OPEN

ORIGINAL ARTICLE
Cosmetic

Varied Definitions of Nasolabial Angle: Searching for Consensus Among Rhinoplasty Surgeons and an Algorithm for Selecting the Ideal Method

Ryan Harris, MD*
Purushottam Nagarkar, MD†
Bardia Amirlak, MD, FACS†

Background: The nasolabial angle (NLA) is an important aesthetic metric for nasal assessment and correction. Although the literature offers many definitions, none has garnered universal acceptance.
Methods: To gauge the consensus level among practitioners, surveys were administered to a convenience sample of rhinoplasty surgeons soliciting practice characteristics, self-assessment of rhinoplasty experience and expertise, and preferred NLA definition. Choices of NLA definition included the angle between: (A) columella and line intersecting subnasale and labrale superius; (B) columella and line tangent to philtrum; (C) nostril long axis and Frankfort perpendicular; and (D) nostril long axis and vertical facial plane.
Results: Of the 82 total respondents, mean age was 50 years (range, 30–80years), and mean professional experience was 17 years (range, 0–67 years). Nineteen described themselves as novice rhinoplasty surgeons, 27 as intermediates, and 36 as experts. Mean number of lifetime rhinoplasties performed was 966 (range, 0–10,000). Twenty respondents (24%) agreed with definition A, 27 (33%) with B, 16 (20%) with C, and 13 (16%) with D. Six chose "other," offering their own explanations of NLA. Self-identified novices were more likely to prefer definition D than were experts ($P = 0.009$).
Conclusions: No majority consensus was reached regarding the definition of NLA. Each method has its benefits and drawbacks, and establishing a single one may be unnecessary and even counterproductive in some cases. Having options available means that surgeons can tailor to each encounter, as long as they adopt a systematic methodology. We submit an algorithm to facilitate this effort. *(Plast Reconstr Surg Glob Open 2016;4:e752; doi: 10.1097/GOX.0000000000000729; Published online 20 June 2016.)*

Rhinoplasty is a difficult, subtle procedure requiring meticulous planning and operative technique. An important component of successful rhinoplasty is objective analysis of standardized photographs, which enables identification of deformities and assessment of results. Well-defined, standard parameters help guide such analysis. Several are routinely examined, including radix height, alar base width, nasal length, tip projection, and nasofrontal angal. Although "standard parameters" suggests concrete measurements that are easily reproducible on standardized photographs, facial topographic complexity often confounds matters.

From the Department of Plastic Surgery, University of Texas Southwestern, Dallas, Tex.

Received for publication October 16, 2013; accepted March 21, 2016.

DOI: 10.1097/GOX.0000000000000729

Disclosure: *The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the Plastic Surgery Department of University of Texas Southwestern.*

One controversial metric is the nasolabial angle (NLA), which is often used as a proxy for tip rotation and denotes the angle between the nasal base and the upper lip. However, the reference points/lines corresponding to these landmarks are not always obvious. The diverse answers offered by the literature[1–3] indicate a need for more clarity. The goals of this study were to (1) determine the consensus level among surgeons regarding the proper NLA definition, (2) investigate the strengths and weaknesses of each one, and (3) devise an algorithm to facilitate selection for a given patient.

METHODS

Surveys were administered to a convenience sample of surgeons interested or engaged in rhinoplasty. Paper surveys were distributed to registrants of The 30th Annual Dallas Rhinoplasty Symposium (Dallas, TX, 2013) and The Rhinoplasty Society 18th Annual Meeting (New York, NY, 2013). Electronic copies were e-mailed to rhinoplasty surgeons in academic and private practices worldwide. Recipients included Rhinoplasty Society members and Rhinoplasty Symposium instructors, speakers, and attendees. Two independent blinded reviewers assessed for false representation and duplicate names or handwriting.

The following information was collected: name (*optional*), age, specialty, practice type, practice location, years in practice, rhinoplasty experience (novice, intermediate, or expert), and estimated rhinoplasties performed. Participants were asked to choose their preferred NLA definition (Fig. 1) or elaborate their own with a supplemental diagram. Space was allotted for comments and justification.

Data analysis was performed with Microsoft Excel 2007 (Redmond, WA). The χ^2 test for contingency tables was used to determine statistically significant deviation from overall frequencies when examining subgroup data. Statistical significance was set at a P value <0.05.

RESULTS

Of 649 distributed surveys, 82 were completed (12.6% response rate). Eight submissions were discarded, including 3 duplicates (print and electronic copies returned by the same surgeon) and 5 incomplete surveys.

Most respondents were plastic surgeons (n = 76), although 7 ENT and 2 OMF surgeons were also included. Three identified with 2 specialties. Average age and time in practice were 50 (range, 30–80) years and 17 (range 0–67) years, respectively. Practice locations spanned 15 countries and 18 US states. Forty-six respondents (56%) were affiliated with private practices, 24 (29%) with academic institutions, 10 (12%) with both, and 2 (3%) with "other." Nineteen respondents (23%) identified as novices, 27 (33%) as intermediates, and 36 (44%) as experts. Lifetime rhinoplasties performed averaged 966 (range 0–10,000).

