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Ana Filipa Costa Lima

Alterações antropométricas da morfologia nasal

em doentes propostos para rinosseptoplastia

Nasal anthropometric differences in patients

proposed for rhinoseptoplasty

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Mestrado Integrado em Medicina

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Trabalho efetuado sob a Orientação de:

Doutor Tiago Manuel Gonçalves Órfão

E sob a Coorientação de:

Professor Doutor Jorge Eduardo Freitas Spratley

Trabalho organizado de acordo com as normas da revista:

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Otorrinolaringologia

TÍTULO DISSERTAÇÃO/MONOGRAFIA (riscar o que não interessa)

Alterações antropométricas da morfologia nasal em doentes propostos para rinosseptoplastia

Nasal anthropometric differences in patients proposed for rhinoseptoplasty

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DE ACORDO COM A LEGISLAÇÃO EM VIGOR, (INDICAR, CASO TAL SEJA NECESSÁRIO, Nº MÁXIMO DE PÁGINAS, ILUSTRAÇÕES, GRÁFICOS, ETC.) NÃO É PERMITIDA A REPRODUÇÃO DE QUALQUER PARTE DESTE TRABALHO.	☒

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Aos meus pais,

aos meus amigos

e ao meu orientador.

Nasal anthropometric differences in patients proposed for rhinoseptoplasty / Alterações antropométricas da morfologia nasal em doentes propostos para rinosseptoplastia

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Keypoints

Question: What are the differences in anthropometric measurements between patients proposed for rhinoseptoplasty and the aesthetic model?

Findings: This retrospective study, involving 119 patients proposed for rhinoseptoplasty (64 females and 55 males), reveals differences between candidates for rhinoseptoplasty and the ideal patterns, in all anthropometric parameters measured (alar-intercanthal distance ratio, width-length ratio, nasofrontal angle, nasolabial angle, nasomental angle and projection of the nasal tip), as well as differences between genders.

Meaning: Candidates for rhinoseptoplasty have a different nose morphology, comparing to the aesthetic patterns. These results are essential for surgeons in preoperative planning, comparative assessment and enhancement of surgical skills.

Abstract

Background: Facial aesthetics surgery is an expanding area and rhinoplasty is one of the most common interventions in this field. Through anthropometry, it is possible to quantify the anthropometric parameters of the nose, being essential the recognition of deviations from the aesthetic standards.

Objective: Measure anthropometric parameters of the nasal pyramid and face in patients proposed for rhinoseptoplasty, associate them with the aesthetic ideal and compare results between genders.

Methods: This retrospective study involved 119 patients proposed for rhinoseptoplasty, 64 females and 55 males. Using photometry, the alar-intercanthal distance ratio, width-length ratio, nasofrontal angle, nasolabial angle, nasomental angle and projection of the nasal tip (Goode´s method) were obtained. A statistical analysis was performed to compare the measures obtained with the aesthetic ideals and between genders.

Results: Compared to the ideal patterns, the sample presented an increased nasal tip projection, higher alar/intercanthal ratio, higher width/length ratio, increased nasofrontal and nasomental angles and a more acute nasolabial angle than the aesthetical pattern (p<0.001). Comparison between males and females revealed that the alar/intercanthal ratio and the width/length ratio were superior in males (p<0.001), while nasofrontal angle was superior in females (p<0.001). Nasomental angle, nasolabial angle and nasal tip projection had no differences between genders.

Conclusion: The present study shows a statistically significant difference in all anthropometric measurements between patients proposed to rhinoseptoplasty and the aesthetic values described in the literature, as well as gender differences. Knowledge of nasal proportions of patients proposed to rhinoseptoplasty is crucial for surgeons in preoperative planning, comparative assessment and enhancement of surgical skills.

Keywords: rhinoplasty, anthropometry, nose, aesthetic.

Resumo

Contextualização: A cirurgia estética facial é uma área em expansão e a rinoplastia é uma das intervenções mais comuns neste campo. Através da antropometria, é possível quantificar os parâmetros antropométricos do nariz, sendo essencial o reconhecimento de desvios dos padrões estéticos.

Objetivos: Medir os principais parâmetros antropométricos da pirâmide nasal e face em doentes propostos para rinosseptoplastia, compará-los com o padrão estético ideal e comparar os resultados entre ambos os sexos.

