

Implications of Facial Asymmetry in Rhinoplasty

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Summary: Many rhinoplasty patients present with a chief complaint of nasal deviation and are unaware of any inherent facial asymmetries; however, recognizing and discussing the interrelation between the deviated nose and facial asymmetry is an important consideration in surgical planning. The objective of this study was to evaluate whether a surgeon's subjective assessment of facial analysis in the setting of nasal deviation correlates with objective anthropometric measurements. In addition, this study sought to further quantify the frequency of facial asymmetry associated with nasal deviation to highlight important anatomical trends for the rhinoplasty surgeon. Finally, this study presents the senior author's (R.J.R.) method of addressing a deviated nose on an asymmetric face. In this study, the authors demonstrated that nasal deviation is closely related to facial asymmetry. Furthermore, the authors demonstrated that objective facial analysis closely correlates to anthropometric facial measurements. In addition, the wide side of the face correlates to the short side of the face and the nose tends to deviate away from the wide side of the face. During surgical correction of the deviated nose in the setting of facial asymmetry, the surgeon's goal should be to obtain nasal symmetry and center the nose on a line between the mid glabella and the mid Cupid's bow. This may reduce the perception of a facial asymmetry, leading to increased patient satisfaction. (*Plast. Reconstr. Surg.* 140: 510, 2017.)

CLINICAL QUESTION/LEVEL OF EVIDENCE: Diagnostic, IV.

The shape and anatomical position of the nose are major determinants of overall facial harmony and aesthetics.¹⁻³ In 2014, rhinoplasty was one of the most sought out and commonly performed aesthetic procedures, with 217,000 cases performed.⁴ The evaluation of a rhinoplasty patient is multifaceted and includes a nasal history, examination of the nasal airway, and performance of a nasofacial analysis, which plays a critical role in selecting the appropriate surgical plan to achieve facial harmony and improved aesthetics.^{1,5,6} Furthermore, many rhinoplasty patients present with a chief complaint of nasal deviation and are unaware of any inherent facial

asymmetries; however, recognizing and discussing the interrelation between the deviated nose and facial asymmetry is an important consideration in surgical planning.⁷

A number of studies investigating the relation between the deviated nose and facial asymmetry have been performed.^{2,3,8-11} These studies have demonstrated a positive correlation between nasal deviation and facial asymmetry when compared to control patients without nasal deviation.^{2,8,11,12} Furthermore, in nontraumatic cases, the nasal axis typically deviates toward the smaller side of the face and is accompanied by chin tilt.¹¹ These findings may be explained by facial growth patterns but have not been clearly recognized.⁸ Understanding these anatomical trends is a critical part of the preoperative evaluation of a patient with nasal deviation presenting for a rhinoplasty consultation. Correction of the deviated nose is a unique challenge for the

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rhinoplasty surgeon because of the functional and aesthetic problems that must be addressed, and an optimal outcome is based on the identification of facial asymmetry in these patients. The objective of this study was to evaluate whether a surgeon’s subjective assessment of facial analysis in the setting of nasal deviation correlates with objective anthropometric measurements. In addition, this study sought to further quantify the frequency of facial asymmetry associated with nasal deviation to highlight important anatomical trends for the rhinoplasty surgeon. Finally, this study presents the senior author’s (R.J.R.) method of addressing a deviated nose on an asymmetric face.

PATIENTS AND METHODS

An analysis was conducted on a randomly selected preoperative photographic database of patients who presented to the senior surgeon (R.J.R.) for primary rhinoplasty evaluation. One hundred patients, 22 men and 78 women, with ages ranging from 18 to 65 years, were then analyzed subjectively by three blinded plastic surgeons for nasal deviation, chin deviation, facial width, and facial height using previously described facial analysis methods.⁵ The same 100 patients were then objectively measured for the same parameters using the measuring tool in Adobe Photoshop CS2 (Adobe Systems, Inc., San Jose, Calif.). The anthropometric landmarks that were used were as follows: facial height was measured separately on each side of the face from zygion to gonion; facial width was measured separately on each side of the face from midline (a line between the midpoint of the glabella to the midpoint of the Cupid’s bow) to zygion; nasal and chin deviation were measured from the deviation of the nose and chin from midline (a line between the midpoint of the glabella to the midpoint of the Cupid’s bow). Relationships among facial deviation, width, and height were assessed. The relationship between subjective and objective measurements was also analyzed.

