

PREOPERATIVE ANALYSIS OF MAXILLOFACIAL ANTHROPOMETRIC PARAMETERS IN SUBJECTS WITH CORRECTIVE RHINOPLASTY IN TRAUMATIC FACIAL INJURY

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ABSTRACT

Background: Rhinoplasty done for cosmetic reasons has now surpassed all ethnicities, socioeconomic status, and age. Rhinoplasty is now not considered a procedure that is exclusively practiced in wealthy subjects. Increasing focus on the beauty of the face, one of the most commonly performed cosmetic procedures in India is Rhinoplasty.

Aim and Objective: The present study was conducted to develop a soft tissue analysis with a special focus on morphology of the nose, and could be used to assess nasal deformity, and plan appropriate treatment for nose correction using Rhinoplasty in agreement with a composite index and anthropometric norms of facial outcomes.

Materials and Methods: All anthropometric and maxillofacial parameters were assessed on digital photographs that were standardized in 40 subjects (20 males and 20 females). The age range of study subjects was 18-23 years. Statistical analysis of all the anthropometric parameters was done following normal (Gaussian) distribution for theoretical distribution using composite Index and Chi-square test. Before and after comparisons were assessed with paired 't' test and results were formulated.

Results: All the assessed anthropometric parameters followed the gaussian (normal) curve with a definite pattern being followed by male and female anthropometric norms to form a component Index.

Conclusion: The present study concludes that the present study should be carried forward in different geographical areas and institutes concerning graft acceptance at the recipient site and material. Also, patients' acceptance and satisfaction need to be considered to reach a definitive conclusion.

Keywords: Anthropometric Norms, Nose Morphology, Orthognathic Surgery, Plastic Surgery, Rhinoplasty.

INTRODUCTION

Rhinoplasty done for cosmetic reasons has now surpassed all ethnicities, socioeconomic statuses, and ages. Rhinoplasty is now not considered a procedure that is exclusively practiced in wealthy subjects. Increasing focus on the beauty of the face, one of the most commonly performed cosmetic procedures in India is Rhinoplasty. Cosmetic nose surgery

has also gained wide popularity in India owing to acceptable results, increased acceptance, and media attention.¹ the incidence is also increasing globally, with high rates in Europe, America, and Asia. Cosmetic Rhinoplasty procedure has surpassed all barriers of age with high popularity rates.²

The surgical procedures intersect with anthropometric methods in treating post-traumatic or congenital facial deformities in different ethnicity and races. To perform accurate and adequate correction in both genders, access to accurate anthropometric measurements and facial database is vital. Owing to the different expectations from surgery in males and females, despite similar surgical procedures done in both genders, certain characteristics should be critically evaluated before and during corrective Rhinoplasty.³ Consideration of these points is focused and cleared in the present study, which will form the base for future clinical studies to accurately plan the treatment of corrective Rhinoplasty. Autogenous tissues used in Rhinoplasty are parietal bone, vomer, ethmoid bone graft, iliac crest, autogenous rib cartilage, conchal cartilage from pinna, and septal cartilage.⁴

Rhinoplasty is considered one of the most difficult surgical procedures owing to the patient's expectations from the procedure, correction of function and form, and highly variable nasal anatomy. In Rhinoplasty planning, decision-making is one of the most difficult aspects as consequences of these decisions have to be accepted post-operatively. However, various principles in the literature guide young age surgeons to face various challenges of executing a Rhinoplasty surgery.⁵

Cosmetic surgeries have to be not only esthetically acceptable but also needs to restore normal function. The most commonly seen postoperative complication following Rhinoplasty is nasal obstruction. Turbinates, nasal valves, septum deformities like preexisting anatomic deformities should be assessed and corrected through thorough and appropriate radiographic and clinical examination.⁶ All surgical procedures have their advantages and shortcomings and learning curve. There are geometric potential complications and interactions for individual maneuvers, which are additive in a surgical sequence.⁷ Orthodontics and dentofacial Orthopedics is not only confined to deformities of the dentofacial region but also include plastic and Orthognathic surgeries including Rhinoplasty.⁸

Hence, the present study was conducted to widen the anthropometric norms of correcting female and male facial features and to use these norms to develop an index and to check facial surgery outcomes. To achieve a desirable clinical outcome with Rhinoplasty, there is a need to assess facial anthropometric measurements distribution for surgeons to set norms. The present study was conducted to develop a soft tissue analysis with a special focus on morphology of the nose and could be used to assess nasal deformity, and plan appropriate treatment for nose correction using Rhinoplasty in agreement with a composite index and anthropometric norms of facial outcomes in Indian population.

