

Comparative Anthropometric Assessment of Facial Asymmetry between Patients with and without External Nasal Deformity

Smriti Baidya^{1*}, Narmaya Thapa¹, Urmila Gurung¹

1. Tribhuvan University Teaching Hospital, Maharajgunj, Nepal

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Corresponding Authors:

Dr. Smriti Baidya

Email:

smritibaidya@gmail.com

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Abstract

Background: Facial symmetry is determining the attractiveness of the face. It must be taken into consideration and not just the nose in isolation for patients seeking rhinoplasty. It may however exist even in absence of external nasal deformity.

Aim: The study was conducted to compare the nature of facial asymmetry and its frequency in patients with and without external nasal deformity.

Methods: This observational, analytical study was conducted from September 2020 to October 2021 in the Department of Ear Nose and Throat (ENT) – Head and Neck Surgery, Tribhuvan University Teaching Hospital (TUTH), Maharajgunj Medical Campus Institute of Medicine, Nepal. Frontal photograph of patients seeking rhinoplasty for external nasal deformity was compared with patients without external nasal deformity visiting ENT Out Patient Department (OPD) for other complaints. Anthropometric measurements based on soft tissue landmarks, starting with an imaginary line from the midpoint of the hairline, crossing midpoint of the nasal bridge, the central point of cupid's bow, upper lip, and lowest midpoint of the chin were measured. Distance between this line and medial canthus, lateral canthus, lateral alar margin, oral commissure, and tragus were measured and the means of the ratios were compared.

Results: The mean of the ratio of the midline to lateral alar margin showed a significant difference ($p < 0.040$) with regards to facial asymmetry in patients seeking rhinoplasty for external nasal deformity. Objectively, all the patients had some degree of asymmetry in both groups.

Conclusion: Facial asymmetry was found in both patients with and without external nasal deformity indicating that facial asymmetry is a common entity irrespective of external nasal deformity.

Conflicts of Interest: The Authors declare no conflicts of interest.

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Introduction

The shape and anatomical position of the nose are the major determinants of overall facial harmony and aesthetics (1). As the nose is located in the center of the face, the shape of the nose is often regarded as an important determining element of the overall facial aesthetics (2). However, facial asymmetry may co-exist. Many rhinoplasty patients present mainly with nasal deviation and are unaware of

any inherent facial asymmetries (1). In contrast to focusing on just the nose, increasing patient awareness of whole facial asymmetry will provide greater patient satisfaction about their predicted outcome (3).

Rhinoplasty is one of the most challenging procedures in facial plastic surgery and consideration must be given to both facial aesthetics and nasal function. It is technically

difficult to achieve consistent results as the aesthetic outcome is visible to all. The evaluation of rhinoplasty patients is multifaceted and includes nasal history, examination of the nasal airway and performance of nasofacial analysis, which plays a critical role in selecting the appropriate surgical plan to achieve facial harmony. It is important not only to correct the nasal deviation but maintain nasal symmetry within the context of the patient's facial symmetry. Detection and discussion of the presence of preexisting facial asymmetry, both in patient education and in surgical planning. The study was conducted to know the frequency of facial asymmetry in patients with and without external nasal deformity and to have baseline evidence of facial asymmetry for counselling to patients seeking aesthetic rhinoplasty surgery.

Methods

The study was an observational, analytical study conducted from September 2020 to October 2021 in the Department of ENT – Head and Neck Surgery, TUTH, Maharajgunj Medical Campus (MMC), Institute of Medicine (IOM), Nepal. Ethical committee approval was taken from Institutional Review Committee (IRC) of Institute of Medicine prior to the start of the study. Written consent for the study and photography was taken from the patients for enrollment in the study. Patients seeking rhinoplasty for external nasal deformity and patients without external nasal deformity who visited ENT OPD for issues other than external nasal deformity of both sexes were included. Patients aged 18 years and above were recruited in the study. Fifty patients were included with 25 in each group. Group A included patients seeking rhinoplasty for external nasal deformity and Group B included patients without external nasal deformity visiting ENT OPD for other complaints. Patients aged less than 18 years, presence of craniofacial anomalies, revision septorhinoplasty and history of previous orthodontic treatment were excluded from the