RESULTS

The Majority of Patients Were Found to Have Left Nasal Deviation

Of the patients measured ($n = 100$), 42 (42 percent of all patients analyzed) were subjectively found to have left nasal deviation, and 32 (32 percent of all patients analyzed) were subjectively found to have right nasal deviation. However, when measured objectively, 44 (44 percent of all

patients analyzed) were found to have left nasal deviation, and 33 (33 percent of all patients analyzed) were objectively found to have right nasal deviation. There was a 95.45 percent agreement between left deviated nasal subjective and objective data and a 96.97 percent agreement between right deviated nasal subjective and objective data (Table 1).

The Majority of Patients Were Found to Have Left Chin Deviation

Of the patients measured ($n = 100$), 49 (49 percent of all patients analyzed) were subjectively found to have left chin deviation, and 17 (17 percent of all patients analyzed) were subjectively found to have right chin deviation. However, when measured objectively, 50 (50 percent of all patients analyzed) were found to have left chin deviation, and 20 (20 percent of all patients analyzed) were objectively found to have right chin deviation. There was a 98 percent agreement between left-deviated chin subjective and objective data and an 85 percent agreement between right chin–deviated subjective and objective data (Table 1).

The Majority of Patients Were Found to Have Left Facial Widening

Of the patients measured ($n = 100$), 63 (63 percent of all patients analyzed) were subjectively found to have left facial widening, and 36 (36 percent of all patients analyzed) were subjectively found to have right facial widening. However, when measured objectively, 63 (63 percent of all patients analyzed) were found to have left facial widening, and 37 (37 percent of all patients analyzed) were objectively found to have right facial widening. There was a 100 percent agreement between left facial widening subjective and objective data and a 97.3 percent agreement between

Table 1. Nasofacial Analysis*

	Subjective	Objective	Agreement (%)
Nasal deviation			
Left	42	44	95
Right	32	33	97
Chin deviation			
Left	49	50	98
Right	17	20	85
Facial widening			
Left	61	63	100
Right	36	37	97
Facial shortness			
Left	61	62	99
Right	37	38	97

*Comparison of subjective and objective assessments.

right facial wideness subjective and objective data (Table 1).

The Majority of Patients Were Found to Have Left Facial Shortness

Of the patients measured ($n = 100$), 61 (61 percent of all patients analyzed) were subjectively found to have left facial shortness, and 37 (37 percent of all patients analyzed) were subjectively found to have right facial shortness. However, when measured objectively, 62 (62 percent of all patients analyzed) were found to have left facial shortness, and 38 (38 percent of all patients analyzed) were objectively found to have right facial shortness. There was a 98.39 percent agreement between left facial shortness subjective and objective data and a 97.37 percent agreement between right facial shortness subjective and objective data (Table 1).

When objectively comparing nasal deviation to facial widening, the following results were found: 21 patients (27 percent of patients with nasal deviation and facial widening) had left nasal deviation and left facial widening; 23 patients (30 percent of patients with nasal deviation and facial widening) had left nasal deviation and right facial widening; 27 patients (35 percent of patients with nasal deviation and facial widening) had right nasal deviation and left facial widening; and six patients (6 percent of patients with nasal deviation and facial widening) had right nasal deviation and right facial widening (Table 2).

When objectively comparing chin deviation to facial widening, the following results were found: 27 patients (39 percent of patients with chin deviation and facial widening) had left chin deviation and left facial widening; 23 patients (33 percent of patients with chin deviation and facial widening) had left chin deviation and right facial widening; 15 patients (21 percent of patients with chin deviation and facial widening) had right chin deviation and left facial widening; and five patients

(7 percent of patients with chin deviation and facial widening) had right chin deviation and right facial widening (Table 2).

When objectively comparing nasal deviation to facial short side, the following results were found: 26 patients (34 percent of patients with nasal deviation and a facial short side) had left nasal deviation and a left facial short side; 18 patients (23 percent of patients with nasal deviation and a facial short side) had left nasal deviation and a right facial short side; 24 patients (31 percent of patients with nasal deviation and a facial short side) had right nasal deviation and a left facial short side; and nine patients (12 percent of patients with nasal deviation and a facial short side) had right nasal deviation and a right facial short side (Table 3).

