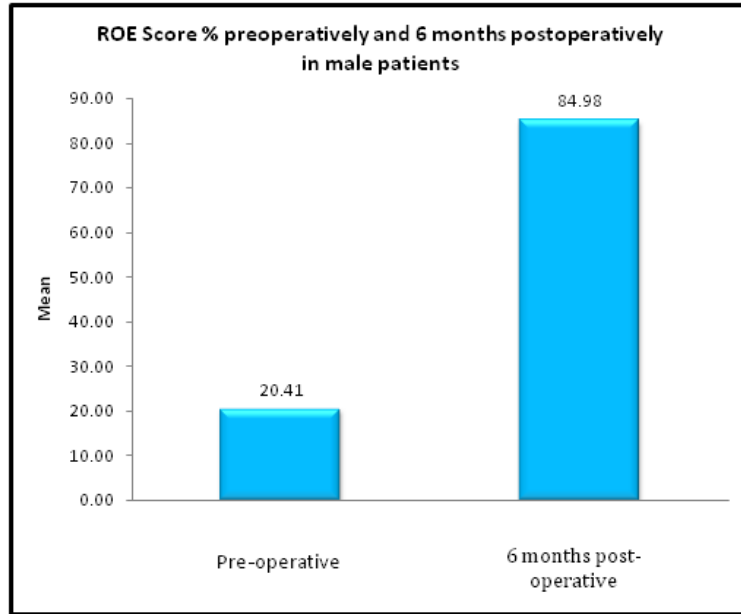


Figure 7: Comparison of ROE Score % in female patients preoperatively and 6 months postoperatively by using paired sample t-test

Table 15:

		Mean	N	SD	t-value	p-value
ROE Score %	Preoperative	15.78	5	1.83	38.900	0.0005 *
	6 months postoperative	95.82	5	5.90		

* Statistical Significance at $p < 0.05$ level

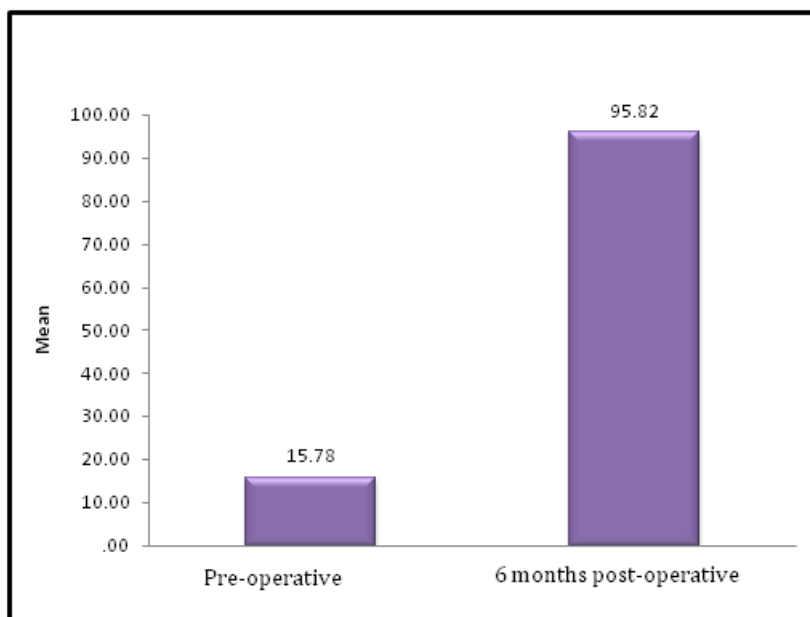


Figure 8: ROE Score % in female patients preoperatively and 6 months postoperatively

Comparison of ROE scores overall

1. The mean value of the ROE score preoperatively and postoperatively was 4.65 and 21.05 respectively. The p-value was 0.0005 which was statistically significant.
2. The mean score percentage preoperatively and 6 months postoperatively was 19.26% and 87.69 % respectively. The p-value was 0.0005 which was statistically significant.

Comparison of ROE scores in females

1. The mean ROE score preoperatively and postoperatively was 15.78% and 95.82% respectively. The p-value was 0.0005 which was statistically significant.
2. Preoperatively, the mean score percentage was 15.78% and 6 months postoperatively was 95.82%. The p-value was 0.0005, which was statistically significant.

Comparison of ROE scores in male patients

1. The mean ROE score preoperatively and postoperatively was 4.93 and 20.40 respectively. The p-value was 0.0005 which was statistically significant.
2. The mean ROE score percentage preoperatively and postoperatively was 20.41%, and 84.98% respectively. The p-value was 0.0005 which was statistically significant.

Discussion

Naso-frontal angle: In our study, mainly patients with saddle nose deformity had a decreased Naso-frontal angle, while the rest of the population had no significant change in the angle. In our study, it has also been seen that males have a more acute pre-op Naso-frontal angle, i.e., (135.3 +/-13.6) and females have a more obtuse naso-frontal angle, i.e., (146.6 +/- 5.2).

Naso-labial angle: The ideal Naso-labial angle for an average good-looking female is 103.9. The mean Naso-labial angle preoperatively and postoperatively was 81.8 and 96.2 degrees respectively, which was close to the ideal. The p-value was 0.082, which was statistically significant.

Naso-facial angle: The mean Naso-facial angle preoperatively and postoperatively was 30.5 degrees and 30.6 degrees respectively in male patients. There was no significant change in the mean Naso-facial angle after surgery (p-value = 0.890).