Twenty respondents (24%) chose definition A, 27 (33%) chose B, 16 (20%) chose C, and 13 (16%) chose D (Fig. 2). One respondent (1%) gave equal weight to definitions C and D, whereas 5 (6%) rejected all 4 in favor of their own, including the angle subtended by:

1. Columella and line perpendicular to Frankfort horizontal[3,4];
2. Columella and line intersecting glabella and pogonion (vertical facial plane);
3. Nostril's long axis and line tangent to cutaneous upper lip;
4. Nostril's long axis and line perpendicular to natural horizontal facial plane (NHFP)[5]; and
5. Nostril's long axis and line tangent to alar crease.

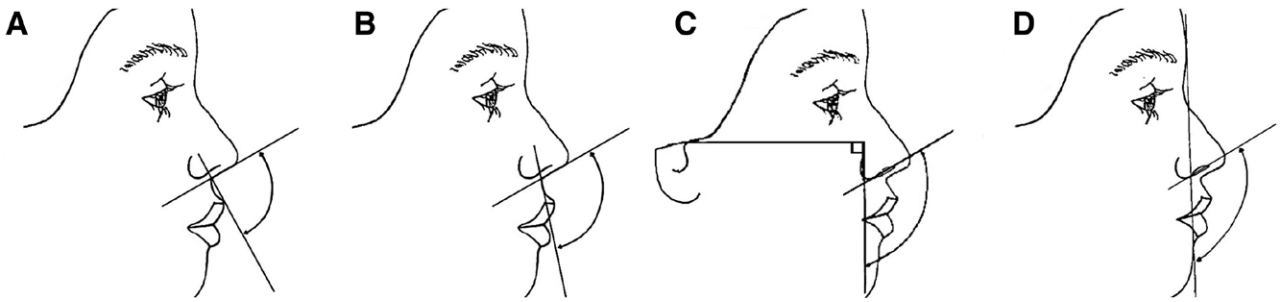

Fig. 1. Four common ways of measuring the nasolabial angle found in rhinoplasty literature[1] that were used in our survey: A, angle between columella and line intersecting subnasale and labrale superius[1]; B, angle between columella and line tangent to cutaneous upper lip proper[2]; C, angle between long axis of nostril and line perpendicular to Frankfort horizontal[3]; and D, angle between long axis of nostril and line intersecting glabella and pogonion.[4] Adapted with permission from Leach J. Aesthetics and the Hispanic rhinoplasty. *Laryngoscope*. 2002;112:1903–1916. Adaptations are themselves works protected by copyright. So in order to publish this adaptation, authorization must be obtained both from the owner of the copyright in the original work and from the owner of copyright in the translation or adaptation.

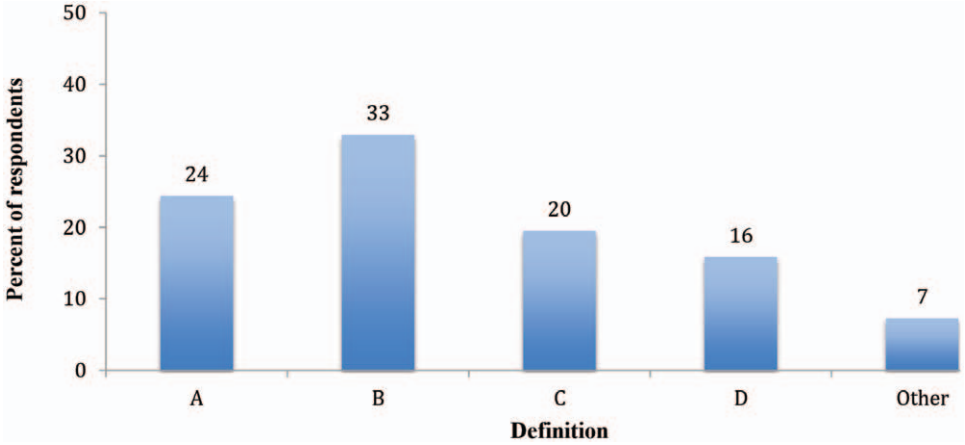

Fig. 2. Percentage of total respondents who chose each definition. A, Angle between columella and line intersecting subnasale and labrale superius; B, angle between columella and line tangent to cutaneous upper lip proper; C, angle between long axis of nostril and line perpendicular to Frankfort horizontal; and D, angle between long axis of nostril and line intersecting glabella and pogonion.

We analyzed the chosen definitions in terms of experience; that is, years in practice (Fig. 3), self-identified expertise (Fig. 4), and estimated rhinoplasties performed (Fig. 5). No consensus was found among respondents as a group or within subgroups stratified by experience and expertise level. Specifically, no NLA definition was chosen by a simple majority in any subgroup.