MATERIALS AND METHODS

The present study was conducted to develop a soft tissue analysis with a special focus on morphology of the nose and could be used to assess nasal deformity, and plan appropriate treatment for nose correction using Rhinoplasty in agreement with a composite index and anthropometric norms of facial outcomes in Indian population. The study was conducted in November 2020 to March 2021 after obtaining clearance from the concerned ethical committee. A total of 150 study subjects were screened and from them, 40 subjects were

finally included in the study. There were 20 males and 20 females within the age range of 18-23 years and the mean age of 19.64 ± 2.26 years.

The digital photographic records were obtained for all 40 study subjects. Inclusion criteria for the study were subjects with pleasing facial profiles and pleasing facial appearance. The exclusion criteria were subjects with a history of Orthognathic surgery and facial asymmetry. All photographs were taken from a digital DSLR camera using the mode of aperture priority with a built-in flashlight and aperture of 16. The flashlight was used as a source of constant illumination.

The camera lens center was kept at a distance of 5 ft from the subject to get a sharpened image. To get records in NHP (natural Head Position), subjects were placed on a single line in the relaxed position. The subjects were asked to look at eye level and into the mirror straight. The mirror was placed at a 5 ft distance from the subject.

Landmarks marked on the photographs were ala, canthus, cervical point, menton, pogonion, subnasale, nose tip, nasion, glabella and trichion. These landmarks are defined as:

- Ala: the flaring cartilaginous expansion forming the outer side of each of the nares.
- Canthus: The angle formed by the upper and lower eyelids at the nasal (inner or medial canthus) or temporal (outer or lateral canthus) end. The outermost border of the pinna/auricle is visible on the frontal photograph, on the right and left sides.
- Cervical point: Point of intersection between the line tangent to the neck and the line tangent to the submental region.
- Menton: Most inferior point on the chin
- Pogonion: Most anterior soft tissue point on the chin in the midline
- Subnasale: Junction of the columella and upper lip
- Tip: Most anteriorly projecting an aspect of the nose
- Nasion: Most posterior midline point of forehead corresponding to nasofrontal suture (the root of the nose)
- Trichion: Anterior hairline in the midline

Anthropometric parameters in females and males were assessed using normal (Gaussian) distribution for theoretical distribution. The fit Goodness of these parameters was assessed using the Chi-Square test. The level of significance was kept at $p > 0.8$. Fairly good fitness was at $p > 0.8$ with the normal curve. Similar manner behavior was studied for anthropometric parameters. The normal distribution pattern was followed by all the parameters.

RESULTS

The present study was conducted to develop a soft tissue analysis with a special focus on morphology of the nose and could be used to assess nasal deformity, and plan appropriate treatment for nose correction using Rhinoplasty in agreement with a composite index and anthropometric norms of facial outcomes in Indian population. The study results showed that the good fitness normal curve in both the genders in the following parameters:

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| • Inter Alar distance | • The right side of the Nasal triangle |
| • The apex angle of the Nasal triangle | • Nasal height |
| • The base of the Nasal triangle | • Nasal width |
| • The left side of the Nasal triangle | • Nasolabial Angle |
| | • Facial Convexity Angle |

- Mentocervical angle
- Nasofacial angle
- Nasofrontal Angle
- Intercanthal width
- Subnasale to Menton
- Glabella to Subnasale
- Trichion to Glabella