Métodos: Este estudo retrospetivo envolveu 119 doentes propostos para rinosseptoplastia, sendo 64 mulheres e 55 homens. Através da fotometria, foram obtidas a razão distância alar-intercantal, razão largura-comprimento, ângulo nasofrontal, ângulo nasolabial, ângulo nasomental e projeção da ponta do nariz (método de Goode). Foi realizada análise estatística para comparar as medidas obtidas com os ideais estéticos e entre sexos.

Resultados: Comparando com os padrões estéticos ideais, a amostra apresentou uma maior projeção da ponta do nariz, maior relação alar/intercantal, maior relação largura/comprimento, aumento dos ângulos nasofrontal e nasomental e um ângulo nasolabial mais agudo que o padrão ideal estético ($p < 0.001$) . Comparando homens e mulheres, a razão alar/intercantal e a razão largura/comprimento foram superiores nos homens ($p < 0.001$), enquanto o ângulo nasofrontal foi superior nas mulheres ($p < 0.001$). O ângulo nasomental, o ângulo nasolabial e a projeção da ponta do nariz não apresentaram diferenças entre sexos.

Conclusão: Este estudo mostra diferenças estatisticamente significativas em todas as medidas antropométricas entre doentes propostos para rinosseptoplastia e os valores estéticos descritos na literatura, assim como diferenças entre sexos. O conhecimento das proporções nasais dos doentes propostos para a rinosseptoplastia é crucial para os cirurgiões no planeamento pré-operatório, avaliação comparativa e aperfeiçoamento das habilidades cirúrgicas.

Palavras-chave: rinoplastia, antropometria, nariz, estética.

Introduction

The nose occupies a central position in the face and, therefore, its shape, size and proportions play an important aesthetic role, providing harmony and balance.[1,2] Some findings suggest that the midline area of human face is essential in the judgment of attractiveness.[3]

Anthropometric measurements of the nose provide objective data about its size and shape[4] and are useful for study of growth and aging, as well as to evaluate ethnic and racial differences.[5] Indeed, anthropometric measurements can vary with age, sex and ethnic background. [1]

Objective evaluation of the face and the nose can be done through cephalometry and anthropometry. [4]

Cephalometry consists of anthropometric imaging analysis, traditionally using X-ray. However, it has the disadvantages of exposure to radiation, two-dimensional measurement of a three-dimensional bone structure, with overlapping structures and poor definition of reference points, namely soft tissue structures.[4,6]

On the other hand, anthropometry is a non-invasive, simple and inexpensive approach to measure and compare anthropometric parameters between individuals, through the analyses of soft tissues. [4,6] This one can be divided into direct anthropometry (a direct measure of surface dimensions), indirect anthropometry (analysis of photographs) and three-dimensional anthropometry .[4,7]

Indirect anthropometry or photometry represents the evaluation of photographs and uses essentially soft tissue reference points.[4] Images, namely through digital photography, is an important tool in the area of nasal surgery. If it is obtained correctly, using a standardized method, it plays important roles in pre-surgical planning, in the comparative assessment of pre and postoperative nasal morphology, as well as in the demonstration of post-surgical results.[8]

Photographs are easy to obtain and allow permanent data recording. However, errors can arise associated with poor definition of reference points and difficulty in measuring distances. The problem associated to photographic distortion can be eliminated by calculating ratios between primary measures or by measuring angles, instead of using direct measures.[4,7]

Facial aesthetics is an expanding area and, in the particular case of the nose, it is often associated with the functional component. Therefore, it is essential to recognize what really represents a deviation from the aesthetic standards assumed as ideal.

Through anthropometry, it is possible to objectively analyse and quantify the facial parameters of a population, which plays an important role in surgical planning and evaluation[9] in procedures such as rhinoseptoplasty.

The aims of this study were to measure the main anthropometric parameters of the nasal pyramid and face in a sample of population from the northern region of Portugal proposed for rhinoseptoplasty and associate them with the ideal aesthetic pattern identified in the literature and compare anthropometric measurements between female and male gender, in the same population.

Materials and Methods

Ethical Considerations

This study was approved by the local ethical committee of the Centro Hospitalar Universitário de São João and it was carried out in accordance with the Ethical Principles for Medical Research involving Human Beings expressed in the Declaration of Helsinki.

Informed consent was obtained from all participants included in the study.

Study Design

A retrospective, observational and cross-sectional study.