Contingency table analysis showed significance of the χ^2 test for the "rhinoplasty expertise" ($P = 0.039$) and "estimated lifetime rhinoplasties" ($P = 0.010$) subgroups. Novices were less likely than either intermediate or expert surgeons to choose option A ($P = 0.03$) and more likely to choose option D ($P = 0.009$). Surgeons who performed over 1,000 executed rhinoplasties chose option C less often than expected ($P = 0.058$), whereas those with <100 executed rhinoplasties chose option D more often than expected ($P = 0.10$).

DISCUSSION

A common goal in cosmetic rhinoplasty is nasal tip improvement, be it rotation, projection, or bulbosity correction.[6] In this context, the NLA becomes a parameter of interest. Just as NLAs vary widely between individuals, there are many NLA definitions, and the slight variations between them can yield large discrepancies on the same photograph. To minimize confusion, some would argue for a single, logical definition.

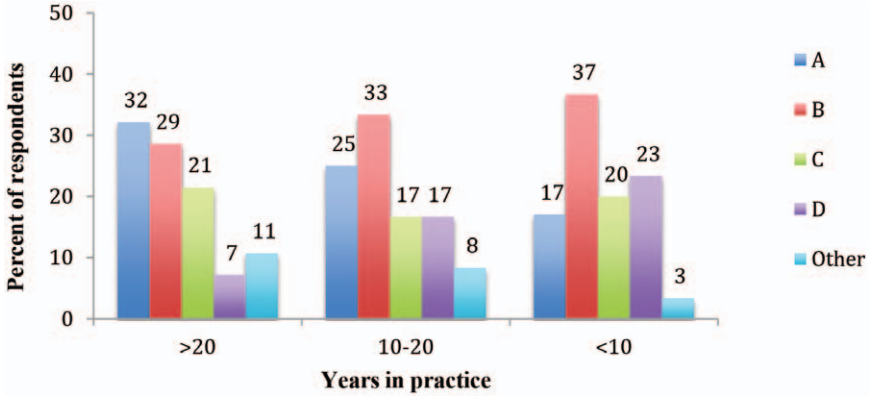

Fig. 3. Percentage of respondents who chose each definition, stratified by years in practice. Note that percentages are based on total respondents within each subgroup. A, Angle between columella and line intersecting subnasale and labrale superius; B, angle between columella and line tangent to cutaneous upper lip proper; C, angle between long axis of nostril and line perpendicular to Frankfort horizontal; and D, angle between long axis of nostril and line intersecting glabella and pogonion.

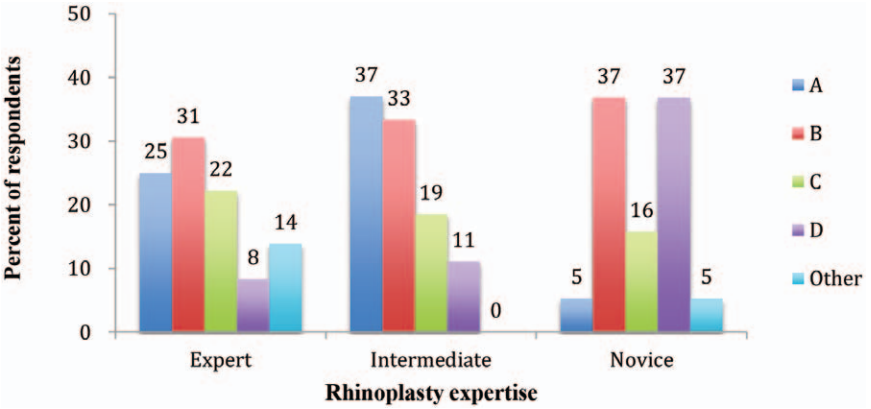

Fig. 4. Percentage of respondents who chose each definition, stratified by rhinoplasty expertise. Note that percentages are based on total respondents within each subgroup. A, Angle between columella and line intersecting subnasale and labrale superius; B, angle between columella and line tangent to cutaneous upper lip proper; C, angle between long axis of nostril and line perpendicular to Frankfort horizontal; and D, angle between long axis of nostril and line intersecting glabella and pogonion.