study. All photographs were taken by the principal investigator using Digital Single Lens Reflex (DSLR) camera with macro lens of 105 mm focal length at a distance of 1.5 meter between patient and camera maintaining the Frankfurt plane. The photographs were subjected to analysis using Adobe Photoshop CS3. Anthropometric measurements were based on facial soft tissue landmarks, starting with an imaginary vertical line originating at the midpoint of the hairline, crossing the midpoint of the nasal bridge, the central point of cupid's bow, upper lip and the lowest midpoint of the chin as per Carvalho et al.⁴ The distance between this line to the medial canthus (MC), lateral canthus (LC), lateral alar margin (LAM) oral commissure (OC) and tragus (Tr) were measured on both sides (Figure 1).

The ratio was calculated by dividing the measurement of one side to another, taking the lesser value as the denominator. Measurements of various anthropometric parameters taken were midline to medial canthus (M-MC), midline to lateral canthus (M-LC), midline to lateral alar margin (M-LAM), midline to oral commissure (M-OC), midline to tragus (M-Tr). Midline to lateral alar margin ratio was taken to determine the degree of asymmetry as it was found to be an independent predictor of the perception of facial asymmetry. Percentage of asymmetry was calculated using the following formula $(\text{Ratio} - 1) \times 100$ and the degree of asymmetry was defined as 2.5- 5%, 5-10% and >10% (4). Data was analyzed using Statistical Package for Social Sciences (SPSS) version 25 software. Descriptive data were analyzed using range, mean, percentage, standard deviation. Categorical data were analyzed using Chi Square test and Fischer's exact test. Numeric data were analyzed using Independent Student's t test. P value less than 0.05 was considered statistically significant.

Results

There were 22 males and 28 females in this study. Group A had 15 males (60%) and 10

females (40%) whereas Group B had seven males (28%) and 18 females (72%). In group A, the age ranged from 20 to 49 years with mean age of 30.88 ± 9.1 years. In Group B, it ranged from 22 to 56 years with the mean age of 35.04 ± 9.2 years. There was no statistical difference in the age between two group. Comparing the mean of ratios, only the ratio of the midline to lateral alar margin showed statistically significant result ($p = 0.04$) between the two groups.

The ratio of midline to medial canthus showed most variation in both groups and the ratio of midline to tragus showed the least variation in both groups, with no statistical difference between the two groups (Table 1). Comparison of mean of ratio between midline to medial

canthus, midline to lateral canthus, midline to lateral alar margin, midline to oral commissure and midline to tragus between two genders in both group were not statistically significant (Table 2).

Out of 25 patients in Group A, none of the patients had degree of asymmetry of 2.5-5% whereas eight and 11 patients had degree of asymmetry of 5-10% and more than 10% respectively.

Similarly, in Group B, 13, three, and five patients had degree of asymmetry of 2.5-5%, 5-10% and more than 10 % respectively. There were only six patients in Group A and four in Group B with a symmetrical face in relation to midline to lateral alar margin (Figure 2).

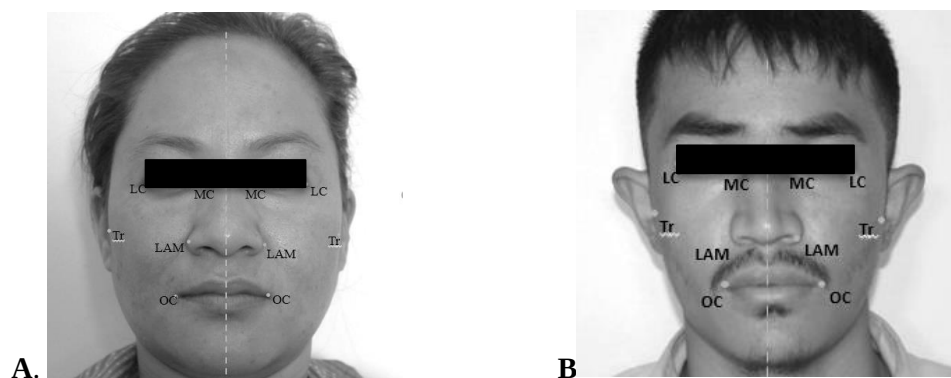


Figure 1. Representation of landmarks of the facial anthropometric measurements. LAM: Lateral Alar Margin, MC: Medial Canthus, LC: Lateral Canthus, OC: Oral Commissure, Tr: Tragus; a: in patients without external nasal deformity, b: in patients with external nasal deformity