Participants

Data collection included all candidates for rhinoseptoplasty, followed at the Department of Otorhinolaryngology, in Centro Hospitalar Universitário de São João, for a period of two years, between October 2017 and October 2019. Exclusion criteria are: age under 18 years, previous facial or nasal surgery and non-Caucasians.

The study included 119 patients proposed for rhinoseptoplasty, 64 females and 55 males.

Anthropometric evaluation

It was analysed the pre-operative anthropometrical parameters of the nose and face in 119 patients undergoing rhinoseptoplasty.

The photographs were obtained, after the patient's consent, through digital photography, in a standardized way: by two researchers , with the same illumination, with the same digital camera (Canon Eos 600), without zoom, at 1,5 meters of distance between the camera and the patient, according to two incidences: frontal and lateral (right profile).

Subsequently, the photographs obtained underwent an analysis of the nose anthropometric parameters, using *Adobe Photoshop CS3*, which allows the measurement of the distance between two points and the angle between two lines. To avoid possible errors due to variations in the distance between the camera and the

patient, ratios and angles (in degrees) obtained from the primary measurements were used.

On frontal view, the following parameters were evaluated (Fig.1A):

a) Alar-intercanthal distance ratio;

b) Width-length ratio.

On the profile view, the following parameters were evaluated (Fig.1B and Fig.1C):

a) Nasofrontal angle (NFA);

b) Nasolabial angle (NLA);

c) Nasomental angle (NMA);

d) Projection of the nasal tip by the Goode´s ratio.

Statistical analysis

The data were analysed using the IBM SPSS Statistics 26 program.

The anthropometric proportions obtained were compared with ideal measurements, according to Powell and Humphreys[10]. The mean value of the sample was compared with a fixed mean value of the ideal range, through one sample T test. The values obtained were expressed as mean ± standard deviation.

To compare the anthropometric values obtained between genders, a Chi-square test was performed. These results were expressed as percentages of cases below, within and above the ideal range. If the ideal ratio mentioned in the literature is an exact value instead of an interval, the range of values within ideal value± 5% error was considered.

A value of p <0.05 was considered to be statistically significant.

Results

One hundred nineteen patients were enrolled in this study, 64 females and 55 males.

The results of anthropometric analysis obtained among patients proposed for rhinoseptoplasty are shown in Table 1 and their comparison with the aesthetic patterns is shown in Table 2.

The majority of patients proposed to rhinoseptoplasty had increased values in the nasofrontal angle (79.8%), nasomental angle (81,5%), nasal tip projection (76,5%) and alar/intercanthal distance ratio (79,8%), when compared to the ideal range in the literature. Seventy nine percent of patients depicted an ideal nasolabial angle. Regarding the width/length ratio, 48.7%, 28.6% and 22.7% showed an increased, ideal and lower ratio, respectively. Comparing the results obtained in this population with the ideal values presented in the literature, all anthropometric parameters were statistically different from the aesthetical ideal: patients proposed to rhinoseptoplasty showed an increased nasofrontal angle, nasomental angle and nasal tip projection. Alar/intercanthal distance ratio and width/length ratio were superior and nasolabial angle inferior when compared to the ideal.

The mean values obtained in both genders are shown in Table 1 whereas the statistical analysis comparing these values between females and males is depicted in Table 3. Only nasofrontal angle, alar/intercanthal distance ratio and width/length ratio presented a significant difference between genders: females had more obtuse nasofrontal angle than males and males showed bigger alar/intercanthal distance ratio and a greater width/length ratio than females.

Discussion

Patients planning to undergo rhinoseptoplasty usually aims to obtain a nose aesthetically pleasant and simultaneously an adequate nasal function. [7,11,12] Therefore, the surgeon should always keep in mind the nasal functional components, aesthetic proportions and the interaction between both.

Among different anthropometric methods, photometry was preferred in this study because of its availability and low cost.

In a study by Powell and Humphreys[10] the aesthetic proportions of the nose were depicted, through observation and analysis of models, celebrities and patients. The aesthetic ideals of the nose established by these authors are still largely used in the literature, which facilitates comparisons between studies. The ideal ranges described in Caucasians are as follows: nasofrontal angle of 115-130º, nasomental angle of 120-132º, nasolabial angle of 90-120º, nasal tip projection (by Goode´s method) of 0.55-0.6, alar/intercanthal distance ratio of 1 and alar width/length of 0.7.[7,10,13,14] However, these authors recognize some differences between genders.