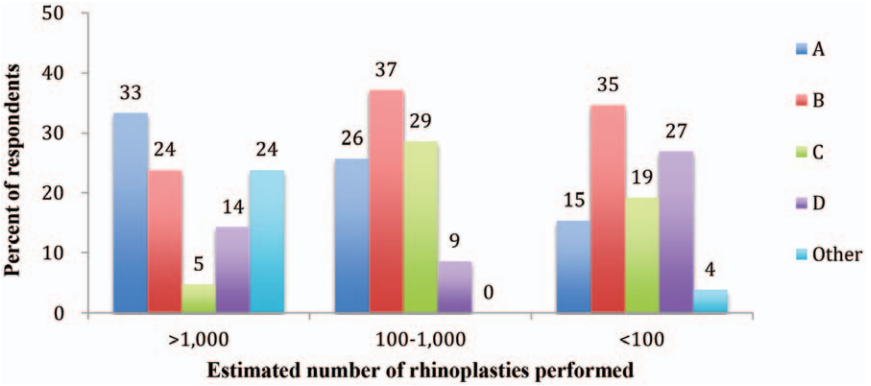

Fig. 5. Percentage of respondents who chose each definition, stratified by estimated number of rhinoplasties performed. Note that percentages are based on total respondents within each subgroup. A, Angle between columella and line intersecting subnasale and labrale superius; B, Angle between columella and line tangent to cutaneous upper lip proper; C, angle between long axis of nostril and line perpendicular to Frankfort horizontal; and D, angle between long axis of nostril and line intersecting glabella and pogonion.

The literature has made such attempts. Several authors support extant definitions, whereas others have proposed new ones that are allegedly more efficient and reproducible.[1–4,7–11] Such endeavors only reinforce this study's conclusion that there is no consensus NLA definition. Furthermore, establishing one may require enactment by a professional organization.

All NLA definitions incorporate skeletal or soft tissue landmarks. However, extreme variability in bone structure and soft tissue drape renders application of one NLA to all patients difficult. We explore the pros and cons of each method by dissecting the NLA into its "horizontal" (naso-) and "vertical" (-labial) components, starting with the horizontal limb. Methods A and B, which when combined were chosen by 57% of respondents, utilize the columella (hence the term "columellar-labial angle"). Although this reference line is easily identified and usually approximates nasal tip trajectory, it is strongly influenced by the caudal septum and maxillary spine.[8] As such, NLAs of 2 otherwise identical noses will differ if 1 has a hanging columella. Meanwhile, definitions C and D, which together were selected by 37% of respondents, utilize the nostril's long axis, which sidesteps the hanging columella issue, but may be misaligned with tip direction[3] and biased by nostril shape and position.

The vertical limb can be distinguished by soft tissue landmarks in definitions A and B (subnasale,

labrale superius, and upper philtrum) or by skeletal landmarks in definitions C and D (Frankfort horizontal, glabella, and pogonion). Advocates of the former contend that the NLA is a "local" measurement, and because the NLA is generally manipulated for aesthetic purposes, surface anatomy would seem more relevant. This may explain why 3-D imaging technologies like Vectra (Canfield Scientific Inc., Fairfield, NJ) measure NLAs consistent with definition A.[12]

It might be inferred that proponents of methods A and B regard C and D as indicators of tip rotation rather than NLA. This would partially account for the varying preferences. Supporting this notion is the fact that C and D lack a true "labial" component. Instead, they are governed by a facial plane defined by bone structures distant from the nose, less frequently altered surgically, and more constant over time.

As for weaknesses of definitions A and B, the subnasale and upper lip are subject to distortion by underlying bone or soft tissue abnormalities. The former include class II malocclusion, protrusive maxilla, upper incisor inclination, or divergent footplates. The latter include philtral/upper lip deficiency and upper lip fillers/implants.

The skeletal markers of definition D are similarly prone to distortions that may have no bearing on nasal aesthetics. For example, retrognathia or chin displacement by endotracheal tubes can influence the vertical facial plane.[1] Conversely, the perpendicular line intersecting the Frankfort plane (definition C) is independent of chin, teeth, and jaw position.[1] Guyuron[12] used the tragus and infraorbital rim to approximate the Frankfort plane on life-sized photography. If we were to recommend a universal NLA definition, it would be this one. However, we would be remiss not to qualify our preference by highlighting its reliance on photographer skills and marker placement on the infraorbital rim. It is clear that this method is not regarded as the gold standard, as at least 77% of experts and over 80% of all-comers subscribed to another NLA definition.

Four self-identified experts stressed the importance of the nasal spine and overlying soft tissue. We concur and accordingly frame our below NLA algorithm with these structures. One respondent suggested a line orthogonal to the NHFP, which extends through the facial profile with the head in repose and eyes gazing straightforward. True NHFP measurements have been described using inclinometers, fluid-level devices, and operator estimation of natural head position.[13–17] Requisite operator skills and equipment, however, may render this NLA method impractical.

Statistical analysis revealed that inexperienced surgeons, as implied by stated rhinoplasty expertise and total rhinoplasties performed, were more likely to rank definition D over definition A than experienced surgeons. Conversely, experienced surgeons were more likely to choose definition A. Recall that no consensus emerged, that is, no single NLA definition was chosen by even a simple majority within any subgroup.

