The Ideal Nasion in Chinese: A Preference Analysis of the General Population

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Abstract: Augmentation rhinoplasty has gained popularity in China in the past decades and nasion profile is a key variable in aesthetic outcomes. The nasion is the deepest portion of the nasofrontal groove and its aesthetic preferences vary between different ethnic groups. At the time of this writing, there is limited research about ideal nasion measurements in the Chinese population. Therefore, we conducted an online survey of plastic surgeons and the public through social media. Participants were asked to rank nasion images according to their preferences. Images were created from a 3-dimensional scan of a Chinese Han female and modified to show various dimensions of nasion height, position, and forehead height. Nasion preferences were compared by age, sex, ethnicity, occupation, and whether a history of plastic surgery. There were 777 respondents, including 461 (59.3%) women and 74 (9.5%) plastic surgeons. Nasion height of 8 and 10 mm ranked highest among all demographic groups. All respondents preferred nasion position to be level with the center of the pupil and forehead height of 4 mm above the nasion. Our study showed that the ideal Chinese nasion is in line with baseline ethnic characteristics. Therefore, plastic surgeons must be aware of these nasion preferences to guide preoperative discussions and achieve satisfactory outcomes.

Key Words: Chinese, nasion, rhinoplasty

In clinical soft tissue measurements, the nasion is the deepest portion of the nasofrontal groove where the forehead ends and the nose begins. Lazovic et al further clarified that in classic anthropometric bony measurement, sellion is the deepest depression of the nasal bones and often coincides with soft tissue nasion. Clinicians were accustomed to calling the sellion the nasion in treatment planning when using clinical photographs. Nasion is an essential element of the nasal profile and must be considered during preoperative evaluation for rhinoplasty. The position, height, and angle of the nasion profoundly impact the appearance of the nasal contour. An under projected nasion can lead to a pseudo-hump appearance even when coupled with an ideal rhinion. Conversely, a high nasion creates a prominent nasofrontal profile. When the nasion is accurately characterized during preoperative facial analysis, the surgeon can plan accordingly to correct the nasion projection and potentially avoid unnecessary manipulation of the rhinion.

Surgeons must be cognizant that the “ideal nasion” differs across ethnic backgrounds. Aesthetics preferences of the Caucasian nasion are well established. Byrd and Hobård emphasized that the lowest point of nose should be on the midline of the nasal dorsum and located at the level of the superior palpebral fold. Villanueva et al found that the Caucasian nasion is optimally located between the superior eyelash line and the supra-tarsal crease with a height of 15 mm projected anteriorly from the plane of the medial canthus. Meanwhile, Steiger and Baker considered the height of nasion in Caucasian was ideally between 9 and 14 mm when measured from the anterior corneal plane. In addition, Sajjadian and Guyuron stated that nasion should be 6 mm deep in reference to the forehead plane in Caucasian females. Naturally, the nasion is shallower and more inferior in Chinese compared with Caucasians. Because of this, Toriumi and Swartout suggest that the Asian nasion should be positioned closer to the pupil. Despite the voice of expert experience, the Chinese population’s preferences for nasion aesthetic remain unknown.

It is imperative to define the ideal nasion in China because patient preference is as vital as a surgical skill to postoperative satisfaction. Therefore, this study aims to define the most attractive nasion height and position through an online survey of laypersons and plastic surgeons in China. We also assess the ideal forehead height relative to nasion, which defines the nasofrontal angle and is crucial to a harmonious transition from the nasion to the upper face. We compare responses based on sex, age, occupation, and personal experience with the aesthetic procedure. Establishing Chinese preferences for nasion aesthetics will improve preoperative surgical planning.
communication between plastic surgeons and patients, and patient expectations for rhinoplasty in China.

MATERIALS AND METHODS
All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The 33-year-old Chinese Han female model depicted gave permission to apply her photograph for research, presentation, and publication.