When objectively comparing chin deviation to facial short side, the following results were found: 30 patients (43 percent of patients with chin deviation and a facial short side) had left chin deviation and a left facial short side; 20 patients (29 percent of patients with chin deviation and a facial short side) had left chin deviation and a right facial short side; 12 patients (17 percent of patients with chin deviation and a facial short side) had right chin deviation and a left facial short side; and eight patients (11 percent of patients with chin deviation and a facial short side) had right chin deviation and a right facial short side (Table 3).

When objectively comparing nasal deviation to chin deviation, the following results were found: 24 patients (42 percent of patients with nasal deviation and chin deviation) had left nasal deviation and left chin deviation; 10 patients (18 percent of patients with nasal deviation and chin deviation) had left nasal deviation and right chin deviation; 16 patients (28 percent of patients with nasal deviation and chin deviation) had right nasal deviation and left chin deviation; and seven patients (12 percent of patients with nasal deviation and

Table 2. Relationships between the Wide Side of the Face and Nasal Deviation or Chin Deviation*

Characteristic	Facial Widening	
	Left (%)	Right (%)
Nasal deviation		
Left	21 (27)	23 (30)
Right	27 (35)	6 (8)
Chin deviation		
Left	27 (39)	23 (33)
Right	15 (21)	5 (7)

*No. of patients and percentage of total patients in the given subgroups.

Table 3. Relationships between the Short Side of the Face and Nasal Deviation or Chin Deviation*

Characteristic	Facial Short Side	
	Left (%)	Right (%)
Nasal deviation		
Left	26 (34)	18 (23)
Right	24 (31)	9 (12)
Chin deviation		
Left	30 (43)	20 (29)
Right	12 (17)	8 (11)

*No. of patients and percentage of total patients in the given subgroups.

chin deviation) had right nasal deviation and right chin deviation (Table 4).

When objectively comparing facial widening to a facial short side, the following results were found: 45 patients (45 percent of patients with facial widening and a facial short side) had left facial widening and a left facial short side; 18 patients (18 percent of patients with facial widening and a facial short side) had left facial widening and a right facial short side; 17 patients (17 percent of patients with facial widening and a facial short side) had right facial widening and a left facial short side; and 20 patients (20 percent of patients with facial widening and a facial short side) had right facial widening and a right facial short side (Table 4).

DISCUSSION

This study evaluated the frequency and characteristics of facial asymmetry in a population of patients seeking rhinoplasty. Our study demonstrates that subjective facial and nasal analysis agrees with objective anthropometric measurements of nasal deviation and facial symmetry. Identification of these asymmetries is important in the preoperative evaluation of the rhinoplasty patient to manage expectations and guide operative planning. In this study population, we also identified that all patients presenting for rhinoplasty have facial asymmetries. Although we did not quantify the degree of asymmetry during analysis, identifying even subtle facial asymmetries before performing a rhinoplasty is critical for thorough preoperative evaluation and patient disclosure.

Our results are also in agreement with previous studies demonstrating that nasal deviation is commonly associated with facial asymmetry.^{2,8,10-12} Furthermore, the direction of deviation was noted to occur predominantly opposite to the wide side or toward the narrow side of the face. This correlation

was most prevalent in patients with right nasal deviation, of which 35 percent of patients had a wider left side. Similar trends, although not as strong, were noted when analyzing data from patients with left nasal deviation, of which 30 percent of patients had a wider right face. This finding is in agreement with previous studies that the nasal deviation tends to be toward the narrow side of the face,^{8,11,12} although nasal deviation did not have a strong association with chin deviation. Also, we noted a correlation between the wide side and short side of the face. For example, the majority of patients who were noted to have a wide left side of the face were also noted to have a short left side of the face. These data provide further evidence for the theory that during development the nose tends to deviate toward the side of the face with delayed growth and may be related only to midfacial growth.⁸ Despite this phenomenon noted, larger population studies are required to further validate our findings. It is also important to note that in this study population 75 percent of the patients had nasal deviation, which may not actually correlate with the number of patients in the senior author's practice presenting with nasal deviation for primary rhinoplasty, and may be a bias of the random selection process of this study. However, this phenomenon may be indicative of the fact that many patients presenting for rhinoplasty do have deviated noses. Further population studies are required to determine the actual percentage of patients who present for primary rhinoplasty and have nasal deviation.

