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Photogrammetric Facial Analysis of Rhinoplasty Applicants in Shiraz

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Abstract

Background: Nose shape plays an important role in individuals' facial appearance and its morphology depends on ethnicity, gender, and environmental conditions. Identifying nasal problems and measuring landmarks can lead to making a perfect surgery plan through preoperative image analysis.

Aim: In this study, our goal was to record the facial profile of rhinoplasty applicants in Shiraz.

Methods: In this study, a photogrammetric analysis was performed on 120 female rhinoplasty applicants, aged 18-30 in Shiraz, Iran. Recorded parameters are nasal height and width, nasolabial and nasofrontal angle. Nasal indices were calculated according to heights and widths of noses. Also, facial asymmetry and nose hump checked for every patient.

Results: Measurements showed that the average nasal index was 67.15±4.72. Thus, the nose of rhinoplasty applicants was the leptorrhine type. Furthermore, the average nasofrontal and nasolabial angles were 145.22±9.93°and 94.47°±14.25. Among all applicants, 35 percent have an asymmetric nose and 31 percent have a nose hump.

Conclusion: An accurate facial analysis of rhinoplasty applicants was performed in this study, and the resultant facial profiles can be used in nose surgery planning and in further ethnic research. .

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Introduction

The nose is an important part of individuals' appearance, thus concerns about its form causes demands for rhinoplasty surgery especially among women. Formerly, rhinoplasty concentrates on refining certain parts of the nose like enhancement of dorsum or nasal tip. However, it is now considered more important for results to be more harmonious and balanced with other facial parts (1). Several parameters can control the shape of the nose such as tribes, race, and environmental climate (2).

To make a surgical plan that achieves harmonious results, it is necessary to have a detailed facial analysis of patients' proportional and angular before surgery. Thus, many researchers have suggested utilizing soft tissue analysis before surgery by photogrammetry analysis. Photogrammetry is the field of science that record information about objects' shape. This method is used frequently in different fields of medicine such as treatment planning, diagnosis, and recording data (3-6).

Many studies have reported differences of

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nose and nasal indices all over the world (6-8). Nasal index (nasal height/width %) is the most common and most important parameter used in anthropomrtric classification. There are three types of nose based on nasal index ratio: leptorrhine or fine nose (nasal index of 69.90 or less), mesorrhine or medium nose (nasal index between 70 and 84.90), and platyrrhine or broad nose (Nasal index of 85 and above) (8, 9).

This classification helps surgeon to identify various ethnicities and races among the specific population that want to work, and each type of this classification guide the surgeon to a different treatment strategy. For example leptorrhine noses need little manipulatins, and patient would be satisfied with the result of the surgery most of the times. But in platyrrhine nose, more you do, get you less and the patients are almost always unsatisfied. Therefore this classification help surgeon to first, select the patient who is suitable for surgery, second, design better surgey planning before performing rhinoplasty.

In this study, our goal was to record the facial profile of rhinoplasty applicants in Shiraz. This will provide valuable data that is essential in plastic surgery for the repair of nasal trauma and cosmetic studies.

Methods

This study was conducted on 120 (all females) rhinoplasty surgery applicants in Shiraz (all were from Fars province). Their ages were between 18–30 years and none of them had any facial surgery before.

For capturing pictures of them, each person sat on a chair in a relaxed position and had photographed in frontal and lateral view. All photographs were analyzed by one of the authors with new software developed for this purpose in MATLAB. Specific landmarks on pictures are selected by the user and then distances, indices, and angles calculate automatically.

The nasal index is expressed as a percentage of the width in relation to the height. According to figure 1, the width is the maximum distance between the 2 alae or nasal wings in the nose and height is the distance between nasion (where the internasal suture reaches to the frontal bone) to subnasal (where the nasal septum reaches the upper lip) (7).

Based on nasal index the nose has been classified into three groups: leptorrhine (nasal Index of 69.90 or less), mesorrhine (nasal index between 70 and 84.90), and platyrrhine (nasal index of 85 and above) (8, 9). In addition, the nasofrontal and nasolabial are two essential angles in the lateral view of patients. According to Figure 1, the nasofrontal angle is the angle of the nasal tip, radix, and most prominent point of the forehead and the nasolabial angle is the angle between the line from the anterior columella to the subnasale and the line from the subnasale to the labiale

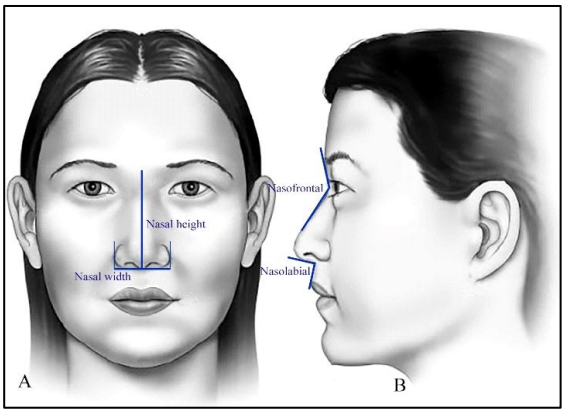

Figure 1. Main parameters in face

System calibration

In order to calibrate the developed software, at first we took a picture of three people and all demand parameters measured with calipers and protractor by plastic surgeons, and these measurements were compared with their corresponds in the developed software. Table 1 shows both results as it realized they are so close to each other.