Photographic Processing and Analyzing
A 3-dimensional (D) image of a female model was obtained using a 3D-Shape Face scanner (3D-Shape Inc., Germany) and Geomagic Wrap 2015 (3D Systems Inc.) software to analyze the raw image data. Images were modified using Adobe Photoshop (Adobe Systems Inc., San Jose, CA) to create different nasal parameters. First, we modified nasal tip parameters to ideal Chinese nasal tip projection and rotation according to our previous study. After the nasal tip aesthetics were determined, we measured the height of nasion and forehead from the plane of medial canthus (Fig. 1). To assess the ideal nasion height, we generated 6 images with a height of 2, 4, 6, 8, 10, and 12 mm, while keeping nasion position at the level of center of pupil and height of the forehead at 12 mm above the plane of medial canthus (Fig. 2). Nasion position was defined in relation to horizontal levels of the eye. Four images were created with the nasion occurring at the level of the supravioletral crease, superior eyelash line, center of pupil, and inferior palpebral margin, while keeping nasion height 8 mm and forehead height 12 mm above the plane of medial canthus respectively (Fig. 3). Finally, we generated 5 images to assess forehead heights of 0, 2, 4, 6, and 8 mm above the nasion while keeping nasion height 8 mm above the plane of medial canthus and nasion position at the level of center of pupil (Fig. 4). These ranges in nasion parameters were designed according to a pilot study in 88 laypersons to reveal related preference scopes.

Survey Design and Distribution
We conducted an online survey between September 2020 and February 2021. The authors sent the survey through a Chinese online platform (www.wjx.com) to public. A link to the survey was accessible online and was spread by the survey website itself. The authors also sent the survey through their own Chinese social software WeChat (similar as Facebook) to their contacts. WeChat is the most popular social networking tool and social media platform developed by Tencent in China. It is an app where people of all ages and careers can work, find and share information, with others. According to Tencent’s report, the number of active accounts of WeChat in the first quarter of year 2021 reached 1.112 billion. The frequency of use of WeChat is also remarkably high. Approximately 63.4% of users use it at least once a day. Considering rapid increase in smartphone and WeChat users in China, Chinese health practitioners have applied the app to improve patients’ rehabilitation with coronary heart disease, promote weight loss among the occupational population, and educate joint replacement patients in the community. Each interviewee could only complete the survey once and the answers could not be altered after submission. The survey consisted of 9 questions in Chinese including demographic data (age, sex, ethnicity, and occupation), personal history of cosmetic surgery (eg, rhinoplasty), and preferences for nasion/forehead height and nasion position based on the photographs we created. Each set of photographs were exhibited in a random order to avoid bias of patients’ decision-making. The interviewee could only select 1 image preference for each nasion parameter. All the responses were input into an Excel spreadsheet for analysis (Microsoft Corporation, Redmond, WA).

Statistical Analysis
We performed all statistical analysis using R (v4.0.2). The proportion choosing each parameter measurement (eg, nasion height of 6 mm) was compared between female and male respondents using a Z test, using an assumption that preferences are normally distributed. We also compared responses according to age, occupation (ie, plastic surgery), and personal history of plastic surgery. To obtain the comparison results, we construct the test statistic by:

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1 - \hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

where \(\hat{p}_1\) and \(\hat{p}_2\) are the estimate of proportion for groups 1 and 2, \(n_1\) and \(n_2\) are the sample size for groups 1 and 2. The \(\hat{p}\) is the proportion in the combined group. For those answers with <10 responses, we did not perform a formal statistical test.

RESULTS
The overall response rate was 47% (777 complete responses from 1653 survey invitations). Demographic data of the participants are summarized in Supplemental Table 1 (Supplemental Digital Content 1, http://links.lww.com/SCS/E171). Most respondents were female (59.3%) and between the ages of 18 and 35 years (80%). Few had a history of plastic surgery, which was more common among women than men (17.1% versus 7.8%, \(P < 0.05\)). Of these, most had rhinoplasty procedures. Among plastic surgeon respondents, significantly more were male than female (74.3% versus 25.7%), and most (65%) performed <10 rhinoplasties per year.