Of the 4 options, D most resembles the "textbook" definition,[18] which might explain its popularity among novices. Definition A is arguably the easiest to assess intraoperatively—it is unaltered by endotracheal tubes and requires no visualization of distant, bony landmarks or tangential lines. This simplicity might explain its popularity among experienced surgeons.

We acknowledge that this study's main weakness is the survey return rate. Relative to the large audience polled, this may indicate a degree of self-selection bias. We nevertheless believe that our study population is suitable given the absolute number of responses and distribution across all experience levels, thus limiting sampling bias and enhancing external validity.

To organize our findings into a theoretical framework, we start with the premise that one's perception of the angle is what truly matters and that it should be free of any interfering factors. When such "distractors" exist at the local level (Table 1, left column), they nudge one's perspective in the myopic direction, whereupon methods A and B lose significance. When they occur distally (Table 1, right column), they tend to shift one's focus toward a myopic viewpoint, rendering methods C and D less useful. In summary, the best method of measurement is the one providing the least distraction and the best overall perception of the rotation/relationships of the nasal profile.

Table 1. Distractors of Perceived NLA

	Nasolabial Region (Local Structures)	Facial Plane (Distal Structures)
Skeletal	Nasal spine Protrusive Maxilla Retrusive Protrusive Incisors Retroclined Proclined	Forehead Retrusive Frontal bossing Chin Retrusive Protrusive
Soft tissue/cartilage	Nostril Alar notching Alar depression Columella Retrusive Hanging Infratip lobule Excess projection Exaggerated double break Upper lip Short philtrum Excess fullness	

A parallel concept lies in the field of architectural design. Much like methods A and B focus on local anatomy, elevation drawings depict 1 facade whereon every adornment is appreciable.[19] This zoomed-in view, however, risks loss of context and defect exposure. Abstracting from fine details is the axonometric projection, which depicts all 3 planes projected to scale.[20] Similar to methods C and D, these drawings furnish an aerial view, affording a more holistic perspective and demonstrating how individual units relate to the geometric totality. This zoomed-out view, however, is subject to optical distortion of diagonals and curves.

It is one thing to analyze facial profiles at a single point in time. However, if rhinoplasty is meant to effect positive, measurable change, then alteration of certain structures limits the utility of certain definitions in the context of pre- and postoperative comparison. Our proposed NLA guide accounts for surgical intervention, emphasizing important variables and minimizing confounders. A corresponding algorithm (Fig. 6) condenses this guide into an 11-step sequence.

NLA Guide

Nasal Spine

1. If the spine obfuscates the intersection point between the caudal nasal septum and the cutaneous upper lip proper, defined as the portion unaffected by spine protrusion:
   a. Method A is inappropriate because the subnasale is not easily identifiable.
   b. Methods B to D are valid.
2. If the spine comprises at least half of the cutaneous upper lip height:
   a. Exclude method B because the dominant spine will bias the slope of the vertical limb.
   b. Method A is null as per Rule 1.a.
   c. Methods C and D are suitable.
3. If surgical correction of the spine is planned, evaluate the impact on the labial vector.
   a. If significant, as with short, thin cutaneous upper lips with weak cephalic maxillary support:
      i. Methods C and D are void because they do not incorporate the slope change in their measurement.
      ii. Methods A and B best capture this alteration, for the subnasale recedes along with the soft tissue drape.
   b. If trivial, as with tall, thick cutaneous upper lips with robust cephalic maxillary buttress:
      i. Discard methods B to –D, as they do not reflect objective improvement.
      ii. Method A reflects this change and is ideal if the subnasale is easily pinpointed.

Upper Lip

1. If the cutaneous upper lip proper is markedly shorter than the alar groove-to-nasal tip length (ie, less than one-fifth):
   a. Exclude methods A and B because accurate angle perception depends on its constituent arms being readily conspicuous and comparable in length.
   b. A more panoramic view of the NLA, such as, methods C and D, is warranted.
2. If the cutaneous upper lip is excessively curved, then the proper NLA method depends on the etiology of curvature:
   a. "Tethered" lip secondary to nasal spine projection.
      i. See Nasal Spine Rule 1.
   b. "Pouty" lip secondary to congenital hyperplasia or lip augmentation.
      i. Avoid method A, which will yield a deceptively acute NLA due to artificial displacement of the labrale superius.
      ii. Methods B to D are suitable, even if concomitant upper lip surgery is performed.
3. If the upper lip contour is straight and thus merges with the horizontal limb at a sharp vertex:
   a. Methods A and B are more appropriate and will theoretically yield the same NLA.
   b. Methods C and D are less helpful, particularly if other anatomic variables are obtrusive (see see Nostril Rule 1 and Bony Anatomy Rules 1 and 2).

Nostril

1. If the nostril is abnormally shaped or hidden (eg, caudally malpositioned alar rim):
   a. Ignore methods C and D because their horizontal limb may not accurately reflect tip rotation in the absence of concomitant nostril surgery.
   b. Methods A and B are suitable irrespective of nostril surgery.

