Original Article

# Patients Satisfaction and Nasal Morphologic Change after Orthognathic Surgery

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## ABSTRACT

**Background:** Patients' attitudes about their nose changes after orthognathic surgeries. We aimed to evaluate the patient's opinion about nasal change and morphologic changes following orthognathic surgery.

**Methods:** This was a cross-sectional study. The sample was derived from the population of patients who underwent orthognathic surgery in the Oral and Maxillofacial Surgery Department of Shahid Beheshti University of Medical Sciences, Tehran, Iran between 2017 and 2019. Subjects who underwent orthognathic surgery were studied. Subjects filled a modified nose evaluation form before and nine months after orthognathic surgery. For objective assessment, the nasolabial angle, nasofrontal angle, nasofacial angle, tip projection, and tip deviation and alar width were evaluated. Sixty-two patients were studied.

**Results:** Forty (64.5%) patients did not absolutely like their nose before orthognathic surgeries, two (3.2 %) expressed a little satisfaction, 17(27.4%) answered they liked more or less, and three liked very much. Nine months after orthognathic surgeries, 4 (6.5%) patients did not like their nose, nine patients (14.5%) liked a little, 30 (48.4%) liked more or less, and 19 liked very much. Analysis of the data demonstrated a significant difference in patients' satisfaction with their noses before and nine months after orthognathic surgeries ($P$<0.001). Patients' satisfaction nine months after orthognathic surgery was not affected by nasal morphologic changes.

**Conclusion:** It seems, patients' satisfaction with their nose improved after orthognathic surgeries. Patients' attitude was not associated with nasal morphologic changes.

**Keywords:** Orthognathic surgery; Nose; Jaw Abnormalities; Nose Deformities

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## INTRODUCTION

Jaw deformities sometimes are associated with nose deformities [1]. The incidence of cosmetic nasal deformities in patients who were a candidate for orthognathic surgery was approximately 61%[2]. Correction of jaw deformities may lead to nose change, which results in patients' dissatisfaction following orthognathic surgeries[3]. Le Fort I-type osteotomy of the maxilla affects bone, cartilage, and soft tissues of the

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nose. The alar widening is the most nasal problem following Lefort I osteotomies, follows by nasal tip change[3].

The nasal change following orthognathic surgery could be pleasant for some patients or unpleasant for others. Nasal change following orthognathic surgeries could be assessed utilizing specific objective measures or examinations or evaluating the patient's subjective satisfaction using the quality of life questionnaires.[4] To our knowledge, there was no study to assess the patients' opinions about the nasal change following orthognathic surgery in the literature.

The study's purpose was to address the following question. Among the patients who have undergone orthognathic surgery, are patients satisfied with nasal change following orthognathic surgery? We hypothesized that the nasal change following orthognathic surgery improves the patient's satisfaction rate. Therefore, we aimed to evaluate the patient's opinion about nasal change and morphologic change following orthognathic surgery.

## MATERIALS AND METHODS

The authors designed a cross-sectional study. The sample was derived from the population of patients who underwent orthognathic surgery in the Oral and Maxillofacial Surgery Department of Shahid Beheshti University of Medical Sciences, Tehran, Iran between September 1, 2017, and December 28, 2019.

The research was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences. (IR.SBMU.DRC.REC.1398.152).

Subjects eligible for study inclusion had skeletal class II or class III deformity and underwent Lefort I osteotomy and sagittal split osteotomy (Bimaxillary osteotomy). Subjects were excluded from the study enrollment if they had previous facial trauma or previous rhinoplasty. Previous facial augmentation, maxillary anterior-posterior movement, or impaction more than 5 mm, were younger than 18 years, refused study enrollment, or failed to return for follow-up.

Subjects were requested to fill a modified nose evaluation form, introduced by Alsarraf et al., [5] before and nine months after orthognathic surgery. Rhinoplasty outcome evaluation (ROE) was documented before and nine months after orthognathic surgeries (Table 1).