Nasion Height Preferences
Nasion height of 8 and 10 mm were the most popular across all demographic groups (Supplemental Table 2, Supplemental Digital Content 2, http://links.lww.com/SCS/E172). Women ages 36 to 45 years, respondents with a personal history of plastic surgery, and plastic surgeons significantly preferred 8 to 10 mm (\(P < 0.05\)). Preferences between 8 and 10 mm did not significantly differ across other demographic groups (Fig. 5).

Nasion Position Preferences
The most popular nasion position in the overall was the level of the center of pupil (43%) followed by the superior eyelash line (34%) (Supplemental Table 3, Supplemental Digital Content 3, http://links.lww.com/SCS/E173). This preference was conserved among female and male groups as well as plastic surgeons. Plastic surgeons showed stronger interest into center of pupil compared with laypersons (52.70% versus 37.97%, \(P < 0.05\)). For age groups, respondents aged 26 to 35 years ranked the center of the pupil highest followed by the superior eyelash line (45.7% in female, and 43.5% in male), while no significant differences between these 2 preferences in other age groups. Personal history of plastic surgery did not impact nasion preference. Meanwhile, non-Han Chinese exhibited more favor to center of pupil than Han Chinese (60.0% versus 41.9%, \(P < 0.05\)) (Fig. 6).
Forehead Height Preferences

All groups reported a significant preference for forehead height of 4 mm, except males age 18 to 25 for whom it did not reach significance and ages 46 to 55 years which showed equal preferences for all heights (Fig. 7). There was no difference between male and female respondents (Supplemental Table 4, Supplemental Digital Content 4, http://links.lww.com/SCS/E174). Plastic surgeons and respondents with history of plastic surgery expressed stronger preferences for 4 mm compared with laypersons (60.8% and 57.9%, respectively, \( P < 0.05 \)).

DISCUSSION

Our survey of Chinese plastic surgeons and laypersons using computer-generated images demonstrates a high level of agreement regarding ideal female nasion aesthetics across demographic groups. Men, women, plastic surgeons, and non-surgeons expressed clear preferences for the most attractive nasion parameters. These included nasion height of 8 to 10 mm and position level with the center of the pupil. The most popular forehead height was 4 mm beyond the nasion to create an attractive nasofrontal angle.

As predicted, the ideal female nasion height and position in our Chinese sample are lower than those found in similar surveys of Caucasians. Gao et al\textsuperscript{15} suggests that Asian females prefer lower nasion height and a more obtuse nasofrontal angle because these are more harmonious with the less stereoscopic Asian facial profile. Expert opinion among rhinoplasty surgeons also suggests that retaining racial identity and achieving a natural look with rhinoplasty are crucial to patient satisfaction. Lam recommends that a shallower nasion height in Asian patients can achieve the desired softening of features while preserving ethnic character, whereas a higher nasion can cause an artificial appearance.\textsuperscript{16} As augmentation rhinoplasty has gained popularity in China in recent years, we have observed an increasing number of postrhinoplasty patients in our own practice who desire surgery to reduce nasion height and lower nasion position. This may be due to patients’ desire for more protruding nasal profile before first surgery without a comprehensive understanding of aesthetic ethnic standards. Although this study exhibited both Chinese layperson and plastic surgeons still favored the Caucasian beauty canons, our clinical experience showed Chinese standards of beauty have gradually returned to relative rationality compared with those of several years ago when “Occidental nose” was zealous among patients. Chinese standards of beauty may become closer to our own ethnic features in the future and we would like to follow and report the trend. Meanwhile, we keep educating patients that beauty exhibits a Gaussian distribution\textsuperscript{17} and over-pursuit of mathematical perfection may lead to opposite outcome. We encourage more patient education about unique characteristics of Chinese rhinoplasty aesthetics during preoperative consultation to facilitate a natural and satisfactory result.