Bony Anatomy

1. If the forehead or chin is abnormally protrusive or retrusive:
   a. Exclude method D because the glabella-pogonion axis is off-kilter unless corrective surgery (eg, genioplasty or forehead contouring) is performed concomitantly.
   b. Irrespective of surgical correction, methods A to C are suitable.

2. Soft tissue markers may be placed before photography to approximate the Frankfort horizontal,[13] but if pertinent landmarks are not identifiable by palpation or on imaging:
   a. Method C is irrelevant because of vertical axis ambiguity.
   b. Methods A, B, and D are suitable.

Although we did not urge survey takers to break down any variables within Figure 1, most surgeons likely do not cater their NLA method to individual patients or follow an algorithmic approach, given a lack of comments otherwise. Occasionally, however, surgeon preference may prevail with near impunity. As Upper Lip Rule 3 implies, in the presence of straight vectors and no offending variables, surgeons may sidestep the algorithm altogether. A similar situation arises when all methods are ruled out or more than one remains, whereby sound judgment must ensue.

Perhaps time constraints are one reason to choose not to follow our guide. The decision making process may curb efficacy, especially if the surgeon operates a busy practice and his/her analytical methods are already standardized. However, given that no 2 patients are alike and that several rules apply to each, it might behoove surgeons to have a reference tool that systematically helps them choose the proper NLA. The following cases illustrate clinical application.

Fig. 6. Nasolabial angle algorithm. This represents a simplified version of the nasolabial angle guide and helps eliminate inapt modes of measurement in pursuit of the best one for a given patient.

Case Studies

Patient 1

As Figure 7 illustrates, the patient's nasal spine (step 1) creates such upper lip curvature that the natural position of her subnasale is obscured; hence, method A is dismissed (step 2). Her spine governs the labial slope to the extent that the demarcation between spine and cutaneous upper lip proper is blurred, undermining method B (step 3).

Fig. 7. A 36-year-old female patient with upper lip concavity status post augmentation, a prominent nasal spine, and a hypoplastic chin.

Assuming no spine correction (step 4), we can bypass step 5. Her augmented lip (step 6) kinks the labial vector (step 8), further precluding method A. Step 7 is irrelevant because methods A and B were already eliminated. Her hypoplastic chin (step 9) discards method D. Frankfort horizontal landmarks can be approximated (step 10), and nostril show is adequate (step 11), making method C the most viable.

Patient 2

Although this patient's preoperative nasal spine (step 1) pushes the subnasale anteriorly (Fig. 8, left), the latter is sufficiently visible to retain method A (step 2). Moreover, the spine occupies at least half of the cutaneous lip, rejecting method B (step 3). Methods C and D are also obviated, as spine modification (step 4) would result in a posteriorly translated subnasale (Fig. 8, right) without labial vector rotation (step 5). The upper lip vermilion is not hyperplastic (step 6), and although the cutaneous upper lip proper is short, it does not quite meet the one-fifth requirement of Upper Lip Rule 1 (step 7). The remaining steps concern previously disregarded methods, rendering method A the most prudent. Interestingly, had the cephalic cutaneous upper lip significantly receded postoperatively, method A would have still been optimal, especially because it enables quantification of NLA improvement.

Patient 3

At baseline (Fig. 9, left), this patient lacks nasal spine protrusion (step 1), so we can skip the next 4 steps. As her upper lip lacks pout (step 6) and has decent height (step 7), all methods are still in contention. However, her curved labial vector (step 8) and equivocal nostril axis obviate methods C and D (step 9). The remaining steps are irrelevant as methods C and D are no longer in play, leaving us with methods A and B. Whether or not alar rim correction is planned, the columella, subnasale, and labial tissue are unaffected, making either definition suitable (Fig. 9, right).

CONCLUSIONS

One goal of this survey-based study was to identify the consensus level regarding the proper NLA definition. Although no such uniformity exists, our findings are equally insightful, underscoring that even experts maintain conflicting beliefs. It is, therefore, crucial that authors state which definition they use to enable accurate interpretation. Our results also suggest that NLA and tip rotation may be distinct entities. Given the manifold approaches,