Nasofacial analysis plays a key role in achieving facial harmony with rhinoplasty. Systematic nasal analysis is important to identify deformities, evaluate anatomical relationships, and establish goals for surgery. The facial analysis is performed during preoperative planning, in the frontal view, before performing nasal analysis. Therefore, in the frontal view, facial symmetry is assessed through evaluation of facial height, width, and nasal and chin deviation followed by a comprehensive nasal analysis on frontal, lateral, and basal views as described previously (Table 5).¹

Yi and Jang demonstrated that, despite improving nasal deviation, patients with facial asymmetry continued to perceive their nose as being deviated, which may have been a result of incomplete correction or newly identified disharmony in the setting of an asymmetric face.¹¹ However, it has also been demonstrated that improvement in nasal symmetry after rhinoplasty leads to a perception that the face is more symmetrical.^{2,7} The rhinoplasty surgeon must perform an in-depth analysis, and in plain terms, discuss all asymmetries noted

Table 4. Relationship between Nasal Deviation and Chin Deviation*

	Left (%)	Right (%)
Chin deviation		
Nasal deviation		
Left	24 (42)	10 (18)
Right	16 (28)	7 (12)
Facial short side		
Facial widening		
Left	45 (45)	18 (18)
Right	17 (17)	20 (20)

*Relationship between facial short side and facial widening (no. of patients and percentage of total patients in the given subgroups).

Table 5. Preoperative Systematic Nasofacial Analysis*

View	Characteristics
Frontal	
Facial proportions	Width (fifths), height (thirds), symmetrical or asymmetrical, and chin deviation
Skin type/quality	Fitzpatrick type, thin or thick, sebaceous
Symmetry and nasal deviation	Midline, C- reverse C-, S- or s-shaped deviation
Bony vault	Narrow or wide, asymmetrical, short or long nasal bones
Midvault	Narrow or wide, collapse, inverted-V deformity
Dorsal aesthetic lines	Straight, symmetrical or asymmetrical, well- or ill-defined, narrow or wide
Nasal tip	Ideal/bulbous/boxy/pinched, supratip, tip-defining points, infratip lobule
Alar rims	Gull-shaped, facets, notching, retraction
Alar base	Width
Lateral	
Nasofrontal angle	Acute or obtuse, high or low, radix
Nasal length	Long or short
Dorsum	Smooth, hump, scooped out
Supra tip	Break, fullness, pollybeak
Tip projection	Overprojected or underprojected
Tip rotation	Overrotated or underrotated
Alar-columellar relationship	Hanging or retracted alae, hanging or retracted columella
Periapical hypoplasia	Maxillary or soft-tissue deficiency
Lip-chin relationship	Normal, deficient
Basal	
Nasal projection	Overprojected or underprojected, columellar-to-lobular ratio
Nostril	Symmetrical or asymmetrical, long or short
Columella	Septal tilt, flaring of medial crura
Ala base	Width
Alar flaring	

*Modified with permission from Rohrich RJ, Ahmad J. Rhinoplasty. *Plast Reconstr Surg*. 2011;128:49e–73e.

and how this will affect the surgical plan. The question remains: How do you fix a deviated nose on an asymmetric face? Despite chin position, the nose must always be placed in the middle of the asymmetric face so that it will be centered on a line from the midglabellar region to the middle of the Cupid's bow on the upper lip (Fig. 1). Techniques for the correction of a deviated nose have been previously well described.^{13–16} However, it is important to note that in a majority of the cases that require correction of nasal deviation, the senior author (R.J.R.) uses upper lateral tension spanning sutures and septal reconstruction, which occasionally includes moving the septum off of the anterior nasal spine.¹³ The case presented in Figure 1 is an excellent example of how centering the nose to this line improves overall facial harmony. In addition, despite the fact that no other surgical procedures were performed on the patient's face, there is an appearance of improved facial symmetry. Although this is a single case report, further study using this goal of centering the nose on the midglabellar to mid-Cupid's bow line to improve facial harmony and perceived symmetry is necessary. Furthermore, improvements in nasal symmetry lead to the perception of better facial symmetry by reducing the amount of attention paid to the nasal area when compared to a patient with a crooked nose.¹⁷ Beauty and the perception

of it are closely tied to facial symmetry.^{18–20} Therefore, it is of utmost importance to not only correct the nasal deviation but maintain or improve nasal symmetry within the context of the patient's facial symmetry.