Results

Facial analysis of 120 rhinoplasty applicants

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was recorded; all parameters were measured automatically after selecting corresponding points on images. According to Table 2, the average nasal heights and nasal widths were 6.1 cm and 4.1 cm respectively.

The average of nasal indices in this group of people was 67.1 (leptorrhine). Table 3 shows the results according to their nasal index classes. According to Table 3, none of our participants was in the platyrrhine class. Table 4 shows the asymmetry and hump disorders among participant.

Table 1. System calibration

Cases	Nasolabial angle	Nasofrontal angle	Nasal index	Nasal width (cm)	Nasal length (cm)	Measurement
Case 1	146.3	111.4	54.19	3.23	5.96	Software
	146.0	110.0	54.24	3.2	5.9	Specialist
Case 2	132.7	74.9	59.81	3.87	6.47	Software
	132.0	74.0	60.00	3.9	6.5	Specialist
Case 3	158.5	70.5	56.21	3.62	6.44	Software
	157.0	71.0	56.25	3.6	6.4	Specialist

Table 2. Nasal parameters

Nasal parameters	All participants (Mean±STDV)
Nasal height	6.18± 0.36 cm
Nasal width	4.14± 0.31 cm
Nasal index	67.15± 4.72
Nasofrontal angle	145.22°± 9.93°
Nasolabial angle	94.47°± 14.25°

Table 3. Frequency of nose shape

Variables	Frequency (total=120)	Nasolabial angle	Nasofrontal angle	Nasal index (Mean±STDV)	Width (Mean±STDV)	Height (Mean±STDV)
Leptorrhine	91 (75.8 %)	95.06± 14.32°	144.93± 10.04	65.60 ± 4.29	4.05 ± 0.27 cm	6.19 ± 0.37 cm
Mesorrhine	29 (24.2 %)	92.62± 14.11	146.14± 9.70	72.02±3.76	4.43± 0.27 cm	6.15± 0.36 cm
Platyrrhine	0	0	0	0	0	0

Table 4. Frequency of nasal asymmetry and nose hump

Disorder	Without any disorder	Both asymmetry and hump	Only hump	Only asymmetry
Percent (number)	14.2% (17)	19.1% (23)	31.6% (38)	35.0% (42)

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Discussion

Facial analysis is essential for plastic surgeons to achieve pleasant results to the harmonious face. Quantitative comparisons of patients before and after surgery help surgeons in further planning and assessment of reconstructive and plastic surgery. Nose shape is different among people and there are several factors such as race, tribe, and weather conditions that have impacts. For instance, narrower noses are frequent in cold and dry weather, while wider noses are frequent in warm and wet weather (10).

Iranian population has a large diversity in the terms of culture, ethic and genetic background, which has led to a blended racial difference. Despite this, there is clear demarcation between north and south populations of Iran in facial anthropometric parameterrs.

Although, several studies have been done among Iranian population about nasal parameters but there is still little data comparing different regions of Iran.

Our study provides a sample of Fars province nasal anthropometric data, to facilate further extensive evaluation of nasal parameters analysis among different Iranian population regions.

In this study, we recorded nasal parameters of 120 rhinoplasty applicants in Shiraz (Fars province).

Tables 1 and 2 shows the results and indicate that 75.8% of women in Shiraz that participate in this study were leptorrhine type (fine nose) and 24.2% were mesorrhine type (medium nose), while none of them was platyrrhine (broad nose). Furthermore, identification of asymmetries is vital in the preoperative evaluation of the patient to guide surgery planning; according to table 3 around 85 percent of applicants had nasal asymmetry and hump, which is in agreement with a previous study by Rohrich et al (11).

There are several studies that compare different genders and ethnicities, for instance, Hassanzadeh et al. (12), compare 200 groups of men and women (students), aged between 18 and 25 in Tehran province. The nasal indices' average in the women's group was 66.05±7.53, similar to our study, the average of nasal indices was 67.15±4.72. Although these are so close, this may be caused by different locations and different aim groups.

Davoudmanesh et al. (13) record facial analysis of young Iranian people in Tehran province aged between 18 and 25, among 100 women the average of nasofrontal angles and nasolabial angles were 156.16°±10.99 and 78.32°±14.14 respectively. Due to table 2, there is a difference between recorded angles and this study, which possibly related to ethnicity and this notes that our participants were rhinoplasty surgery applicants. However, in another study in Kerman province where is near to Fars, nasolabial angles' average was 98±10, which is so close to our study records (14).

In research by Hormozi et al. (15) they recorded facial parameters of rhinoplasty applicants in Tehran province, the average nasal length and nasal width were 5.750±0.5658 cm and 3.12±0.30 cm respectively, while in our study these parameters were 6.18±0.36 cm and 4.14±0.31 cm.

Therefore, there are several reasons for nasal parameters of different groups and races. The similarities in the nasal parameters can be connected to Farkas's theories that the nasal index could be related to gender, region, and climatic differences (16).

