Laterality and Left-sidedness in the Nose, Face, and Body: A New Finding

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Background: Asymmetry is a common occurrence in bilaterian animals, particularly human beings. Through examination of patients and their photographs during rhinoplasty, we noted wider left-sided nasal and facial features in most patients. This observation led us to hypothesize that this might be consistent to the whole body.

Methods: We conducted a study in 3 parts to test the question above. First, we analyzed operating notes of 50 rhinoplasty patients to determine the wider side of the upper, middle, and lower thirds of the nose. Second, we analyzed the width of the face and chest wall in 31 patients to discern any correlation between facial and bodily asymmetry. Third, computerized tomographic scans of the thorax and body of 48 patients were studied to measure the width of the hemithorax and hemipelvic bone.

Results: (1) Upper vault width was wider on left side (78%). Left middle vault width was wider (88%). The lower lateral cartilage, lateral crura convexity was more prominent on left side (48%), and a wider scroll area was found and trimmed in 21 (left) and 0 (right) cases. The alar base was wider on left side (56%). (2) In the body and face analysis, 64.5% had a wider left-sided face and body. (3) In the computed tomographic scan analysis, same-sided thorax and pelvis asymmetry was seen (85.35%), 33 and 7 of which were left- and right-sided, respectively.

Conclusion: We observed generalized asymmetry of the face and body with left-sided predominance. (Plast Reconstr Surg Glob Open 2017;5:e1590; doi: 10.1097/GOX.0000000000001590; Published online 28 December 2017.)

INTRODUCTION

Rhinoplasty is the most common aesthetic procedure completed in the Middle East, because mainly of geographical anthropologic distribution that includes noses with larger humps compared with other races. The senior authors of this study (FH, BN) began conducting rhinoplasty procedures 25 years ago, and in this period have scrutinized the anatomy of the nose. Generally speaking, they found that there is a consistent asymmetry between the right and left sides of the nose and also noticed that in the majority of cases, the left side of the nose was wider than the right side. This widening involves the bony vault, middle vault, and tip area. In this study, the authors sought to expand these observations to the whole face and trunk in this population.

Although there are multiple published articles on chirality and anatomic asymmetry,1,2 most articles discuss the arrangement of internal organs rather than symmetry of the skin and skeleton. We have previously completed asymmetry investigations in the head and neck,3,4 and in this study, we attempted to compare asymmetry of the left and right sides of the nose, face, and body to discern whether there is a correlation between asymmetry in the upper and the lower parts of the body.

METHODS

This study was composed of 3 different measurements comparing the left and right sides of the body and face.

Measurement 1

We reviewed the charts of 50 consecutive rhinoplasty cases, considering 5 nasal measurement criteria:

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1. We measured width of the upper vault on the basis of osteotomy type, performing lateral osteotomy for the narrower side and lateral and medial osteotomy on the wider side (Fig. 1).

2. For the middle vault, we performed routine bilateral spreader flaps in all cases. To resolve middle vault asymmetry, we kept the recoil force of the upper lateral cartilage (ULC) on the narrower side and added a piece of cartilage as a spreader graft if there was severe concavity (Fig. 2). On the convex side, we made a longitudinal incision on the dorsum of the ULC flap as discussed by Steve Byrd (Figs. 3 and 4). If the convexity was not corrected by this maneuver, we removed small strip of ULC. The width of the middle vault was evaluated on the basis of adding, incising, and/or removing a piece of the ULC.

3. To achieve tip symmetry, we performed transdomal suturing. On the concave side, we either did not use this suture or added alar strut to mitigate the deformity depending on the degree of weakness and depression of lower lateral cartilage. On the convex side, we used single or double transdomal sutures and side mattress sutures as described by R. Gruber (Fig. 5).

4. For lateral wall convexity, we performed scroll area trimming (Fig. 6).

5. We measured the width of the alar base according to the amount of alar base resection.

Measurement 2

Measurement of the width of the face and body was completed for 31 patients (Fig. 7). Cases were selected randomly of those who were referred to our clinic for aesthetic breast surgeries. The marking and measured distances were trichion to cheek and sternal notch to coracoid process.