Mean of Anthropometric parameters in males and female study subjects were assessed in the present study, and the results showed that these parameters of the pleasing facial profile followed a normal (Gaussian) distribution curve. The pattern was normal as 99% falling in mean + 3SD, 95% falling in mean + 2SD, and 68% of readings were in mean \pm 1SD. Inter alar distance was 43.92 ± 3.64 , 50.97 ± 4.30 , and 47.45 ± 5.32 in females, males, and total study subjects respectively. Nasal Height was 50.44 ± 3.38 , 55.56 ± 5.61 , and 53.02 ± 5.29 in females, males, and total study subjects respectively. Nasal width was 104.02 ± 10.76 , 33.79 ± 2.76 , and 31.20 ± 4.11 in females, males, and total study subjects respectively. Nasolabial angle in females, males, and total study subjects was 104.02 ± 10.76 , 96.97 ± 15.42 , and 100.49 ± 13.70 respectively. Nasomental angle in females, males, and total study subjects were 129.15 ± 5.08 , 129.64 ± 4.16 , and 129.40 ± 4.64 respectively. Facial convexity angle was 14.66 ± 5.41 , 12.01 ± 5.58 , and 13.34 ± 5.63 in females, males, and total study subjects respectively. Intercanthal width was 40.01 ± 3.30 , 43.27 ± 3.47 , and 41.64 ± 3.75 in females, males, and total study subjects respectively. Also, trichion to glabella distance in females, males, and total subjects was 62.86 ± 5.71 , 68.00 ± 5.92 , and 65.42 ± 6.34 respectively as shown in Table 1. All these parameters were shown to follow a normal distribution curve.

The present study also assessed various parameter ratios in the study subjects, and the results are summarized in Table 2. It is seen that Inter medial canthal distance: ala-ala (outer border of rt. & lt. ala) was 1:1.09 in females and 1:1.17 in males, intermedial canthal distance: outer border of the ear to lateral canthus was 1:1.07 in females and 1:1.12 in males. Inter medial canthal distance: eye (medial to lateral canthus) was 1:0.87 in females and 1:0.87 in males. Trichion to Glabella: Subnasale to Menton was 1:1.15 in females and 1:1.30 in males, and Trichion to Glabella: Glabella to Subnasale was 1:1.11 in males and 1:1.18 in females.

DISCUSSION

The present study was conducted to develop a soft tissue analysis with a special focus on morphology of the nose and could be used to assess nasal deformity, and plan appropriate treatment for nose correction using Rhinoplasty in agreement with a composite index and anthropometric norms of facial outcomes in Indian population. The study results showed that a good fitness normal curve in both the genders in all the assessed study parameters. A total of 150 study subjects were screened and from them, 40 subjects were finally included in the study. There were 20 males and 20 females within the age range of 18-23 years and the mean age of 19.64 ± 2.26 years. These demographics were comparable to the characteristics assessed by the studies of Elif F et al⁹ in 2002 and David M et al¹⁰ in 2004 where authors assessed subjects with similar demographics.

Mean of Anthropometric parameters in males and female study subjects were assessed in the present study, and the results showed that these parameters of the pleasing facial profile followed a normal (Gaussian) distribution curve. The pattern was normal as 99% falling in mean + 3SD, 95% falling in mean + 2SD, and 68% of readings were in mean \pm 1SD. Inter alar distance was 43.92 ± 3.64 , 50.97 ± 4.30 , and 47.45 ± 5.32 in females, males, and total study subjects respectively. Nasal Height was 50.44 ± 3.38 , 55.56 ± 5.61 , and 53.02 ± 5.29 in females,

males, and total study subjects respectively. Nasal width was 104.02 ± 10.76 , 33.79 ± 2.76 , and 31.20 ± 4.11 in females, males, and total study subjects respectively. Nasolabial angle in females, males, and total study subjects was 104.02 ± 10.76 , 96.97 ± 15.42 , and 100.49 ± 13.70 respectively. Nasomental angle in females, males, and total study subjects were 129.15 ± 5.08 , 129.64 ± 4.16 , and 129.40 ± 4.64 respectively. Facial convexity angle was 14.66 ± 5.41 , 12.01 ± 5.58 , and 13.34 ± 5.63 in females, males, and total study subjects respectively. Inter canthal width was 40.01 ± 3.30 , 43.27 ± 3.47 , and 41.64 ± 3.75 in females, males, and total study subjects respectively. Also, trichion to glabella distance in females, males, and total subjects was 62.86 ± 5.71 , 68.00 ± 5.92 , and 65.42 ± 6.34 respectively. All these parameters were shown to follow a normal distribution curve. These results were consistent with the findings of Stephanie A. Joe¹¹ in 2004 and Scavage H et al¹² in 2006 where anthropometric parameters followed normal distribution curve as in the present study.