Comparing our sample's anthropometric nasal parameters with the ideal values, our results revealed that all variables were significantly different from the ideal proportions. An increased Goode's ratio (0.637) and nasofrontal angle (138.98º) were observed when compared to the ideal values: 0.55-0.6 and 122.5º. Differences in Goode's ratio usually means that patients have a nose more projected or a decreased length (Fig. 1C).

Nasolabial angle was more acute (100.47º) than the ideal (105º), probably associated to an increased nose length. This observation probably means that the variation in Goode's ration is due to increased nose projection and not decreased nasal length. Berger et al.[15] also compared pre and postoperative anthropometric nose measurements and obtained a similar pre-operative Goode's ratio (0.63).

In an ideal model, the intercanthal and alar distance should be equivalent.[7] This was not the case in our sample, as the alar/intercanthal distance ratio was significantly greater (1.154), representing wider noses in our population. The width/length ratio was higher (0.750) than the ideal (0.7), again suggesting that these patients have a broader or a shorter nose. As alar/intercanthal distance ratio was high, the width/length ratio is

probably justified by a broader nose, even if there is a dispersion of values in the three categories (<0.665; ideal; >0.735).

Interestingly, similar results were obtained by Santos et al.[16] which studied anthropometric measurements and major deformities in Caucasians seeking rhinoplasty and found that the major deformities in this population were dorsal hump (78%), rinomegalia(53%) and boxy bulbous tip(47%). Differences between the nasal parameters evaluated in our sample and the aesthetic patterns assumed as ideal, reveal that patients seeking for a rhinoplasty usually have a larger nose, evident in the frontal and basal view. Moreover, profile view shows an increased nasal projection and length when compared to ideal. It is a common perception among rhinoplasty surgeons that most of the caucasian patients look for a small and refined nose. Undoubtedly, in causasian most of rhinoplasty surgeries represent reduction rhinoplasties, both in males and females. These demands are completely different from African-origin population or Asian population which most frequently desire augmentation rhinoplasties.

Our series showed that males had a sharper nasofrontal angle, increased alar/intercanthal ratio and higher width/length ratio than females, suggesting a higher dorsum and a wider nose in men (Table 3). This anthropometric differences between genders were expected based in previous papers[10]. On the other hand, nasomental angle, nasolabial angle and nose tip projection were similar in men and women (Table 3). Females usually are considered to have a more obtuse nasolabial angle than men and in association with increased nose tip rotation and decreased tip projection.[12] However, contrary to expected, there were no statistically significant differences in nasolabial angle and in nasal tip projection between males and females, probably because our sample nasal morphology has consistent deviation from ideal patterns as it is a sample of individuals looking for rhinoplasty. Female population frequently has functional and aesthetical complaints associated with a "tension nose" and/or tip ptosis and seeks rhinoplasty to change a nose with male proportions into a more delicate one. Therefore it is reasonable to assume as natural that women pre-operative photographic parameters are similar to men, representing a "big nose" they want to change into a "female nose".

This study has some limitations. The study sample contains more women than men, reflecting the gender most frequently seeking rhinoseptoplasty. [17] Another limitation is related to width/length ratio, since the primary measurements were obtained from different photographs: the alar distance was obtained from the frontal view and the length of the nose was obtained from the profile view, due to the impossibility of obtaining these two measurements in the same incidence. Although the standardization of photographs, when evaluating different photographs incidences, slight inaccuracies in measurements can occur. Some studies in healthy Caucasian noses[7,12] showed similar results: increased nasal tip projection, width-length ratio and alar/intercanthal distance ratio and a more obtuse nasofrontal angle than the aesthetic patterns, but a similar nasolabial angle. We could not conclude if the differences observed in the present study were due to racial or geographical differences in this specific sample. In the future, it would be important to include a control group with healthy Caucasians in an effort to understand clearly these differences. It would also be interesting to compare these results with post-surgical results, as well as increasing the study sample.

Conclusions

The present study shows a statistically significant difference in all anthropometric measurements between caucasian patients proposed to rhinoseptoplasty and the aesthetic values previously described. Patients from this sample had a more projected and wider nose, superior nasofrontal and nasomental angles and more acute nasolabial angle than the aesthetical ideal pattern. Our sample also presented differences between genders: males had a sharper nasofrontal angle, an increased alar/intercanthal ratio and an increased width/length ratio than females, suggesting a longer and a wider nose in males.