In the above group, photographs of the face and body were cut in half longitudinally using Photoshop. We then transposed the same half of the face and body on the opposite side, producing 3 pictures for each patient: right–left (normal), right–right side, and left–left side for both body and face (Fig. 8). We then measured the width of both right sides and both left sides of face and body.

Measurement 3

We also measured the width of the chest and pelvis skeleton with computed tomography (CT) (Fig. 9). Forty-eight cases were randomly chosen from the radiology department files of patients who received CT of the thorax and abdomen. In the thoracic CT, we drew a line from the posterior spinal process to midsternum, not specifically choosing a specific level in each patient. We drew a perpendicular line to the previous line, and the sides were measured. The same procedure was performed on the abdomen by drawing a line from the posterior spinal process to the mid-symphysis pubis. A perpendicular line to this line passing over the anterior superior iliac spine was drawn, and again both sides were measured.

Fig. 1. Asymmetric nasal osteotomy. Lateral osteotomy on the narrower side (right) and double osteotomy on wider side (left).

Fig. 2. Common asymmetries of ULCs. There may be asymmetries of both horizontal and vertical components of ULCs.

Fig. 3. Management of asymmetric ULCs. On the narrower side, upper lateral flap recoil force is preserved on the right, whereas recoil force is decreased by dorsal incision on the left. A spreader graft can be added to the narrower side if needed.
RESULTS

Measurement 1

The results for rhinoplasty cases are outlined in Table 1 and showed the following:

1. We performed symmetric lateral osteotomy in 11 cases. Double osteotomy (medial and lateral) was completed in 39 cases on the left side and none on the right side. Thus, of a total of 50 cases, the left upper vault was wider in 39 (78%) ($P = 0.03$).

2. In addition to the routine bilateral spreader flaps, we added 22 spreader grafts on the right side and only 3 on the left. Spreader flaps were either incised or minimally excised in 44 cases in the left and none on the right ($P = 0.001$).

3. We used alar struts in 11 cases on the right side and 5 on the left side. Lateral wall mattress sutures were applied in 13 cases on the left and none on the right ($P = 0.003$).

4. The scroll area was trimmed in 21 cases on the left side and none on the right side.

5. In 50 patients, alar base width was equal between the right and left sides in 17 patients. In 5 cases, the alar base was wider on the right side, and in 28 cases, it was wider on the left (56%) ($P = 0.001$). We showed a significant wider alar base on the left side.

Measurement 2

In looking at different distances on the fixed points of the face and body, the most significant distances were between (1) trichion to cheek ($P = 0.000$) and (2) sternal notch to coracoid process ($P = 0.013$) measurements (Table 2). The result showed that in 20 of 31 cases (64.5%), the face and body were wider on the left side, with only 3 cases (9.6%) showing wider right sides. Eight
cases (24.8%) showed similarity between right and left sides. The photograph transposition in 35 cases showed that 24 patients (68%) had wider face and body on the same side with predominance to the left side ($n = 15; 42.8\% ; P = 0.02$) (Table 3). There was no significant correlation between the face and body width in each individual, though face and body were significantly wider on the left side.

**Measurement 3**

In the CT scan group, the results showed a wider left thoracic cage and pelvic bone in 33 of 48 cases (68.75 %)
compared with only 7 (14.5%) on the right side. In 7 cases (14.5%), the wider distance of the thoracic cage and pelvic bone was not on the same side. In only one case, the right and left sides were equal. This means that in 85% of cases, patients had same-side asymmetry ($P = 0.0015$) (Table 4).

**DISCUSSION**

Chirality and asymmetry between the face and body are common in many populations. Early Greek scientists were pioneers in exploring internal anatomic organ arrangement, and they believed in symmetry of all body structures. It took years of cadaver dissections to show asymmetric arrangement of internal organs. How does asymmetry develop? Laterality is controlled by many factors, though genetics have proven to play a

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**Table 1. Rhinoplasty Results**

| Double Osteotomy of Nasal Bone | Wider Alar Base (No Alar Resection in 9 Cases) | Septum Major Convexity or Deviation | Alar Base Resection |
|-------------------------------|---------------------------------------------|-----------------------------------|---------------------|
| Right | Left | Right | Left | Right | Left | Midline | Right | Left | Equal | None |
| 0% | 78% | 5 | 28 | 5 | 20 | 25 | 5 | 28 | 8 | 9 |