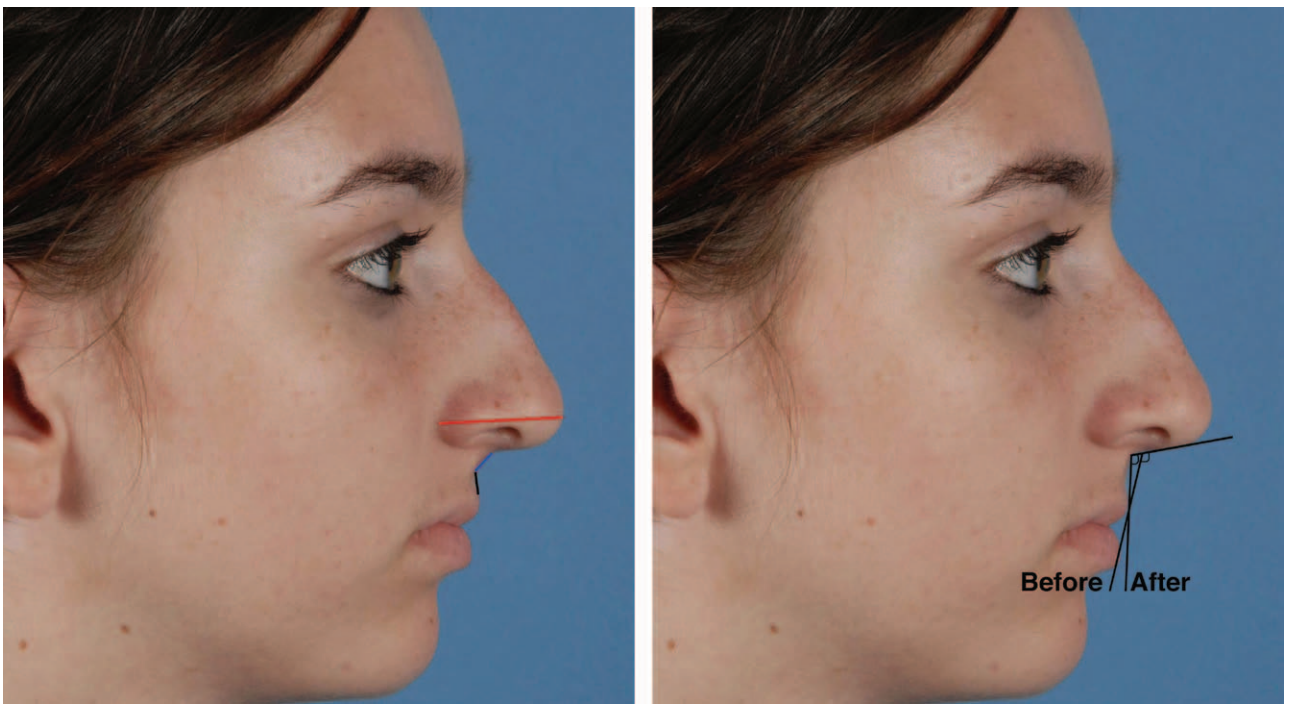

Fig. 8. Left, Preoperative photograph of a 16-year-old patient with tethered upper lip because of her prominent nasal spine. The cutaneous upper lip proper (black) is barely shorter than the spine (blue), but slightly greater than one-fifth of the alar groove-to-nasal tip distance (red). Right, Note how theoretical spine correction alters the NLA despite negligible change in the labial vector slope. Photograph edits made with Adobe Photoshop CS6 (Adobe Systems, Inc., San Jose, Calif.).

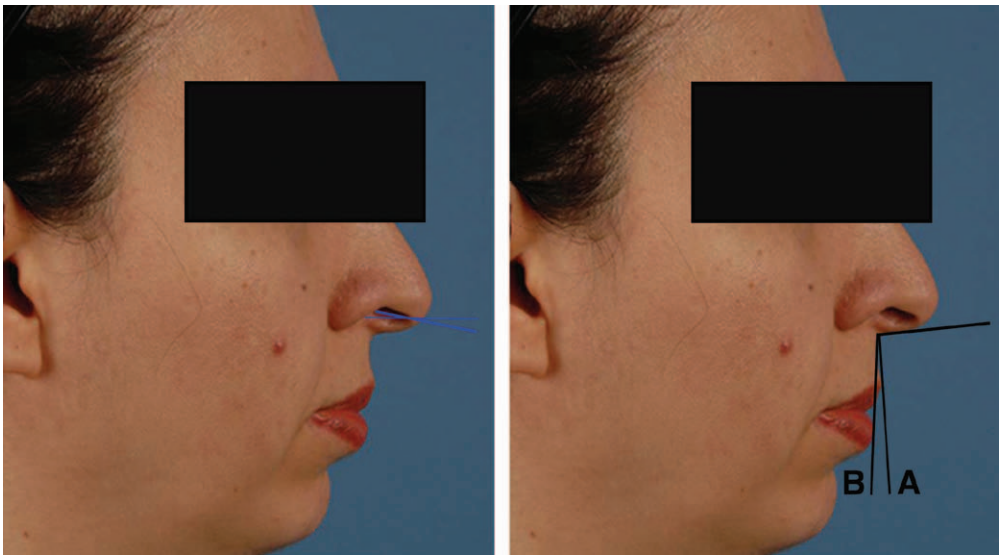

Fig. 9. Left, A middle-aged female patient with alar rim notching, a tall, curved upper lip, and no obvious nasal spine. The blue lines represent 2 possible long axes of her misshapen nostril. Right, The vertical limbs of methods A and B are shown drawn through the labrale superius and along the cutaneous upper lip contour, respectively. Both methods share the same columella vector. Photograph edits made with Adobe Photoshop CS6 (Adobe Systems, Inc.).

one might call for a better NLA definition that incorporates nasal tip trajectory (columellar or nostril axis) with respect to the upper lip. Likewise, a more appropriate definition of nasal tip rotation might encompass the tip's relationship with the vertical plane (Frankfort perpendicular versus glabella-pogonion axis).