The present study also assessed various parameter ratios in the study subjects. It is seen that Inter medial canthal distance: ala-ala (outer border of rt. & lt. ala) was 1:1.09 in females and 1:1.17 in males, intermedial canthal distance: outer border of the ear to lateral canthus was 1:1.07 in females and 1:1.12 in males. Inter medial canthal distance: eye (medial to lateral canthus) was 1:0.87 in females and 1:0.87 in males. Trichion to Glabella: Subnasale to Menton was 1:1.15 in females and 1:1.30 in males, and Trichion to Glabella: Glabella to Subnasale was 1:1.11 in males and 1:1.18 in females. These results were consistent with the results of Dimaggio FR et al¹³ in 2007 and Fariaby J et al in 2006 where authors showed parameter ratio of the assessed variables comparable to the present study.

CONCLUSION

Within its limitations, the present study concludes that this study was conducted to develop an analysis of the soft tissue with the main focus on the morphology of the nose. The results of the present study can be useful in diagnosis, planning of treatment, and post-operative evaluation of the results of the Rhinoplasty procedure. This study also helped in establishing composite index and anthropometric norms of facial outcomes. The study had few limitations as smaller sample size, short monitoring period, single institutional study, single geographical area, and hence, this study could not depict the overall picture. More prospective clinical trials with a larger sample size and longer monitoring period are required to reach the definitive conclusion.

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TABLES

Anthropometric Parameters	Females	Males	Total
Inter Alar distance	43.92±3.64	50.97±4.30	47.45±5.32
The apex of Nasal triangle	67.84±6.33	67.80±6.14	67.75±5.99
The base of Nasal triangle	39.34±3.41	42.02±4.36	44.70±3.47
Lt. Side of Nasal triangle	35.08±2.81	37.60±3.86	40.11±3.01
Rt. Side of Nasal triangle	35.61±2.70	40.38±3.25	38.02±3.78
Nasal Height	50.44±3.38	55.56±5.61	53.02±5.29
Nasal Width	28.61±3.58	33.79±2.76	31.20±4.11
Nasolabial Angle	104.02±10.76	96.97±15.42	100.49±13.70
Facial Convexity Angle	14.66±5.41	12.01±5.58	13.34±5.63
Mento Cervical Angle	98.40±7.48	103.03±9.31	100.71±8.72
Nasomental Angle	129.15±5.08	129.64±4.16	129.40±4.64
Nasofacial Angle	31.45±3.28	32.26±3.14	31.85±3.22
Nasofrontal Angle	140.89±6.96	134.58±7.68	137.73±7.95
Intercanthal width	40.01±3.30	43.27±3.47	41.64±3.75

Subnasale to Menton distance	72.80±4.94	89.04±8.65	80.92±10.76
Glabella to Subnasale distance	79.37±5.09	75.51±6.64	74.94±5.91
Trichion to Glabella distance	62.86±5.71	68.00±5.92	65.42±6.34

Table 1: Mean of Anthropometric parameters in male and female study subjects

Parameters	Females	Males
Inter medial canthal distance: ala-ala (outer border of rt. & lt. ala)	1:1.09	1:1.17
Inter medial canthal distance: outer border of the ear to the lateral canthus	1:1.07	1:1.12
Inter medial canthal distance: eye (medial to lateral canthus)	1:0.87	1:0.86
Trichion to Glabella: Subnasale to Mento	1:1.15	1:1.30
Trichion to Glabella: Glabella to Subnasale	1:1.18	1:1.11

Table 2: Anthropometric Facial ratios based on the Genders