Our results align with previous studies of Asian female nasion aesthetics. In contrast to natural Caucasian noses where the nasion begins at the superior palpebral fissure, the nasion occurs on a horizontal plane closer to the pupil in Asian females.\textsuperscript{9} Our study found that this was the most ideal position of the nasion among Chinese participants, followed by the level of the superior eyelash line. Previous studies have measured nasion height as a proportion of nasal length instead of absolute height.\textsuperscript{18} In our clinical practice, we found it useful to determine the absolute nasion height at the beginning of the procedure as it then becomes a reference point for other nasal parameters. By changing nasion, one can alter the angles of the upper third of the nose as well as the nasofrontal and nasofacial angles.\textsuperscript{19} To our knowledge, this is the first report using 3D images of the ideal absolute heights of the nasion and forehead among Chinese individuals. Compared with direct manual examination, stereophotogrammetry represents a practical technique for obtaining nasal morphometry as the images can be stored digitally and are readily accessible for subsequent analysis.\textsuperscript{20} This could offer a practical tool for decision-making related to nasal morphology.

Together, the nasion and forehead form the nasofrontal angle which is a key aesthetic parameter in rhinoplasty, similar to the nasolabial angle between the upper lip, columella, and nasal tip.\textsuperscript{21} Our study found a forehead height of 4 mm from the nasion to be ideal and highlights the importance of filling the forehead area to attain an appropriate nasal contour in Chinese patients. In our clinical practice, we prefer to choose fat grafting in the forehead. Nasofrontal angle preferences differ slightly between Caucasians and Asians; 135 and 139 degrees, respectively.\textsuperscript{22} This is similar to the average nasofrontal angle (138.7 ± 7.51 degrees) in a study of 501 Han Chinese women.\textsuperscript{23} Because most Chinese women seek augmentation rhinoplasty, this suggests that the forehead must be simultaneously augmented to avoid creating an overly obtuse angle when nasion height is increased.

Our study should be interpreted with consideration of the following limitations. First, we recruited the general population through social networks to obtain a sample, however,
FIGURE 2. Six modified images with different nasion height.

FIGURE 3. Four modified images with different nasion position.
FIGURE 4. Five modified images with different forehead height.

FIGURE 5. Nasion height preferences in different subgroups (sex, history of plastic surgery, and occupation).

FIGURE 6. Nasion position preferences in different subgroups (sex, history of plastic surgery, and occupation).
this approach leads to selection bias for those with access to the internet. Secondly, plastic surgeons numbered only 75, and their viewpoints may not be reflective of the field at large. In addition, we studied the absolute value of nasion parameters instead of the ratio between nasion and tip projection. This is based on our previous study about ideal nasal tip aesthetics, in which we found Chinese overwhelming preferences of nasal tip projection to nasal dorsum length ratio was 0.63, and nasal rotation angle was 106 degrees. Therefore, we modified the standardized photograph according to ideal nasal tip parameters at the beginning of the study and investigated different nasion parameters while keeping the nasal tip constant. However, the evaluation of nasion aesthetics was multidimensional. Future studies should focus on exploring the ratios between nasion projection and nasal tip/forehead projection. Finally, we assessed preferences for young Chinese female nasion aesthetics, and our findings may not be generalizable to older female, male, or nonbinary Chinese rhinoplasty patients.

Our quantitative survey assessment of the ideal of Chinese female nasion aesthetics, identified preferences for nasion height of 8 to 10 mm and position at the level of pupil among Chinese men, women, and plastic surgeons. All demographic groups similarly preferred a forehead height of 4 mm above the nasion. Our results showed that the majority of Chinese seek lower nasion height compared with Caucasians, which is in line with baseline ethnic characteristics. Based on our findings we suggest that augmentation of the forehead region may be necessary after elevating nasion height to attain a desirable nasofrontal angle. As rhinoplasty continues to grow in popularity in China, plastic surgeons must be aware of these nasion preferences to guide preoperative discussions and achieve satisfactory surgical outcomes.

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