

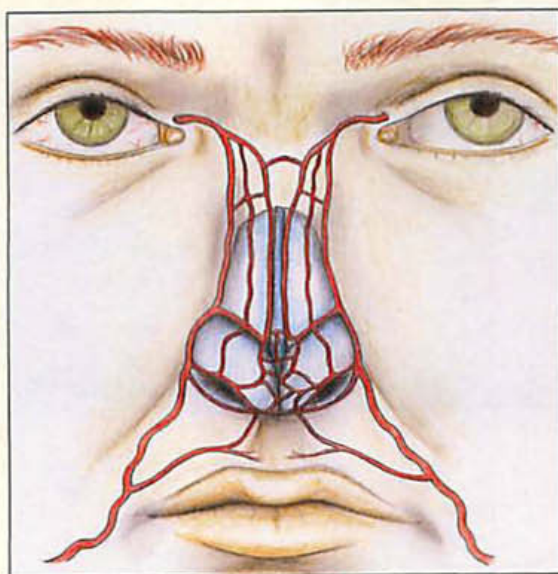
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Zonal Analysis of Facial Asymmetry and Its Clinical Significance in Facial Plastic Surgery

Karan Dhir, MD; William Lawson, MD, DDS; William J. Binder, MD

Objectives: To describe common patterns of facial asymmetry and to augment the facial analysis paradigm for improved preoperative counseling and surgical planning.

Methods: We conducted a frontal photographic analysis of 50 patients who were seeking various types of facial cosmetic surgical procedures. The horizontal zonal thirds of the face were analyzed, and the bilateral data points were compared in regard to brow height, width of midface at maximum distance, malar eminence height, nasal alar height, and mandible width measured from the oral commissure to the gonial angle.

Results: Forty-five patients demonstrated measurable asymmetry of the midface. The malar eminence was found to be more superiorly positioned and defined on the narrower side of the face in all cases. In contrast, the con-

tralateral wider side of the face appeared flatter, with a more hypoplastic, inferiorly positioned malar eminence. Also, the wider side of the face more often demonstrated a wider mandibular dimension and a superiorly displaced ala. The upper third of the face, in regard to brow height, was the most variable and showed little correlation to the lower two-thirds of the face.

Conclusion: This facial analysis exercise can assist the surgeon in (1) preoperative counseling, (2) managing expectations, (3) choosing appropriate-sized implants for improved symmetry, and (4) offering a more detailed assessment during the counseling of patients before face-lift surgery.

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FOR CENTURIES, FACIAL SYMMETRY has been linked to the perception of facial beauty, resistance to disease, and quality genetics for offspring survival. Although gross asymmetries may suggest disease, genetic mutation, or unattractiveness, the dividing line between natural and abnormal asymmetry has not yet been determined.¹⁻³

Over the course of the last century, the relationship between facial symmetry and the perception of beauty has been studied intensely. Some authors concluded that symmetry has little influence or no impact at all on attractiveness.^{4,5} In fact, when photographs have been altered to reflect symmetrical mirror images of a left-left or right-right hemifacial duplication, the altered faces have been found to be less attractive than the original faces.⁶ Others disagree and suggest that facial symmetry, closeness to the average, and certain facial features, such as big eyes, a small nose, thin jaw, prominent cheek bones, a large mouth, and high eyebrows, play a role in what constitutes attractiveness.⁴⁻⁷

Nonetheless, attempts toward obtaining facial symmetry are commonplace in the field of facial cosmetic surgery, particularly in the field of rhinoplasty.⁸⁻¹⁰ In contrast, there is a paucity of literature that describes protocols on how to use facial augmentation and rejuvenation procedures for the purpose of correcting facial asymmetry. The aim of this study was to evaluate the prominent features of each horizontal third of the face for the purpose of delineating patterns of facial development. We used the standard horizontal division landmarks, including trichion to glabella, glabella to subnasale, and subnasale to pogonion. The malar eminence was found to be more superiorly positioned and defined on the narrower side of the face. In contrast, the contralateral wider side of the face demonstrated an inferiorly positioned and less defined malar eminence. This addition to the accepted facial analysis paradigm will assist in the preoperative planning and counseling for facial augmentation and lifting procedures.

