

Lateral View Anthropology of the Saudi Arabian Nose; Computed Tomography Measurement



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Abstract

Background: The nose critically determines the external appearance of an individual. However, the "ideal" nasal measurements presented in literature can result in unwanted features after rhinoplasty. This creates the need to establish and measure the anthropometric features of the Saudi population in lateral profile view using computed tomography scan since a review of the literature does not produce evidence.

Objectives: Establish measurements and quantitative data of Saudi Arabian noses in lateral profile view using computed tomography scan that may help facial plastic surgeons in preoperative assessment of the Saudi patient.

Design and Setting: Cross-sectional analytic study done in a tertiary care hospital.

Patients and Methods: One hundred and thirty-eight patients (76 male and 62 female) who were scheduled for paranasal sinus CT scan were included in the study. The inclusion criteria were Saudi nationality, older than 18 years, and no history of facial trauma, nasal surgery or sinus occupying lesion.

Main Outcome Measures: Six lateral profile anthropometric parameters were assessed and measured: nasal length, nasal tip projection, dorsal height, radix height, nasofrontal angle and nasolabial angle.

Results: In male patients, the mean distance for nasal length was 47.55mm, mean nasal tip projection was 27.1mm, mean dorsal height was 23.27mm, mean radix height was 12.53mm, the mean nasofrontal angle was 133.82 degrees, and the mean nasolabial angle was 108.48 degrees. In female patients, the mean nasal length was 44.38mm, the mean nasal tip projection was 24.2mm, the mean dorsal height was 19.64mm, the mean radix height was 11.31mm, the mean nasofrontal angle was 138.22 degrees, and the mean nasolabial angle was 100.93 degrees.

Conclusion: The use of computed tomography scan in analyzing nasal anthropology seems to be accurate and simple, particularly in addressing the slope and angles. Additionally, the parameters measured in lateral profile differ between ethnic groups.

Limitation: Saudi nationality holders are not necessarily native Saudi population. Furthermore, the sample size was too small to represent cross-sectional analysis of the native Saudi population. However, these findings are meant to be initial and primary for further studies with larger sample sizes.

Keywords: Anthropology; Rhinoplasty; Lateral view of nose; Saudi arabian nose

Introduction

Rhinoplasty procedures have increased in popularity recently [1]. Furthermore, the outcome of rhinoplasty procedure depends on the surgical skills as well as analysis of nasal anatomy before surgical intervention [2]. The anatomical framework of the nose is considered a key structure in forming the whole nasal shape [1]. The nose critically determines the external appearance of an individual, [3] particularly the dorsum of the nose, which is considered the cornerstone measure for the evaluation and aesthetic management of the nose [4]. The surgeon should individualize the analysis of their patient to get a harmonic shape for the candidate with the help of anthropology measurement for the intended population [3]. Nevertheless,

a major drawback of using conventional anthropometric measurements is the requirement of a life-size photograph or real measurement of the nose which, in the setting of routine clinical practice, is inconvenient [5].

To overcome this limitation, computed tomography scan for nasal bone can be used to study the nose from different angles [3]. Thus, the need to establish and create an objective and quantitative data that may help the surgeon to plan the cosmetic procedures for the nose, and in the era of advancement in radiology technology, it is beneficial to use CT scan to study nasal properties [3].

Analysis of the Saudi Arabian nose and its properties in lateral profile has not been done radiologically ,after reviewing the literature [5] Hence, establishing the aesthetic standards of profile view for the Saudi population is essential for a better real-life practice and satisfactory outcome [5]. Therefore, CT-PNS scan was used to measure and analyze different nasal angles and properties of the nose in a profile view (sagittal view) of the Saudi population.

Patients and Methods

The study was performed as cross-sectional analysis from February 2015 to December 2015 at a tertiary care center (King Abdulaziz University hospital) in Riyadh, Saudi Arabia. A Saudi nationality patient who underwent CT paranasal sinus (CTPNS) for sinus disease, which is not intended primarily for this study, and has a negative history of sinus-occupying lesion, facial trauma or nasal surgery and older than 18 years was included the analysis.

The nasal properties were collected from CT-PNS at a sagittal view. Nasofrontal angle was measured between the glabella and naso frontal suture line (nasion). Nasolabial angle was measured between the soft tissue of the upper lip and columellar cartilage. Nasal length was measured from the nasofrontal suture line (nasion) to nasal tip at midline. Radix height was measured from the nasofrontal suture line (nasion) to medial canthus (anterior lacrimal crest).Dorsal height was measured from a keystone area (rhinion) to the point of intersection with a line from the medial canthus (anterior lacrimal crest) [6] that makes the 2 lines perpendicular to each other. Nasal tip projection was measured from subnasal (anterior nasal spine) [7] to nasal tip. A 3-dimensional CT scan was used to obtain 1mm * 1mm slice thickness by using the spiral mode. The machine used was Brilliance iCT machine (Royal Philips Electronics of the Netherlands, Amsterdam). The software built into the machine was used to calculate the measurement.

