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Anthropometric nasal analysis of Han Chinese young adults

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ABSTRACT

Background: There are varying degrees of racial differences in the size, shape, proportions of the facial structures.
Methods: A total of 900 Han Chinese young adults (501 females and 399 males) were included in the analysis. Measurements taken of the soft tissue of the external nose included 12 items of linear distance and 5 angles. Six proportion indices of the soft tissue of the external nose were determined.
Results: In the 12 parameters of linear measurement, females were found to have significantly smaller nasal base width, nasal ala length, nasal ala thickness, columella height, columella width, and nasal tip width in comparison to males (all, $P < 0.01$). In the five angular measurements, females were found to have a smaller nasal tip angle and nasolabial angle (both, $P < 0.05$) and a larger nostril tilt angle, nasofrontal angle, and nasal tip angle (all, $P < 0.001$). Nasal depth–nasal width and columella height–nasal depth were both significantly less in males than females (53.25 ± 8.2 vs. 54.56 ± 9.7 and 51.61 ± 11.92 vs. 53.37 ± 12.56, respectively); whereas nasal ala length–nasal height was significantly less in females than in males (29.41 ± 8.95 vs. 30.9 ± 7.02).
Conclusion: Significant differences are present in nasal indices of males and females of Han Chinese ancestry. These data may serve as a reference standard for nasal reconstructive and aesthetic surgery.

1. Introduction

The form, size, and ratios of nasal soft tissue play an important role in facial aesthetics, facial plastic surgery, and forensic identification, and the nasal indices and parameters including nasal length, height, ratios and angles also are important parameters in anthropometric facial analysis. For a relatively long period, plastic surgeons have considered the neoclassical aesthetic standard developed during the European Renaissance as a standard of plastic surgery. Recently, many scholars have systematically studied the faces of different ethnic groups using anthropometry and found that there are varying degrees of racial differences in the size, shape, proportions of the facial structures (Choe et al., 2004; Leong and White, 2004; Farkas et al., 2005; Choe et al., 2006; Uzun et al., 2006; Ercan et al., 2007; Farkas et al., 2007; He et al., 2009; Zhuang et al., 2010; Tuncel et al., 2012). For example, there are variations in nasal shape based on race. The Caucasian (leptorrhine) nose has increased tip projection and more vertically oriented nostrils when compared with the African (platyrrhine) and the Asian (mesorrhine) has intermediate features, i.e., nostril to infralobule ratios decrease when progressing from leptorrhine to platyrrhine nose (Romo and Abraham, 2003). A recent study has reported that the contemporary ideal female face is shorter than the male face, which is the opposite of the ideals of antiquity (Mommaerts and Moerenhout, 2011).

It is therefore very important for plastic surgeons to develop a relative aesthetic standard for individual patients that includes both subjective and objective measures (Chung et al., 2009; Nassif and Lee, 2010; Rohrich and Bolden, 2010; Springer et al., 2008). At present, diagnosis and evaluation of the plastic surgery outcomes are primarily based on qualitative or simple quantitative measurements, and there is a lack of reliable measurement data as a reference for maxillofacial surgery, especially during reconstruction of secondary nasal deformity after cheiloplasty (Wang et al., 2008). To overcome this deficit, authors are developing databases of craniofacial indices and proportions (Moate and Darendeliler, 2002; De Greef et al., 2006; Etöz et al., 2008; Springer et al., 2008). Research has also been performed to

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develop standardized photogrammetry techniques to represent anthropometric measurements reliably (Han et al., 2010).

China is the world's most populous country, and Han Chinese make up the majority of the population in China. Equally importantly, Han Chinese have a worldwide of distribution. With economic and cultural development in China, the Chinese people are demanding a greater aesthetic standard about their own appearance and they are gradually becoming more accepting towards receiving cosmetic/plastic surgery and those with superior economic conditions prefer to undergo cosmetic/plastic surgery abroad. There are few anthropometric studies in China (Xiong et al., 2006; He et al., 2009), so it has become important to carry out anthropometric research regarding the soft tissue of the external nose for normal population in China. The objective of this study was to measure major nasal external soft tissue parameters in a large Chinese Han population to serve as a reference and standard for nasal reconstruction and aesthetic surgery.