CONCLUSIONS

In our study, we demonstrated that nasal deviation is closely related to facial asymmetry. In addition, the majority of patients presenting for rhinoplasty evaluation had facial asymmetries. These findings need to be further validated on a larger scale, as it may be closely related to facial development. Furthermore, we demonstrated that objective facial analysis closely correlates to anthropometric facial measurements. In addition, the wide side of the face correlates to the short side of the face, and the nose tends to deviate away from the wide side of the face. During surgical correction of the deviated nose in the setting of facial asymmetry, the surgeon's goal should be to obtain nasal symmetry and center the nose on a line between the mid glabella and mid Cupid's bow. This may reduce the perception of facial asymmetry, leading to increased patient satisfaction. These findings are important to the rhinoplasty surgeon because understanding that most patients who present with nasal deviation

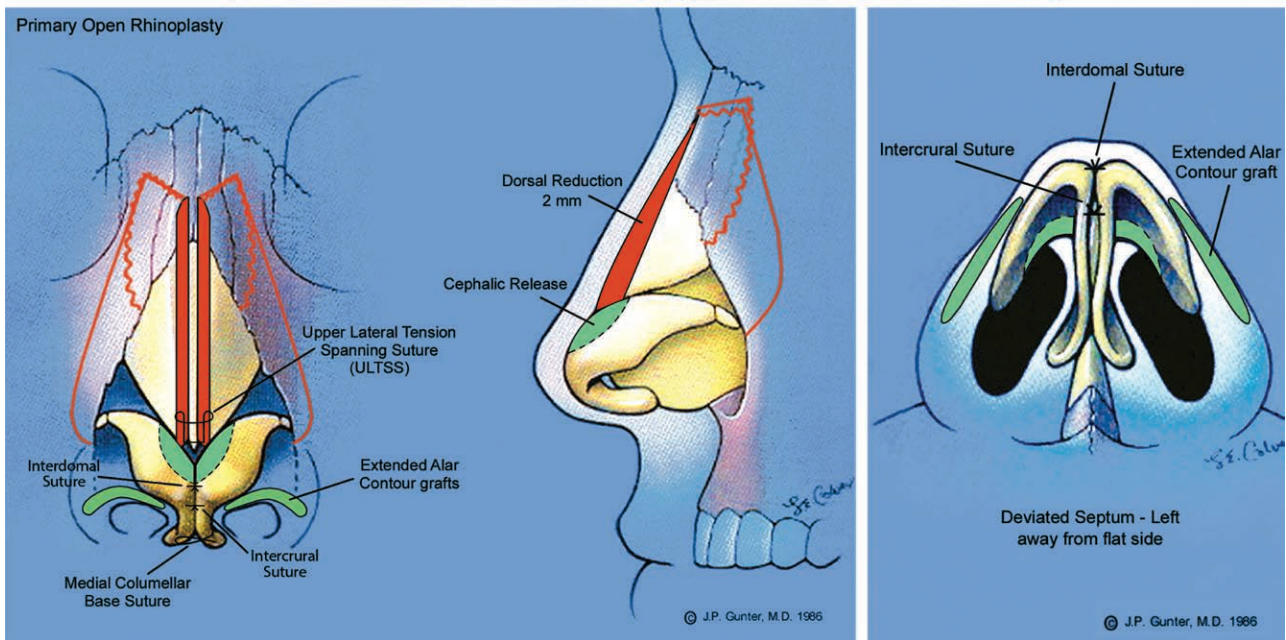


Fig. 1. Case example. Young female patient presenting with left nasal deviation and a right wide and short facial asymmetry. Preoperative (*above, left*) and postoperative (*above, right*) results of primary open rhinoplasty (note: a line is drawn from the mid glabella to mid Cupid’s bow on which the nose should be centered). (*Below*) Primary open rhinoplasty performed with cephalic release, 2-mm dorsal reduction, extended alar contour grafts, upper lateral tension spanning suture, interdomal suture, intercrucial suture, medial columellar base suture, septal reconstruction, and osteotomies.

are likely to have associated facial asymmetries will help guide surgical planning.