Conclusion

At the end of this study, we showed that about 75% of nasal type in female's rhinoplasty applicants in Fars province is leptorrhine. The outcomes of this study are useful in anthropological studies, forensic science, and surgery, which can be used for future treatment planning and post rhinoplasty simulation.

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Ethics
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References
1. C. W. Park, M. J. Lee, and Y. I. Jung, "Photogrammetric Facial Analysis of Attractive Celebrities Using the Glabella for Planning Rhinoplasty and Analyzing Surgical Outcomes," Arch. Aesthetic Plast. Surg., vol. 24, no. 3, pp. 105–10, Oct. 2018, doi: 10.14730/aaps.2018.24.3.105.

2. R. L. Hall, "Energetics of nose and mouth breathing, body size, body composition, and nose volume in young adult males and females," Am. J. Hum. Biol., vol. 17, no. 3, pp. 321–30, May 2005, doi: 10.1002/ajhb.20122.

3. S. S. Park, "Fundamental principles in aesthetic rhinoplasty," Clinical and Experimental Otorhinolaryngology, vol. 4, no. 2. Korean Society of Otorhinolaryngology - Head and Neck Surgery, pp. 55–66, Jun. 2011, doi: 10.3342/ceo.2011.4.2.55.

4. S. A. Milošević, M. L. Varga, and M. Šlaj, "Analysis of the soft tissue facial profile of croatians using of linear measurements," J. Craniofac. Surg., vol. 19, no. 1, pp. 251–8, Jan. 2008, doi: 10.1097/scs.0b013e31815c9446.

5. P. Nechala, J. Mahoney, and L. G. Farkas, "Digital Two-Dimensional Photogrammetry: A Comparison of Three Techniques of Obtaining Digital Photographs," Plast. Reconstr. Surg., vol. 103, no. 7, pp. 1819–25, Jun. 1999, doi: 10.1097/00006534-199906000-00002.

6. S. C. Rhee, S. R. Kang, and H. S. Park, "Balanced angular profile analysis," Plast. Reconstr. Surg., vol. 114, no. 2, pp. 535–44, Aug. 2004, doi: 10.1097/01.PRS.0000131873.98390.36.

7. T. Romo and M. T. Abraham, "The ethnic nose," Facial Plastic Surgery, vol. 19, no. 3. Facial Plast Surg, pp. 269–77, Aug. 2003, doi: 10.1055/s-2003-43162.

8. J. P. Porter and K. L. Olson, "Analysis of the African American female nose," Plast. Reconstr. Surg., vol. 111, no. 2, pp. 620–6, Feb. 2003, doi: 10.1097/01.PRS.0000042176.18118.99.

9. S. C. Aung, F. C. Liam, and L. S. Teik, "Three dimensional laser scan assessment of the Oriental nose with a new classification of Oriental nasal types," Br. J. Plast. Surg., vol. 53, no. 2, pp. 109–16, 2000, doi: 10.1054/bjps.1999.3229.

10. R. L. HALL and D. A. HALL, "Geographic Variation of Native People along the Pacific Coast," Human Biology, vol. 67. Wayne State University Press, pp. 407–26, doi: 10.2307/41465394.

11. R. J. Rohrich, N. L. Villanueva, K. H. Small, and R. A. Pezeshk, "Implications of Facial Asymmetry in Rhinoplasty," Plast. Reconstr. Surg., vol. 140, no. 3, pp. 510–6, Sep. 2017, doi: 10.1097/PRS.0000000000003606.

12. Tahmasebi F, Khanehzad M, Madadi S, and Hassanzadeh G., "Anthropometric Study of Nasal Parameters in Iranian University Students - Anatomical Sciences Journal," ASJ, pp. 167–70, 2015, Accessed: Aug. 05, 2020. (Online). Available: http://anatomyjournal.ir/browse.php?a_code=A-10-108-3&slc_lang=en&sid=1.

13. M. Bayat, M. Shariati, F. Rajaeirad, M. S. Yekaninejad, F. Momen-heravi, and Z. Davoudmanesh, "Facial Anthropometric Norms of the Young Iranian Population," J. Maxillofac. Oral Surg., vol. 17, no. 2, pp. 150–7, Jun. 2018, doi: 10.1007/s12663-016-0897-3.

14. J. Fariaby, A. Hossini, and E. Saffari, "Photographic analysis of faces of 20-year-old students in Iran," Br. J. Oral Maxillofac. Surg., vol. 44, no. 5, pp. 393–96, Oct. 2006, doi: 10.1016/j.bjoms.2005.07.029.

15. A. K. Hormozi and A. B. Toosi, "Rhinometry: An important clinical index for evaluation of the nose before and after rhinoplasty," Aesthetic Plast. Surg., vol. 32, no. 2, pp. 286–93, Mar. 2008, doi: 10.1007/s00266-007-9057-y.

16. L. G. Farkas, J. C. Kolar, and I. R. Munro, "Geography of the nose: A morphometric study," Aesthetic Plast. Surg., vol. 10, no. 1, pp. 191–223, Dec. 1986, doi: 10.1007/BF01575292.