For objective assessment, the nasolabial angle(NLA), nasofrontal angle(NFA), nasofacial angle (NFCA),

**Table 1:** Rhinoplasty outcome evaluation (ROE) questionnaire.

| Question number | |
|---|---|
| Q1 | Do you like how your nose look? |
| Answer | Absolutely no (0) A little (1) More or less (2) Very much (3) Absolutely yes (4) |
| Q2 | Do you breathe well through your nose? |
| Answer | Absolutely no (0) A little (1) More or less (2) Very much (3) Absolutely yes (4) |
| Q3 | Do you believe your friends and people who are dear to you like your nose? |
| Answer | Absolutely no (0) A little (1) More or less (2) Very much (3) Absolutely yes (4) |
| Q4 | Do you think the current appearance of your nose hamper your social and professional activities? |
| Answer | Absolutely no (0) A little (1) More or less (2) Very much (3) Absolutely yes (4) |
| Q5 | Do you think your nose looks as good as it could be? |
| Answer | Absolutely no (0) A little (1) More or less (2) Very much (3) Absolutely yes (4) |
| Q6 | Would you undergo surgery to change the appearance of your nose or to improve your breathing? |
| Answer | Absolutely no (0) A little (1) More or less (2) Very much (3) Absolutely yes (4) |

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tip projection, and alar width were evaluated before and nine months after orthognathic surgery.

The NLA was measured by drawing a straight line through the most anterior and posterior points of the nostrils.

The angle intersecting the glabella to the nasion line, and the nasion-to-tip line was defined as the NFA. The intersection angle between a line from nasion to pronasalae and a line drawn from nasion to pogonion was defined as NFCA.

Tip projection was defined as a line from the alar-cheek junction to the tip of the nose (Figure 1).

The alar width was measured from one alar crease to the contralateral crease (Figure 2).

In Lefort I, osteotomy, cinch suture, and V-Y plasty were performed for all subjects. In the cases of superior maxillary repositioning more than 3 mm, nasal septal trimming was done. The nasal septum was passively placed after creating a groove in the midsagittal of the maxillary floor. The bilateral sagittal split osteotomy was done in all patients.

Age, gender, skeletal deformity, subjects' attitudes before orthognathic surgery, and objective nasofacial factors were considered variables. Subjects' attitudes after orthognathic surgeries were the outcomes of the study (Figure 3 and Figure 4).

### *Statistical Analysis*

The statistical analyses were performed using the statistical package for the social sciences (SPSS) for PCs, version 21 (IBM, USA). McNamara test was used to assess patients' attitudes about their nose before and after orthognathic surgeries. Chi-square test was applied to compare patients' satisfaction rate between males and females as well as in-class II and III skeletal deformities. The paired T-test was used to compare the subjective and objective measurements before and nine months after orthognathic surgeries. ANOVA test was applied to assess changes in nasofacial measurements and patients' satisfaction rate. We considered *P* values < 0.05 as statistically significant.

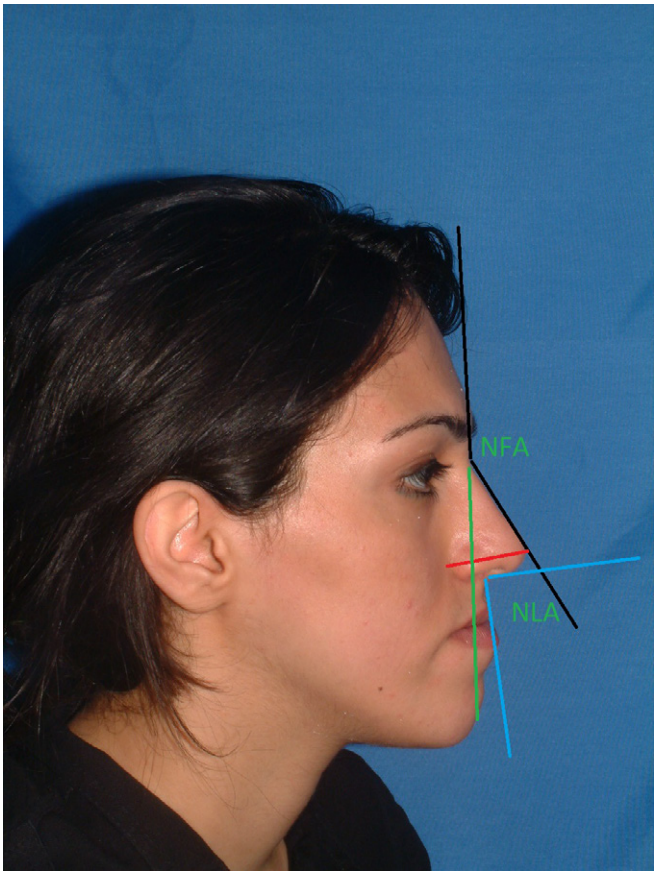


**Figure 1:** The nasal morphologic measurements: Tip projection (the red line), Nasofacial angle (the intersect of the green and black lines), Nasofrontal angle (The intersect of black lines), and nasolabial angle (the intersect of blue lines).

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Figure 2: Alar width measurement.

Figure 3: The patient's profile view nine months after orthognathic surgery.