Having a universal definition is one way to eliminate the variability of NLA measurement. However, blindly applying a single definition risks losing accuracy. Instead, we hope to promote greater standardization of nasal analysis via an unbiased NLA guide. By no means is it all-encompassing, but it highlights important, common considerations. Having options enables case-by-case decision-making provided that surgeons understand the benefits and drawbacks of each one and remain consistent in pre- and postoperative photographic analysis.

Bardia Amirlak, MD, FACS
Department of Plastic Surgery
University of Texas Southwestern
1801 Inwood Rd, Dallas, TX 75390
E-mail: Bardia.Amirlak@UTSouthwestern.edu

ACKNOWLEDGMENT

The authors thank Diane Sinn for her help with creating, distributing, and collecting the surveys used in this study. This study was conducted in accordance with the Declaration of Helsinki.

PATIENT CONSENT

Patients provided written consent for the use of their images.

REFERENCES

1. Leach J. Aesthetics and the Hispanic rhinoplasty. *Laryngoscope.* 2002;112:1903–1916.
2. Armijo BS, Brown M, Guyuron B. Defining the ideal nasolabial angle. *Plast Reconstr Surg.* 2012;129:759–764.
3. Kim DW, Egan KK. Metrics of nasal tip rotation: a comparative analysis. *Laryngoscope.* 2006;116:872–877.
4. Biller JA, Kim DW. A contemporary assessment of facial aesthetic preferences. *Arch Facial Plast Surg.* 2009;11:91–97.
5. Bohluli B, Varedi P, Nazari S, et al. Lateral crural suspension flap: a novel technique to modify and stabilize the nasolabial angle. *J Oral Maxillofac Surg.* 2013; 71(9):1572–1576.
6. Lee M, Unger JG, Gryskiewicz J, et al. Current clinical practices of the Rhinoplasty Society members. *Ann Plast Surg.* 2013;71:453–455.
7. Fitzgerald JP, Nanda RS, Currier GF. An evaluation of the nasolabial angle and the relative inclinations of the nose and upper lip. *Am J Orthod Dentofacial Orthop.* 1992;102:328–334.
8. Gunter JP, Rohrich RJ. Lengthening the aesthetically short nose. *Plast Reconstr Surg.* 1989;83:793–800.
9. Nandini S, Prashanth CS, Somiah SK, et al. An evaluation of nasolabial angle and the relative inclinations of the nose and upper lip. *J Contemp Dent Pract.* 2011;12:152–157.
10. Spörri S, Simmen D, Briner HR, et al. Objective assessment of tip projection and the nasolabial angle in rhinoplasty. *Arch Facial Plast Surg.* 2004;6:295–298; discussion 299.
11. Robison JM, Rinchuse DJ, Zullo TG. Relationship of skeletal pattern and nasal form. *Am J Orthod.* 1986;89:499–506.
12. Guyuron B. Precision rhinoplasty. Part I: The role of life-size photographs and soft-tissue cephalometric analysis. *Plast Reconstr Surg.* 1988;81:489–499.

13. Lundström A, Lundström F, Lebret LM, et al. Natural head position and natural head orientation: basic considerations in cephalometric analysis and research. *Eur J Orthod*. 1995;17:111–120.
14. Moorrees CF, Kean MR. Natural head position, a basic consideration in the interpretation of cephalometric radiographs. *Am J Phys Anthropol*. 1958;16:213–234.
15. Cleall JF. Deglutition: a study of form and function. *Am J Orthod*. 1965;51:566–594.
16. Showfety KJ, Vig PS, Matteson S. A simple method for taking natural-head-position cephalograms. *Am J Orthod*. 1983;83:495–500.
17. Preston CB, Evans WG, Todres JI. The relationship between ortho head posture and head posture measured during walking. *Am J Orthod Dentofacial Orthop*. 1997;111:283–287.
18. *Grabb & Smith's Plastic Surgery*. 6th ed. Charles H. Thorne. Lippincott, Philadelphia: Williams & Wilkins; 2007:525.
19. Kicklighter CE, Baird RJ, Kicklighter JC. *Architecture: Residential Drawing and Design*. South Holland, IL: Goodheart-Willcox Co.; 1995.
20. McMorrough J. *Drawing for Architects: How to Explore Concepts, Define Elements, and Create Effective Built Design Through Illustration*. Beverly: Rockport Publishers; 2014.