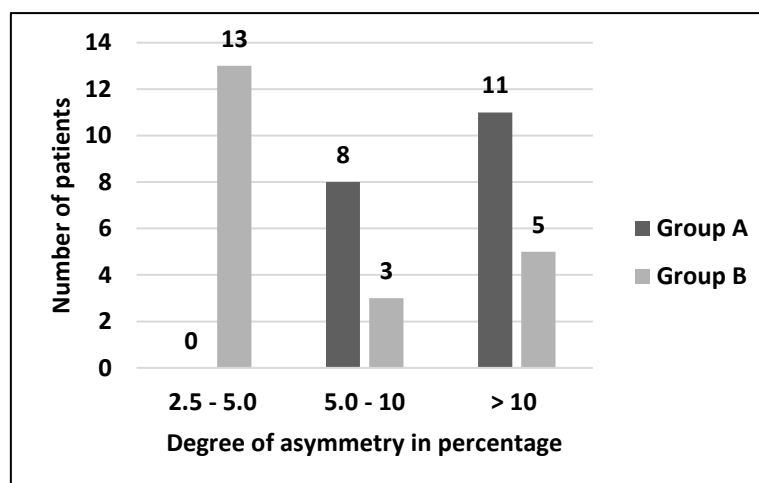


Figure 2. Degree of asymmetry between two groups

Table 1. Comparison of mean of all ratios between two groups

Ratio	Group	Mean± SD (Standard Deviation)	Student's t-test p value
M-MC	A	1.12 ± 0.12	0.27
	B	1.08 ± 0.10	
M-LC	A	1.05 ± 0.04	0.78
	B	1.04 ± 0.05	
M-LAM	A	1.11 ± 0.09	0.04*
	B	1.05 ± 0.06	
M-OC	A	1.09 ± 0.10	0.56
	B	1.08 ± 0.09	
M-Tr	A	1.04 ± 0.89	0.89
	B	1.03 ± 0.39	

Table 2. Comparison of mean of all the ratios between two genders in two groups.

Ratio	Group	Male		Female	
		Mean ± SD	Student's t-test p value	Mean ± SD	Student's t-test p value
M-MC	A	1.13 ± 0.01	0.33	1.11 ± 0.14	0.47
	B	1.09 ± 0.08		1.08 ± 0.11	
M-LC	A	1.05 ± 0.06	0.10	1.03 ± 0.01	0.06
	B	1.02 ± 0.02		1.05 ± 0.05	
M-LAM	A	1.13 ± 0.10	0.19	1.10 ± 0.08	0.36
	B	1.04 ± 0.07		1.05 ± 0.05	
M-OC	A	1.11 ± 0.12	0.21	1.06 ± 0.05	0.33
	B	1.06 ± 0.05		1.09 ± 0.10	
M-Tr	A	1.05 ± 0.04	0.90	1.03 ± 0.01	0.09
	B	1.04 ± 0.04		1.03 ± 0.03	

Discussion

Rhinoplasty has become one of the commonly performed yet demanding surgeries in facial plastics. Although the nose contributes hugely to facial aesthetics, symmetry of the face as a whole is important for the attractiveness of the

face. Addressing only the deviated nose and disregarding facial asymmetry may result in the unexpected outcome post rhinoplasty.

It is important to investigate the relationship between deviated nose and facial asymmetry to help establish a basis for rhinoplasty.

Interestingly, asymmetry of the face may be present even in patients without obvious external nasal deformity. However, it is still yet to be determined how common it is. Hence, this study was conducted to assess the nature of facial asymmetry and its frequency in patients with and without external nasal deformity.