Significant left-sided widening was noticed in the upper, middle, and lower thirds of the nose. Medial and lateral osteotomy was completed on the left side in 39 cases with no double osteotomy on the right side. ULC width augmentation was conducted with an additional spreader graft to the spreader flap in 22 cases (44%) with width reduction by dorsal cut or minimal resection in 44 cases (88%) on left side. Double lower lateral cartilage sutures and or lateral mattress sutures were applied on the left side in 13 cases (26%) to decrease bulbosity in addition to transdomal suturing on both sides. Wider alar base was noticed on the right side in 5 cases (10%) versus 28 cases (56%) on left side of the nose.

**Table 2. Face–Body Measurements (31 Patients), Wider Side**

| Trichion–Check | Sternal Notch–Coracoid Process | Number of Cases on Each Side |
|----------------|--------------------------------|-------------------------------|
| Left | Right | 20 (64.5%) | 3 (9.6%) | 8 (25.8%) |

Same-side asymmetry was found in 75% of patients. Sixty-four percent were wider on left.

**Table 3. Image Transposition (35 Cases), Wider Side**

| Left Face and Body | Right Face and Body | Left Face, Right Body | Right Face, Left Body | Right Face, Equal Body |
|--------------------|---------------------|-----------------------|-----------------------|------------------------|
| 42.8% | 25.7% | 11.4% | 17.1% | 2.8% |

A total of 68% had same-side asymmetry; 42.8% were wider on left.

**Table 4. Thorax–Pelvis CT Scan Result (48 Cases), Wider Side**

| Right > Left | Right and Right | Left and Left | Right = Left | Total |
|--------------|-----------------|---------------|--------------|-------|
| 14.5% | 14.5% | 68.75% | 2.1% | 48 |

This showed 85% same-sided asymmetry with wider left-sided asymmetry in 69%.
significant role. During the gastrulation phase of development, left to right and rotating movements of nodal cilia result in chiral movement of motor proteins of the cytoskeleton and bulk transport of extracellular morphogens. Genetic data may be translated through pH and voltage gradients across the midline, which will activate left/right asymmetry in the vertebrate embryo.7

In recent years, molecular geneticists have made significant contributions to the science of asymmetric vertebrate anatomy and have found that asymmetric animals are evolutionary more progressed than their symmetric ancestors.8 In bilaterian animals not only are the viscera transposed and CT measurements of thoracic and pelvic cavities. Similarly, Haraguchi et al. measured facial dimensions at different ages (651 males and 1149 females; mean age of 15 y; range of 4 to 59 y).15 Asymmetric subjects had 80% wider right-sided hemiface, and 79.3% of those with chin deviation had left-sided laterality. In this regard, during pubertal growth, the proportion of subjects with wider right hemiface decreased (P < 0.0001), whereas the proportion of those with a wider left hemiface increased (P < 0.01). Confirming the above findings, Farkas et al. also found larger right-sided faces at childhood ages.

Another set of researchers performed cephalometric analysis on 92 volunteers with right/left asymmetry consisting of 8 linear distance, 9 angular, and 3 mid-facial measurements.20 The result indicated that asymmetry was characterized by a wider left side of the face and a shorter vertical dimension on the right side.

In our study, we believe that asymmetry of the face and the body is a rule, not an exception. Correlation of this asymmetry between the body and face along with left-sided predominance has become noticeable to our authors gradually over the past several decades. Every surgeon, particularly those who are interested in rhinoplasty, should be aware that the right side wall of the nose is narrower than the left, so he/she should be prepared for augmentation or less reduction on the right side versus the left. The significance of these findings serves to enhance existing insight both to patients and surgeons. The patient who is aware of the differential anatomy of his/her body and face will hopefully have a more realistic view about the capabilities of his/her surgeon to produce symmetry and will be less surprised by the outcome of the operation. Our insights can also help surgeons develop a clearer surgical plan to reach a more pleasing and predictable result.

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