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PATIENT CONSENT

The patient provided written consent for the use of her images.

REFERENCES

1. Rohrich RJ, Ahmad J. Rhinoplasty. *Plast Reconstr Surg.* 2011;128:49e–73e.

2. Nouraei SA, Pulido MA, Saleh HA. Impact of rhinoplasty on objective measurement and psychophysical appreciation of facial symmetry. *Arch Facial Plast Surg*. 2009;11:198–202.
3. Münker R. Facial profile correction and nasal appearance. *Facial Plast Surg*. 1995;11:138–158.
4. American Society of Plastic Surgeons. Top 5 cosmetic procedures of 2014. Available at: <http://www.plasticsurgery.org/news/plastic-surgery-statistics/2014-statistics/top-five-cosmetic-surgery-procedures-2014.html>. Accessed December 1, 2015.
5. Gunter JP, Adams WP. *Dallas Rhinoplasty: Nasal Surgery by the Masters*. Vol. 1. St. Louis: Quality Medical; 2002.
6. Janis J, Rohrich RJ. Clinical decision-making in rhinoplasty. In: Nahai F, ed. *The Art of Aesthetic Surgery: Principles & Techniques*. 2nd ed. St. Louis: Quality Medical; 2005.
7. Chatrath P, De Cordova J, Nouraei SA, Ahmed J, Saleh HA. Objective assessment of facial asymmetry in rhinoplasty patients. *Arch Facial Plast Surg*. 2007;9:184–187.
8. Hafezi F, Naghibzadeh B, Nouhi A, Yavari P. Asymmetric facial growth and deviated nose: A new concept. *Ann Plast Surg*. 2010;64:47–51.
9. Jang YJ, Wang JH, Lee BJ. Classification of the deviated nose and its treatment. *Arch Otolaryngol Head Neck Surg*. 2008;134:311–315.
10. Katira K, Guyuron B. The deviated nose and asymmetric eyebrows: An important trap to avoid. *Plast Reconstr Surg*. 2014;133:519–523.
11. Yi JS, Jang YJ. Frequency and characteristics of facial asymmetry in patients with deviated noses. *JAMA Facial Plast Surg*. 2015;17:265–269.
12. Yao F, Lawson W, Westreich RW. Effect of midfacial asymmetry on nasal axis deviation: Indications for use of the subalar graft. *Arch Facial Plast Surg*. 2009;11:157–164.
13. Gunter JP, Rohrich RJ. Management of the deviated nose: The importance of septal reconstruction. *Clin Plast Surg*. 1988;15:43–55.
14. Rohrich RJ, Gunter JP, Deuber MA, Adams WP Jr. The deviated nose: Optimizing results using a simplified classification and algorithmic approach. *Plast Reconstr Surg*. 2002;110:1509–1523; discussion 1524–1525.
15. Rohrich RJ, Adams WP Jr, Ahmad J, Gunter JP, eds. *Dallas Rhinoplasty: Nasal Surgery by the Masters*. Boca Raton, Fla: CRC Press; 2014.
16. Geissler PJ, Roostaean J, Lee MR, Unger JJ, Rohrich RJ. Role of upper lateral cartilage tension spanning suture in restoring the dorsal aesthetic lines in rhinoplasty. *Plast Reconstr Surg*. 2014;133:7e–11e.
17. Godoy A, Ishii M, Byrne PJ, Boahene KD, Encarnacion CO, Ishii LE. The straight truth: Measuring observer attention to the crooked nose. *Laryngoscope* 2011;121:937–941.
18. Lu SM, Bartlett SP. On facial asymmetry and self-perception. *Plast Reconstr Surg*. 2014;133:873e–881e.
19. Rhodes G. The evolutionary psychology of facial beauty. *Annu Rev Psychol*. 2006;57:199–226.
20. Zaidel DW, Cohen JA. The face, beauty, and symmetry: Perceiving asymmetry in beautiful faces. *Int J Neurosci*. 2005;115:1165–1173.