Knowledge of nasal proportions in patients proposed to rhinoseptoplasty is crucial for surgeons preoperative planning, comparative assessment and enhancement of surgical skills.

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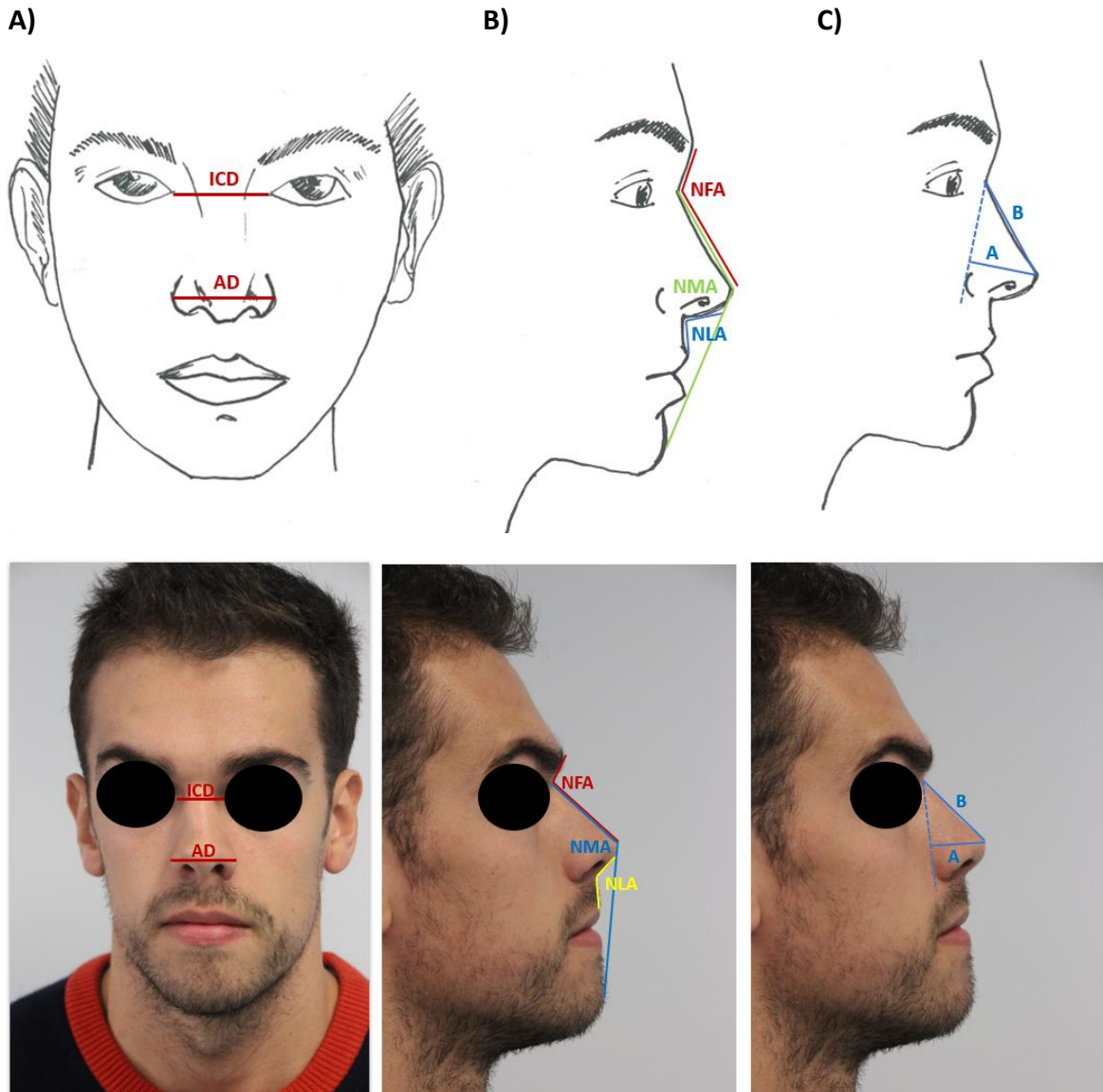
Figures and Tables