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METHODS

We conducted a frontal photographic analysis of 50 patients (23 men and 27 women) who were seeking various types of facial cosmetic surgical procedures. The exclusion criteria included patients younger than 18 years as well as a history of facial cosmetic surgery, trauma, cleft lip, or congenital microsomia.

To standardize the frontal photographs and to minimize variability in the patient population, accepted ideal frontal photographic principles were used.¹¹⁻¹⁴ A digital camera body (Nikon D90) with a 100-mm lens was attached to a tripod. The photographic frame encompassed the crown of the head to the clavicles, with the lateral canthus horizontal to the superior attachment of the ear. The midlens was raised to a height parallel to the patients' pupils. The patients were instructed to bite down on the back molars, without clenching, and to not smile with the lips closed. Using photoediting software (Adobe Photoshop CS5; Adobe Inc), the frontal photographs were included if the horizontal distances from the lateral canthus to the superior attachment of the ear were within 2 mm of each other and the interpupillary line was horizontal to the floor.

Once included, the horizontal zonal thirds were analyzed, and the bilateral data points were compared in regard to brow height, width of midface at maximum distance, malar eminence height, alar height, and mandible width measured from the oral commissure to the gonial angle. We used the standard horizontal division landmarks, including trichion to glabella, glabella to subnasale, and subnasale to pogonion

RESULTS

A total of 50 individuals were included in the study. The mean age was 37 years (age range, 19-65 years), with a female to male ratio of 1.17:1. Twenty-nine patients were white, 9 were Hispanic, 7 were Middle Eastern, 3 were Asian, and 2 were African American.

Forty-five patients demonstrated measurable asymmetry of the midface. The malar eminence was found to be more superiorly positioned and defined on the narrower side of the face in all 45 patients. In contrast, the contralateral wider side of the face was found to have a hypoplastic, inferiorly positioned malar eminence.

Moreover, the wider side of the face demonstrated a wider mandibular dimension in 30 of the 45 patients (67%) and a superiorly displaced ala in 32 of them (71%). Interestingly, the upper one-third of the face, in regard to brow height, showed no correlation to the lower two-thirds of the face, with only 26 of the 45 patients (57%) demonstrating a higher brow on the wider side of the face (**Figure**).

COMMENT

A review of the literature yields few studies correlating the effects of facial asymmetry between nasal, midface, mandibular, and orbital development. One recent study that examined patients with gross nasal deviation observed that the deviated side of the nasal septum (concave side) correlated with specific growth patterns, such as a lower cornea, brow, acanthi, and ala.¹⁵ However, the causality of septal growth affecting the facial development or vice versa was not discussed. Studies that sug-

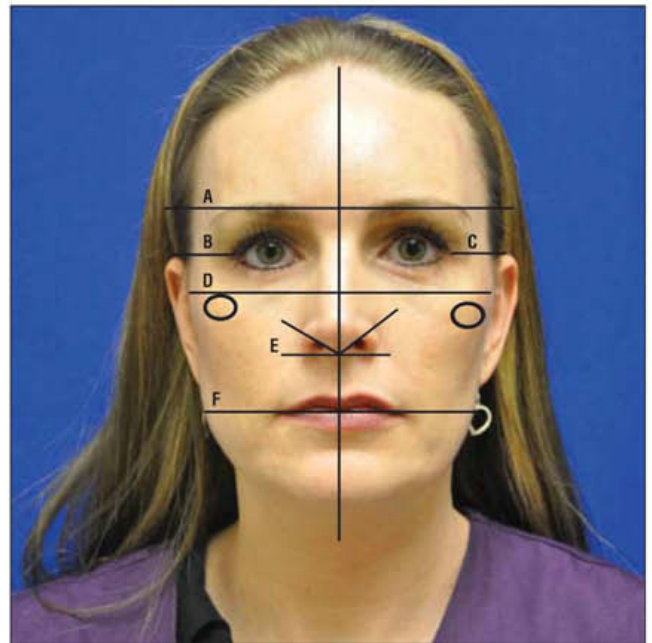


Figure. Frontal photograph demonstrating common facial developmental findings. A, Upper third of face with the left brow more superior in position. B and C, Standardization lines that are horizontal and equal in length within 2 mm. D, Left midface demonstrates inferiorly positioned malar eminence (ovals) on the wider side of the face. E, Vector of ala more superiorly positioned toward the wider side of the face. F, Left mandible wider in conjunction with midface findings.