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**Figure 4:** The patient's frontal view nine months after orthognathic surgery.

## RESULTS

Sixty-two patients (27 males, 35 females) were studied. The mean age of patients was 24.32±4.02 years. Twenty-one patients had class II skeletal deformities, and 35 patients class III skeletal. None of the subjects underwent maxillary set back.

The nasal morphologic changes before and nine months after orthognathic surgeries are reported in Table 2.

Forty (64.5%) patients did not absolutely like their nose before orthognathic surgeries, two (3.2%) expressed a little satisfaction, 17(27.4%) answered they liked more or less, and 3 liked it very much. Nine months after orthognathic surgeries, 4 (6.5%) patients did not like their nose, nine (14.5%) liked a little, 30 (48.4%) liked more or less , and 19 liked very much. Analysis of the data demonstrated a significant difference in patients' satisfaction with their noses before and nine months after orthognathic surgeries ($P$<0.001).

Thirteen (21%) patients had a little problem breathing before orthognathic surgeries, 39(62.9%) expressed that they had more or less well breathing, and ten had breathing well before orthognathic surgeries. Nine months after orthognathic surgeries, two patients had a little breathing problem after orthognathic surgeries, 22 (35.5%) had more or less well breathing, and 38 (61.3%) had to breathe well. There was a significant difference in patients' complaints about breathing before and nine months after orthognathic surgeries ($P$<0.001) (Table 3).

Forty-one (66.1%) patients believed their friends and people who were dear to them a little liked their nose before orthognathic surgeries, 17 (27.4%) believed their friends more or less liked their nose, and 4(6.5%) believed their friends liked very much. Nine months after orthognathic surgeries,12 (19.4%) patients believed their friends a little liked their nose, 32 (51.6%) believed their friends more or less liked their nose, and 18 (29%) believed their friends liked very much. There was a significant difference in patients' answers about their friends, attitudes about their nose before and nine months after orthognathic surgeries ($P$<0.001).

Twenty-one (33.9%) patients mentioned that the current appearance of their nose absolutely did not hamper their social and professional activities,

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30(48.4%) believed a little, 9 (14.5%) believed more or less, and 2(3.2%) believed very much. Nine months after orthognathic surgeries, 6 (9.7%) patients stated the current appearance of their nose absolute did not hamper their social and professional activities, 13 (21%) believed a little, 29 (46.8%) believed more or less, and 14(22.6%) believed very much. Analysis of the data indicated a significant difference in patients' attitudes for the effect of their current appearance on their social and professional

**Table 2:** Objective and subjective assessment results before and after orthognathic surgeries.

| Variables | Before OG | Nine months after OG |
|---|---|---|
| **Nasolabial angle** | 83.95±3.10 | 93.32±4.70 |
| **Nasofrontal angle** | 125.23±3.76 | 119.51±3.04 |
| **Nasofacial angle** | 32.35±1.97 | 37.40±1.85 |
| **Alar width (mm)** | 37.14±1.89 | 39.69±1.39 |
| **ROE score%** | 34.07±11.50 | 46.64±9.92 |

Paired *t*-test ($P<0.001$)

**Table 3:** Comparison of the number of subjects who answered the ROE questionnaire before and nine months after orthognathic surgeries.

| Question | Absolutely no | A little | More or less | Very much | Absolutely yes |
|---|---|---|---|---|---|
| **Q1** | | | | | |
| **Before OG** | 40 | 2 | 17 | 3 | 0 |
| **After OG** | 4 | 9 | 30 | 19 | 0 |
| **Q2** | | | | | |
| **Before OG** | 0 | 13 | 39 | 10 | 0 |
| **After OG** | 0 | 2 | 22 | 38 | 0 |
| **Q3** | | | | | |
| **Before OG** | 0 | 41 | 17 | 4 | 0 |
| **After OG** | 0 | 12 | 32 | 18 | 0 |
| **Q4** | | | | | |
| **Before OG** | 21 | 30 | 9 | 2 | 0 |
| **After OG** | 6 | 13 | 29 | 14 | 0 |
| **Q5** | | | | | |
| **Before OG** | 13 | 23 | 13 | 3 | 0 |
| **After OG** | 4 | 10 | 23 | 25 | 0 |
| **Q6** | | | | | |
| **Before OG** | 8 | 23 | 12 | 14 | 5 |
| **After OG** | 39 | 15 | 3 | 2 | 3 |

McNamara test ($P<0.001$)

**Table 4:** Evaluation of patients 'satisfaction (question 1) nine months after orthognathic surgery with nasal morphologic changes.