Result

The study group consists of 138 patients (76 male and 62 female) 55.07% and 44.9%, respectively, whomet our criteria mentioned earlier. The distribution of ages was as follows: 7 patients aged 18-20 years, 42 patients aged 21-29 years, 40 patients aged 30-39 years, 28 patients aged 40-49 years, 21 patients above 50 years.

The Nasal Length

The mean nasal length in male patients was 47.55 (38.0-60.8)mm (SD 4.45), whereas the mean nasal length in female patients was 44.38 (36.0-53.7)mm (SD 3.92), the total mean was 46.13mm for both male and female Saudi patients. The median nasal length for male and female patients was 47.3mm and 44.5 mm, respectively (Table 1).

Table 1: Summary of nasal length radiologically.

Age interval	Male			Female			Total
	n	mean	range	n	mean	range	
<20 years	5	43.62	38.0 - 50.3	2	46.8	44.4 - 49.2	7
20-29 years	26	48.53	38.4 - 57.3	16	44.46	38.7 - 49.7	42
30-39 years	21	47.83	38.3 - 60.8	19	44.68	36.1 - 53.7	40
40-49 years	11	46.59	42.3 - 51.7	17	44.26	36.0 - 50.5	28
+50 years	13	47.47	41.0 - 53.0	8	43.19	39.1 - 52.3	21
Total	76	47.55	38.0 - 60.8	62	44.38	36.0 - 53.7	138

The Nasal Tip Projection

In male patients, the mean nasal tip projection was 27.1 (18.5-34.3)mm (SD 3.62) and the median was 27.250mm. In female patients, the mean nasal tip projection was 24.2 (17.1-28.9)mm (SD 2.82) and the median was 24.15mm. The total mean for both male and female was 25.78 (17.1-34.3)mm with a median of 26.1 mm (Table 2).

Table 2: Summary of nasal tip projection radiologically

Age interval	Male			Female			Total
	n	Mean	Range	n	Mean	Range	
<20 years	5	26.36	21.3 - 31.1	2	24.60	23.0 - 26.2	7
20-29 years	26	26.96	20.0 - 34.3	16	23.98	18.1 - 28.9	42
30-39 years	21	26.79	18.5 - 33.3	19	24.1	19.4 - 27.8	40
40-49 years	11	28.94	24.9 - 32.8	17	24.24	18.2 - 28.0	28
+50 years	13	26.51	22.0 - 32.4	8	24.85	17.1 - 28.5	21
Total	76	27.1	18.5 - 34.3	62	24.19	17.1 - 28.9	138

The Dorsal Height

Dorsal height mean for both male and female Saudi patients was 21.64mm. The mean dorsal height for males was 23.27 (15.4-29.8)mm (SD 3.28) with median 23.6mm, whereas the mean dorsal height in female candidates was 19.64 (12.8-24.9) mm (SD 2.95) with a median of 19.5mm (Table 3).

The radix height

The mean for total radix height for both male and female Saudi candidates was 11.98mm. In male patients, the mean

radix height was 12.53 (7.0-16.90)mm (SD 1.95) with a median of 12.5mm. However, the mean radix height in female patients was 11.31 (7.4-16.5)mm (SD 1.79) and median radix height was 11.35mm (Table 3).

Table 3: Summary of dorsum and radix height radiologically.

Age interval	Male		Female	
	Mean DH	Mean RH	Mean DH	Mean RH
<20 years	22.1	11.98	20.8	9.6
20-29 years	24.03	12.81	20.03	12.04
30-39 years	23.17	12.76	19.65	10.89
40-49 years	23.59	12.73	19.49	11.04
+50 years.	22.11	11.61	18.87	11.84
Total	23.27	12.53	19.64	11.31

DH: Dorsal Height

RH: Radix Height

The nasofrontal angle

In male patients, the mean nasofrontal angle was 133.82 degrees (107.1-157.8) degrees (SD10.21) with median nasofrontal angle 133.85 degrees. In female patients, the mean angle was 138.22 degrees (122.0-156.0) degrees (SD 7.31) and the median nasofrontal angle in female patients was 139.95 degrees. However, the mean nasofrontal angle for total male and female candidates was 135.8 degrees (Table 4).

Table 4: Comparison of nasofrontal and nasolabial angles between radiological study and photometric study in the Saudi population.

Lateral profile angles	Male		Female	
	Radiological analysis	Photometric analysis	Radiological analysis	Photometric analysis
	Mean (n=76)	Mean (n=104)	Mean (n=62)	Mean (n=105)
Nasofrontal angle	133.8	135.9	138.223	145.9
Nasolabial angle	108.5	100.4	100.934	102.3

The nasolabial angle

The mean nasolabial angle in male patients was 108.48 degrees (SD 16.9) and range from 83.7to 143.7 degrees. However, the mean nasolabial angle in female patients was 100.93 degrees (SD 17.67) and range of 60.0 to 126.2 degrees. The median nasolabial angle in male and female patients was 108.95 and 103.8 degrees, respectively. The mean nasolabial angle for total male and female candidates was 105.1 degrees (Table 4).