Figure 1 – Schematic and photographic representation of anthropometric nasal measurements on the frontal view: **Fig.1A)** Alar-intercanthal distance ratio (obtained by dividing the alar distance (AD) by the intercanthal distance (ICD)), Width-length ratio (obtained by dividing the alar distance (AD) by the length of the nose, nasion-pronasion distance (B), presented in Fig. 1C) ; on the profile view: **Fig.1B)** Nasofrontal angle (NFA) (glabela-nasion-pronasion angle); Nasolabial angle (NLA) (pronasion - subnasal point - upper lip angle); Nasomental angle (NMA) (nasion - pronasion – pogonion angle); **Fig.1C)** Projection of the nasal tip by the Goode´s ratio (obtained by dividing the distance between alar point and pronasion (A) by the nasion-pronasion distance (B); the alar point is obtained by the intersection between a vertical line that passes through the nasion and the alar groove and a horizontal and perpendicular line that passes through the pronasion).

Table 1 – Anthropometric nasal parameters in patients proposed for rhinoseptoplasty.

Variable		Mean	SD
Nasofrontal angle	Total	138,98	0,841
	Female	142,81	1,013
	Male	134,53	1,126
Nasomental angle	Total	128,32	0,510
	Female	127,91	0,721
	Male	128,80	0,718
Nasolabial angle	Total	100,47	1,071
	Female	101,78	1,399
	Male	98,95	1,641
Nasal tip projection (Goode's ratio)	Total	0,637	0,005
	Female	0,631	0,006
	Male	0,643	0,006
Alar/Intercanthal distance ratio	Total	1,154	0,011
	Female	1,119	0,016
	Male	1,195	0,014
Width-length ratio	Total	0,750	0,011
	Female	0,709	0,013
	Male	0,798	0,016

Table 2 – Comparison of nasal proportions between patients proposed for rhinoseptoplasty and the aesthetical ideal.

Variable	Ideal value	Mean	SD	95% Confidence Interval		p-value
				Total (N= 119)		
Nasofrontal angle(º)	122,5	138,98	0,841	137,32	140,65	<0.001
Nasomental angle(º)	126	128,32	0,510	127,31	129,33	<0.001
Nasolabial angle(º)	105	100,47	1,071	98,35	102,59	<0.001
Nasal tip projection	0,575	0,637	0,005	0,628	0,646	<0.001
Alar/Intercanthal distance ratio	1	1,154	0,011	1,132	1,177	<0.001
Width-length ratio	0,7	0,750	0,011	0,728	0,772	<0.001

Table 3 – Comparison between genders in nasal anthropometric analysis.

Variable		Female N=64 (%)	Male N=55 (%)	Total N=119 (%)	p-value
Nasofrontal angle	< 115º	0 (0%)	0 (0%)	0 (0%)	<0.001
	115-130º	5 (7,8%)	19 (34,5%)	24 (20,2%)	
	> 130º	59 (92,2%)	36 (65,5%)	95 (79,8%)	
Nasomental angle	< 120º	6 (9,4%)	3 (5,5%)	9 (7,6%)	0,601
	120-132º	8 (12,5%)	5 (9,1%)	13 (10,9%)	
	> 132º	50 (78,1%)	47 (85,5%)	97 (81,5%)	
Nasolabial angle	< 90º	8 (12,5%)	13 (23,6%)	21 (17,6%)	0,137
	90-120º	55 (85,9%)	39 (70,9%)	94 (79,0%)	
	> 120º	1 (1,6%)	3 (5,5%)	4 (3,4%)	
Nasal tip projection (Goode's ratio)	< 0,55	4 (6,3%)	2 (3,6%)	6 (5,0%)	0,736
	0,55-0,6	13 (20,3%)	9 (16,4%)	22 (18,5%)	
	> 0,6	47 (73,4%)	44 (80%)	91 (76,5%)	
Alar/Intercanthal distance ratio	< 0,95	6 (9,4%)	0 (0%)	6 (5,0%)	<0.001
	0,95-1,05	15 (23,4%)	3 (5,5%)	18 (15,1%)	
	> 1,05	43 (67,2%)	52 (94,5%)	95 (79,8%)	
Width-length ratio	< 0,665	23 (35,9%)	4 (7,3%)	27 (22,7%)	<0.001
	0,665-0,735	21 (32,8%)	13 (23,6%)	34 (28,6%)	
	> 0,735	20 (31,3%)	38 (69,1%)	58 (48,7%)	

Anexo

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