The age group of patients seeking rhinoplasty for external nasal deformity in our study ranged between 20 and 49 years, with the mean age being 30.88 ± 9.1 years. Similarly, in the study by Abbas et al. (5) the age of patients seeking rhinoplasty surgery ranged between 18 to 46 years, which was similar to our study. The study by Okur et al. (6) showed a slightly lower mean age of patients, which was 25.6 years. It is important to note that younger patients are more concerned about their aesthetic beauty and are also easily influenced by the favorable outcomes seen in others. The study by Adamson et al. (7) lists younger age as one of the high risk factors for dissatisfaction following the outcome of rhinoplasty surgery. In our study, there were 22 males and 28 females, out of which 60% males and 40% females sought rhinoplasty for external nasal deformity. The study by Yi et al. (2) also showed male predominance in seeking rhinoplasty surgery with 70% male and only 30 % females. In a patriarchal society like ours, females are backward in seeking medical attention, more so for cosmetic procedures in comparison to males. The other reason for this discrepancy could be, males being more prone to sustain injuries like motor vehicle accidents and trauma is one of the causes of external nasal deformity. According to Nepal Living Standards Survey 2010/118, the literacy rate among females in Nepal is 44.5 % compared to 71.6% among males. This significant difference in literacy rates between the two genders could be one of the key factors attributing to fewer females seeking medical care, particularly

correction of facial asymmetry in comparison to males.

In the pre-operative assessment of facial asymmetry, certain measurements can be used to predict the existence of asymmetry. The landmarks for anthropometric measurements in this study were adapted from Carvalho et al. (4). Measurements to several soft tissue landmarks namely medial canthus, lateral canthus, oral commissure, lateral alar margin and tragus were taken from an imaginary vertical line drawn from the midpoint of the hairline to the midpoint of the nasal bridge, the central point of cupid's bow and the lowest point of the chin. In addition, the degree of asymmetry was noted relative to the ratio of midline to lateral alar margin as per Chatrath et al. (9) The ratio of midline to lateral alar margin was taken as the basis for assessing asymmetry as it was found to be an independent predictor of perception of facial asymmetry. Comparing between these two groups, there was a statistically significant difference in the means of the ratios of only one parameter i.e. ratio of midline to lateral alar margin. This indicated that asymmetry in midline to lateral alar margin was prominent in patients with external nasal deformity and was a reliable parameter to confirm facial asymmetry. Similar finding was noted by Chatrath et al. (9) in their study conducted in the United Kingdom. The study evaluated pre-operative photographs of 234 patients (including Asian, White, Middle Eastern, Latino and Afro Caribbean) requesting rhinoplasty. Unlike our study, they did not include patients without external nasal deformity. In contrast to our study, the study conducted by Carvalho et al. (4) in Brazil, which compared the pre-operative photographs of patients undergoing rhinoplasty with the photographs of volunteers, found that patients had a degree of asymmetry in relation to the measurement taken from the midline to the tragus.

Farkas et al. (10) emphasized that the prominent asymmetry was present in the middle third of the face. The finding of our study tallies with their study as asymmetry was noted on midline to lateral alar margin, which lies in the middle third of the face. However, in our study, measurements pertaining to upper third of the face were not included for analysis. Another study by Shaner et al. (11) conducted in Canada found asymmetry of the lower face. The differences in finding between studies of similar nature might be attributed to the fact that the studies were conducted in patients of varied races. Ethnic and racial influences can result in different appearances of the nose in terms of shape and size (12, 13).

In this study, the male to female ratio was 1:1.09 and none of the parameters were statistically different based on gender irrespective of whether patients had external nasal deformity or not. This finding resonated with the findings of Abbas et al. (14) with male to female ratio of 3:5, which showed no statistically significant difference concerning the ratios between genders.

In this study out of 25 patients in group A, none of the patients had degree of asymmetry of 2.5-5% whereas eight and 11 patients had degree of asymmetry of 5-10% and more than 10% respectively. Similarly, in group B, 13, three and five patients had degree of asymmetry of 2.5-5%, 5-10% and more than 10% respectively. The degree of asymmetry was more in patients with external nasal deformity than in patients without external nasal deformity. However, asymmetry of variable degree was observed even in patients without external nasal deformity of variable degree. The study by Carvalho et al. (4) showed that 79% and 71% of patients had degree of asymmetry of more than 2.5, 67% and 54% of patients had degree of asymmetry of more than 5 and 25% and 19% had degree of asymmetry of more than 10 amongst patients and volunteers

respectively. Surprisingly, patients without complaints of external nasal deformity also had an asymmetrical face. Hence, during the pre-operative evaluation of rhinoplasty patients, they should be counselled that a certain degree of asymmetry though unnoticeable will always persist on their faces. There is high incidence of asymmetry in the general population, even without aesthetic complaints (4). This is because patients are unaware of inherent facial asymmetries other than deviated nose, and recognition of pre-existing facial asymmetry is missed. So, evaluation of the asymmetry of the face as a whole helps the surgeon to plan surgery and increase post-operative satisfaction (15).