Discussion

The ethnic concept of rhinoplasty necessitates the need to understand the physical and social characteristics of each population to achieve good and socially accepted appearance for an individual [8]. Moreover, Saudi Arabia, the largest country in the Gulf region, lacks the use of CT scan technology in determining characteristic nasal properties. This study is carried out to evaluate the lateral view anthropology and establish an initial measurement for the Saudi population and assess nasal framework radiologically. The anthropometric information is crucial in the preoperative guidance for surgeons. However, the conventional methods of anthropometric measurements seem to be too complex and inconvenient for routine clinical practice [5]. Assessment of facial parameters is usually done quantitatively by using a centimeter ruler and life-sized photographic

enlargement or the face itself. However, the difficulties that may face the surgeon during assessment are incline of the ruler to one side or at an angle with a facial plane, and the photograph that has been enlarged [5].

The use of CT scan in the field of anthropology is well-known in the practice of craniofacial anomalies. Nevertheless, it has been used in the assessment of rhinoplasty patients due to its accuracy in the assessment of nasal framework with the development of 3D technology. Additionally, the radiological anthropometry, in contrast to biometric analysis, is more effective in measuring the slope or angle and carries more accuracy and simplicity [9]. Rhinoplasty in the Middle Eastern nose carries goals and techniques that may be different from other cultures [4]. However, people from outside the Arabian Peninsula and Gulf regions desire a greater change with rhinoplasty in terms of dorsal reduction and tip projection [10]. Thus, the satisfaction of the rhinoplasty patient cannot be guaranteed by following the «ideal» nasal measurements found in the literature. This clinical series of CT-PNS data is used to fill the deficiency in radiological characters of Saudi noses, specifically the lateral profile.

In this study, the mean nasofrontal angle in male candidates was 133.82 degrees, whereas the mean nasofrontal angle in female candidates was 138.22 degrees. A study done by Al-Harathi et al. studied the anthropology of the Saudi population using CT

scan; their mean nasofrontal angle for male patients was 125.3 degrees and 135.6 degrees for female. Another anthropological study of the Saudi population was done by Al-Qattan et al. with photometric analysis; the mean nasofrontal angle in male patients was 135.9 degrees, and the mean female nasofrontal angle was 145.9 degrees. However, a similar outcome was found in a Korean study done by Moon et al. Their mean nasofrontal angle in males was 131.14 degrees and the angle in female candidates was 140.70 degrees. Photographically, a study done by Wang et al. showed the mean nasofrontal angle in male Korean candidates was 126.0 degrees and mean nasofrontal angle in female Korean candidates was 133.6 degrees. Clearly, the Saudi nose carries a large nasofrontal angle compared to the Korean nose. These differences in nasofrontal angle measurements may greatly alter the outcome of rhinoplasty if the surgeon plans to address the nasofrontal angle in a specific population.

Radiologically, the nasolabial angle in this study for males showed a mean of 108.48 degrees and in females 100.93 degrees. In a study done using nasal photometric analysis by Al-Qattan et al., their mean nasolabial angle for male patients was 100.4 degrees, and mean nasolabial angle for female patients was 102.3 degrees. However, Wang et al. reported the mean nasolabial angle in male patients was 78.5 degrees and in female patients was 82.7 degrees. Obviously, the Saudi population showed more obtuse nasolabial angle as compared to the Korean population, which showed a more acute angle. Thus, each population may have a unique nasal characteristic which should be studied well and establish a database as reference measurements that help in achieving a harmonic and pleasing facial appearance for such an individual.

Regarding the nasal tip projection, this radiological study showed a mean nasal tip projection in male and female candidate 27.1mm and 24.2mm, respectively. However, Al-Qattan et al. studied the nasal tip projection in the Saudi population using photometric analysis; their result for mean nasal tip projection was 20.7mm for male, and 22.1mm for female. Al-Harthiet al. showed their result for mean nasal length in male and female subjects to be 56.3mm (51.3-64.0) and 51.6mm (45.0-55.0), respectively. However, this clinical series had mean nasal length in males as 47.55mm (38.0-60.8) and the mean nasal length in females as 44.38mm (36.0-53.7).

The study represents Saudi nationality holders; however, they are not necessarily native Saudis. Additionally, the sample

size was too small to represent across-sectional analysis of the native Saudi population. However, factors like reference point of measurement, age of the candidates, skin/soft tissue thickness of nose and/or sample size could contribute to the existing difference. Finally, the presence of radiological personnel experienced in nasal anatomy could improve the accuracy for comparison in future.

Conclusion

Unique nasal anthropometric features of the Saudi population in lateral profile were observed in the study compared to the Korean population. Furthermore, male Saudis tend to have a relatively small nasofrontal angle but larger nasolabial angle compared to females who have short dorsal and radix height radiologically. However, these findings are best seen as initial and primary, and more studies with larger sample sizes are required.

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