gest that the nasal septum plays a direct role in the growth of the surrounding structures of the face often extrapolate information from developmental findings observed on patients with cleft palates.¹⁶ Also, animal studies have been used to strengthen this argument. Young rabbits that underwent surgical procedures involving the septum demonstrated marked retardation of growth in the nose and upper jaw.^{17,18} However, this theory was questioned in humans in 1 publication that studied 26 children who underwent septal surgery for significant nasal obstruction or cosmetic disfigurement. Postoperative measurements demonstrated no deleterious effects on the development of the nose and midface at a mean follow-up of 3.1 years.¹⁹

Other studies have attempted to link facial asymmetry and growth patterns to facial musculature function. This hypothesis stems from the recent work on lateralization of brain hemispheres. One such study suggested that facial asymmetry in regard to greater width, or as the authors term *facedness*, depended on the dominant cerebral hemisphere.²⁰ For example, individuals whose cognitive styles and activities are primarily verbal (left hemisphere) will, on the average, be right-faced. Individuals whose cognitive styles and activities involve visuospatial and nonverbal symbolic manipulation, (right hemisphere) on the average, are left-faced. The authors studied the faces of academe and argued that professors of humanity (left hemisphere dominant) demonstrated larger right faces. Conversely, the professors of mathematics and physics (right hemisphere dominant) demonstrated larger left faces. They did not include the upper face in the study owing to the cross-innervation of facial mimetic musculature. In agreement, our patients demonstrated the lower two-thirds of the face to be wider in tandem. The brow

height did not correlate with the lower two-thirds of the face, possibly strengthening the argument of brain lateralization as the driving force in facial development.²⁰

With the improvement of 2- and 3-dimensional imaging modalities and the use of computer-assisted measurements on standardized landmarks, many publications have tried to quantify common findings of asymmetry, with little agreement on the degree, side, and spatial localization of asymmetry. Although the quantification of facial asymmetry with these modalities is novel, it is difficult to use them in the clinical setting. Therefore, other studies, including this one, have relied on examining 2-dimensional images to determine common developmental findings when analyzing the face in order to recommend, assist, or modify surgical procedures to correct the facial asymmetry.^{21,22}

The nose is the most prominent midface feature and deserves separate discussion. The predictable nature of growth is conventionally extrapolated from cleft lip nasal deformities.¹⁰ True maxillary hypoplasia results in posterior, inferior, and lateral deflection of the ala's attachment to the face. However, midface asymmetry and its effect on nasal axis deviation do not often follow this tenet in patients without a cleft lip.¹⁰ In our study, we concluded that the alar position was higher toward the wider side of the face. We hypothesize that the increased midface width retracts the ala in a posterosuperior direction. The implication in patients who are undergoing rhinoplasty is 2-fold. First, understanding alar retraction in the asymmetrical face helps guide the physician in managing expectations during the preoperative consultation. Second, it may suggest the need for surgical maneuvers such as the subalar graft or implant.

There are differing viewpoints regarding the degree of the most asymmetrical zone of the face. Farkas and Cheung²³ carried out a study of 308 white children and provided data to support the theory that the upper third of the face was the most asymmetrical. Similarly, in our study, the brow position was found to be independent of midface width, with only 57% of patients demonstrating a higher brow on the ipsilateral wider side of the face. Others authors have published varying viewpoints suggesting that the lower area of the face and the midface are the most asymmetrical. We concluded that the midface and mandibular dimensions were 67% more likely to be asymmetrical in tandem from the opposite side of the face. Causation for this finding may include masticatory function, dentition, or a combination of both.

In the preoperative planning for facial augmentation, it can be advantageous to be mindful of common developmental patterns in the general population. In our patients, the wider side of the face consistently demonstrated a less pronounced malar eminence and a deficient anteroposterior projection as compared with the narrower side of the face, which demonstrated more projection in conjunction with a higher, more-defined malar eminence. This facial analysis exercise can assist the surgeon in preoperative counseling, managing expectations, choosing appropriate-sized implants for improved symmetry, and offering a more detailed assessment during the counseling of patients before face-lift surgery.

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