2. Material and methods

2.1. Material

All participants were Chinese college students of Han ancestry who studied in the city of Shenyang, China. The inclusion criteria were:

1) parents and grandparents were Han Chinese,
2) no congenital or postnatal craniofacial deformities,
3) no history of surgery or trauma to the maxillofacial region,
4) no nasal infection, rhinitis, or other nasal allergic diseases,
5) no skin disease in nasolabial area, and
6) normal occlusion.

The exclusion criteria were:

1) hypodevelopment or hypergenesis of the middle and lower one-third part of the face,
2) obvious asymmetry (height, length, or width) of the eyes, ears, nose, or lip area,
3) deviation of nasal septum and nasal flaring,
4) absence of enough teeth to caused insufficient height of the lower one-third of the face.

2.2. Measurement tools and methods

Measurement tools used were a 125 mm vernier calliper (accuracy, 0.02 mm), stainless steel scale (accuracy, 0.5 mm), dividers, and spring dividers. For obtaining measurements, the subject was sitting with the head kept horizontal with the Frankfurt plane (FH) parallel to the ground. The subject was instructed to relax their body and look forward naturally with their mouth closed and breathing was steady such that there was no movement of the nasal muscle. A point was marked with eyeliner on the external nose of the subject, with the diameter of the marked point being about 0.5 mm. The linear distance was measured by the direct measurement method (Rudolf Martin). During measurements, the measurement tool just touched but did not compress the soft tissue surface. A picture of the left profile of the subject was taken with a Canon digital camera (focal length, 720 mm; object distance, 160 mm). The angle was measured using Adobe Photoshop CS3 software. Every measurement item was performed by the same measurer who measured each item twice. The lower value was selected from the paired measurements and recorded. For paired items, the value of the left side was used for analysis. After all subjects were measured, the mean value was statistically analyzed to two decimal points. Gross errors such as outliers were removed using the Pauta criteria.

2.3. Marked points of measurement, measurement items, and proportion indices

Based on the marked points of measurement defined by Farkas and Deutsch (1996) for the soft tissue of the head and face, 10 marked points of measurement were selected, five non-paired and five paired (Table 1, Fig. 1A, B). Measurement items of the soft tissue of the external nose included 12 items of linear distance and 5 angles (Table 2, Fig. 1C). There were two pairs of paired items, as described by Farkas and Deutsch (1996). The six proportion indices of the soft tissue of the external nose determined were those as described by Farkas and Deutsch (1996). Nasal index = nasal width × 100/nasal height; Nasal depth–nasal width index = nasal depth × 100/nasal width; nasal bridge index = nasal length × 100/nasal height; nasal ala length–nasal height index = nasal ala length × 100/nasal height; columella width–nasal width index = columella width × 100/nasal width; columella height–nasal depth index = columella height × 100/nasal depth. As these measurements have been widely recognized and applied (Farkas and Deutsch, 1996), no reliability and validity assessment was deemed necessary.

2.4. Statistical analysis

Data were presented as mean with standard deviation, and comparisons were performed with *t*-tests. Data were analyzed with using SPSS 15.0 statistics software (SPSS Inc, Chicago, IL, US), and a value of $P < 0.05$ was considered statistically significant.

3. Results

A total of 900 Han Chinese young adults (501 females and 399 males) ranging in age from 17 to 24 years old were included in the analysis. First, we measured 12 linear nasal external soft tissue parameters and 5 nasal angles (Table 3). In the 12 parameters of

Table 1
Marked points of measurement.

Point	Description
Non-paired	
Highest point of the columella (c)	Intersection between the long axis of the columella and the line connecting the anterior points of bilateral nostrils.
Nasion point (n)	Intersection of the nasofrontal seam and the midsagittal plane, which can be identified by touching with the finger tip.
Nasal tip point (prn)	Most protruded point of the nasal tip when the head Frankfurt plane is parallel to the horizontal plane.
Subnasal point (sn)	Apex of the angle between the inferior margin of the columella and the upper lip skin in the midsagittal plane.
Upper lip point (ls)	Intersection of the midsagittal plane and the boundary line between the mucosa and skin of the upper lip.
Paired	
Alinasal point (alr, all)	Outmost point of the nasal ala.
Measurement point of the ala thickness (al'r al'l)	Midpoint of a line from the nasal tip point to the alinasal point.
Outmost point of the curve of nasal ala (acr, acl)	Outmost point of the basal curve of the nasal ala.
The inner canthus points (enr, enl)	Intersection of the inner ends of the upper and lower eyelids with the eyes normally open.
Midpoint of the columella (sn'r, sn'l)	Midpoint of the lateral margin of both sides of the columella.