Lobule to nostril ratio: In our study, we were dealing with mesorrhine noses on average. Pre-operatively and post-operatively nostril to lobule ratio was 1:2 and 1:1 respectively in all male patients. So there was a decrease in the mean ratio of lobule to nostril post-operatively which was more towards leptorrhine but it was not statistically

significant (p-value = 0.437). In our study, among the female patients, the mean lobule to nostril ratio preoperatively and postoperatively was 1.09:1 and 1.16:1 respectively. Hence, the mean lobule to nostril ratio increased and was not statistically significant (p-value = 0.824).

Nasal Tip angle: In male patients there was an increase in the mean nasal tip angle postoperatively, which was more towards the value of the leptorrhine type (the ideal is 100 degrees for men). Here the p-value was 0.240, which was not statistically significant. In the female patients, the mean nasal tip angle preoperatively and postoperatively was 93.4 and 99.6 degrees respectively. There was an increased mean nasal tip angle, which also goes towards the value of the leptorrhine type (the ideal is 105 degrees for women). The p-value was 0.034 which was statistical significance.

Columellar lobule angle: In our study, the mean columellar lobule angle preoperatively and postoperatively was 30.5 degrees and 28.7 degrees respectively. The p-value was 0.018, which was statistically significant. In the female patients, the mean columellar lobule angle preoperatively and postoperatively was 39.2 and 33.0 degrees respectively.

The value was within the normal range for leptorrhine patients. The p-value was 0.364, which was not statistically significant. However, there was complete patient satisfaction, with no complaints from the patients regarding their nasal tip shape postoperatively.

Rhinoplasty outcome evaluation score: In our study, the mean pre-operative ROE score was 19.25 and the post-operative score was 87.68, indicating a 68.43 point gain following surgery. The females had a somewhat higher satisfaction score with the surgery (95.82) as compared to the males (84.96). These results are in accordance with those of Khan et al., who found that females are more satisfied [10] as well as Khansa et al., who found that males are less satisfied [11].

According to another assessment of male rhinoplasty patients, males had non-specific complaints and poorer knowledge of their abnormality than females [12]. The subjective assessments of all the 20 patients, at 6 month post-operative period, were done by the rhinoplasty outcome questionnaire method. Among them, 17 patients had excellent satisfaction, 2 patients had good satisfaction and 1 patient had acceptable satisfaction. The grades of satisfaction were taken as 5.0% (Acceptable), 10.0% (Good) and 85.0% (Excellent).

Conclusion

In our study, a significant portion of the patient demographic comprised young males with a history of trauma. Additionally, a subset of patients underwent primary rhinoplasty to meet the medical fitness criteria for army recruitment. Interestingly, patients from a lower socioeconomic background exhibited lower surgical expectations but reported high satisfaction with the outcomes. Notably, the Rhinoplasty Outcome Evaluation Score revealed that 17 patients experienced excellent satisfaction, 2 patients reported good satisfaction, and 1 patient found the outcomes acceptable. Emphasizing the consideration of ideal nasal parameters proved crucial in achieving satisfactory results. It's worth noting that not all nasal parameters reached the ideal values, reflecting individual variations in patient requirements.

Reference

1. Eickstedt EV. The race and types of the western Himalayas. *Man India*. 1927;6:237.
2. Carvalho B, Ballin AC, Becker RV, Berger CA, Hurtado JG, Mocellin M. Rhinoplasty and facial asymmetry: analysis of subjective and anthropometric factors in the Caucasian nose. *Int Arch Otorhinolaryngol*. 2012;16(4):445-50.
3. Andretto AC. The central role of the nose in the face and the psyche: review of the nose and the psyche. *Aesthetic Plast Surg*. 2007;31:406-10. doi:10.1007/s00266-006-0241-2.
4. Forrest CR. Dallas Rhinoplasty: Nasal Surgery by the Masters, Third Edition. *Plast Reconstr Surg*. 2014;134(5):1091.
5. Armijo BS, Brown M, Guyuron B. Defining the ideal nasolabial angle. *Plast Reconstr Surg*. 2012;129(3):759-64.
6. Byrd HS, Hobar PC. Rhinoplasty: a practical guide for surgical planning. *Plast Reconstr Surg*. 1993;91(4):642-54; discussion 655.
7. Pessa JE, Rohrich RJ. Nasal analysis and anatomy. In: Philadelphia: Elsevier Saunders; 2013. p. 373-86.
8. Daniel RK. Rhinoplasty: Large nostril/small tip disproportion. *Plast Reconstr Surg*. 2001;107:1874.
9. Esteves SS, Silva AP, Ferreira MG, Ferreira A, Ferreira P, Abruñhosa J, et al. Validation of Rhinoplasty Outcome Evaluation (ROE) Questionnaire to Portuguese. *Rev Port ORL*. 2015;53:81-5.
10. Khan N, Rashid M, Khan I, Sarwar SUR, Rashid H, Khurshid M, et al. Satisfaction in patients after rhinoplasty using the Rhinoplasty Outcome Evaluation Questionnaire. *Cureus*. 2019 Jul 30.
11. Khansa I, Khansa L, Pearson GD. Patient satisfaction after rhinoplasty: a social media analysis. *Aesthet Surg J*. 2015;10:1-5. doi:10.1093/asj/sjv095.
12. Rohrich RJ, Janis JE, Kenkel JM. Male rhinoplasty. *Plast Reconstr Surg*. 2003;15:1071-86.