The study was done in small sample size which may not be representative of the general population. Only anthropometric measurements were taken into consideration while conducting the studies which have the limitations of the study.

Conclusion

Anthropometric measurements of facial asymmetry between patients seeking rhinoplasty for external nasal deformity and patients without external nasal deformity revealed a statistically significant difference of facial asymmetry with relation to the ratio of midline to lateral alar margin. However, other measures of facial asymmetry were more in patients with external nasal deformity than in patients without external nasal deformity. Asymmetry of variable degree was also observed even in patients without external nasal deformity of variable degree.

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Patients' perspective:

Patients were interested in the idea of evaluation of their face for presence of facial asymmetry.

Conflicts of Interest

The authors declare no conflicts of interest.

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Ethics

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Authors ORCIDs

Smriti Baidya

<https://orcid.org/0000-0002-0404-9835>

Narmaya Thapa

<https://orcid.org/0000-0002-2634-8430>

Urmila Gurung

<https://orcid.org/0000-0001-7640-0199>

References

1. Rohrich RJ, Villanueva NL, Small KH, Pezeshk RA. Implications of Facial Asymmetry in Rhinoplasty. *Plast Reconstr Surg*. 2017;140(3):510-6.
2. Yi JS, Jang YJ. Frequency and Characteristics of Facial Asymmetry in Patients With Deviated Noses. *JAMA Facial Plast Surg*. 2015;17(4):265-9.
3. Hafezi F, Naghibzadeh B, Nouhi A, Yavari P. Asymmetric facial growth and deviated nose: a new concept. *Ann Plast Surg*. 2010;64(1):47-51.
4. 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):445-51.
5. Abbas OL, Kurkcuoglu A, Aytop CD, Uysal C, Pelin C. Perception of Symmetry in Aesthetic Rhinoplasty Patients: Anthropometric, Demographic, and Psychological Analysis. *Perception*. 2017;46(10):1151-70.
6. Okur E, Yildirim I, Aydogan B, Akif Kilic M. Outcome of surgery for crooked nose: an objective method of evaluation. *Aesthetic Plast Surg*. 2004;28(4):203-7.
7. Adamson PA, Chen T. The dangerous dozen--avoiding potential problem patients in cosmetic surgery. *Facial plastic surgery clinics of North America*. 2008;16(2):195-202, vii.
8. Nepal Living Standard Survey 2010/11.
9. Chatrath P, De Cordova J, Nouraei SA, Ahmed J, Saleh HA. Objective assessment of facial asymmetry in rhinoplasty patients. *Arch Facial Plast Surg*. 2007;9(3):184-7.
10. Farkas L, Deutsch C. Anthropometric determination of craniofacial morphology. *American journal of medical genetics*. 1996;65:1-4.
11. Shaner DJ, Peterson AE, Beattie OB, Bamforth JS. Assessment of soft tissue facial asymmetry in medically normal and syndrome-affected individuals by analysis of landmarks and measurements. *Am J Med Genet*. 2000;93(2):143-54.
12. Heidari Z, Mahmoudzadeh-Sagheb H, Khammar T, Khammar M. Anthropometric measurements of the external nose in 18-25-year-old Sistani and Baluch aborigine women in the southeast of Iran. *Folia morphologica*. 2009;68(2):88-92.
13. Koirala S, Shah S, Khanal L. Nasal index of the Tharu and Mongoloid population of Nepal: A cross sectional study. *Russian Open Medical Journal*. 2014;3:0302.
14. Abbas O, Kürkçüoğlu A, Baykan R. Comparison of objective and subjective assessments for perception of facial symmetry. *International Journal of Experimental and Clinical Anatomy*. 2016;10:94-8.
15. Sozen T, Dizdar D, Goksel A. Awareness of Facial Asymmetry and Its Impact on Postoperative Satisfaction of Rhinoplasty Patient. *Aesthetic Plast Surg*. 2021;45(1):214-20.