| Variables | Absolutely no | A little | More or less | Very much | ANOVA test |
|---|---|---|---|---|---|
| **Nasolabial angle change** | 10±3.65 | 9.78±2.54 | 9.17±2.69 | 9.37±2.97 | p=0.90 |
| **Nasofrontal angle change** | -5.25±1.5 | -6.11±1.90 | -5.53±1.52 | -5.89±1.56 | p=0.68 |
| **Nasofacial angle change** | 4.0 | 5.55±1.13 | 4.83±1.41 | 5.37±1.01 | p=0.09 |
| **Alar width change (mm)** | 1.50±0.58 | 2.78±1.09 | 2.53±1.33 | 2.68±1.34 | p=0.36 |

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**Table 5:** Comparison of patients 'satisfaction (question 1) in nine months after orthognathic surgery between males and females.

| Variables | Absolutely no | A little | More or less | Very much | P-value |
|---|---|---|---|---|---|
| **Gender** | | | | | |
| **Male** | 3 | 3 | 13 | 8 | *P*=0.56* |
| **Female** | 1 | 6 | 17 | 11 | |
| **Skeletal Deformities** | | | | | |
| **ClassII** | 0 | 2 | 14 | 5 | *P*=0.90* |
| **Class III** | 4 | 7 | 16 | 14 | |
| **Age (years)** | 21.75±4.35 | 25.33±3.35 | 24.63±4.23 | 23.89±3.94 | *P*=0.46** |

*chi-square test **ANOVA test

activities before and nine months after orthognathic surgeries (*P*<0.001).

Thirteen (21%) patients thought their nose did not look as good as it could be before orthognathic surgeries, 33 (53.2%) believed that their nose a little acceptable, 13(21%) thought that their nose more or less acceptable, and 3 (4.8%) patients believed their nose looked very much good. Nine months after orthognathic surgeries,4 (6.5%) patients stated that their nose did not look as good as it could be before orthognathic, 10 (16.1%) patients believed that their nose a little acceptable,23 (37.1%) thought that their nose more or less acceptable, and 25 (40.3%) believed their nose looked very much good. There was a significant difference in patients' attitudes about their nose appearance before and after orthognathic surgeries (*P*<0.001).

Eight (12.9%) patients did not want to undergo surgery to change the appearance of their nose or to improve their breathing, 23(37.1%) had a little tendency to do it,12(9.4%) more or less, 14 (22.6%) very much, and 5 (8.1%) absolutely would like to do it. Nine months after surgeries,39(62.9%) did not want to undergo surgery to change the appearance of their nose or to improve their breathing,15 (24.2%) had a little tendency to do it,3 (4.8%) more or less, 2(3.2%) very much, and 3 (4.8%) absolutely would like to do it. Analysis of the data showed a significant difference in patients' tendency to undergo nasal surgery before and nine months after surgeries.

According to nasal morphologic changes, patients' satisfaction (question 1) nine months after orthognathic surgery was evaluated. Analysis of the data did not demonstrate any differences in patients' satisfaction regarding nasal morphologic changes (Table 4).

In nine months after orthognathic surgery, patients' satisfaction rate was not different between males and females and in class II skeletal and class III skeletal patients (Table 5).

## DISCUSSION

Bimaxillary orthognathic surgery leads to nasal morphological change [6]. The most significant changes include an increase in the alar base width and the nasal tip elevation[7, 8]. Patients have a different attitude toward their nose before and after orthognathic surgeries [9] .Facial soft tissue changes following orthognathic surgery occurred in the middle third of the face, which is more complex than the lower third of face[10] . In this study, patients satisfaction and nasal morphologic changes were investigated.

In this study, patients' satisfaction with their nose was significantly different before and after orthognathic surgery (64.5% of them did not like their nose before orthognathic surgery, but 79.03% liked their nose in 9 months after surgeries). The nasal alterations are predictable to some degree. Suppose patients have intrinsic nasal deformities, such as a narrow alar base or under rotated nasal tip. In that case, the nasal change may be desire[11]. In other cases, the orthognathic surgery itself may induce a nasal deformity. However, patients' satisfaction levels sometimes did not relate to nasal morphological change itself. The change in facial harmony and facial morphology entirely affects patients' attitudes[12].

After orthognathic surgery, the nasal morphological change did not affect patients' satisfaction levels in our study. Factors that impact satisfaction was the final aesthetic outcome, type

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of orthognathic surgery, perceived social benefits from the outcome, sex, and alternation patients' self-concept after treatment. Post-operative dissatisfaction was associated with the sensation of functional impairment and/or dysfunction after surgery, treatment length, and lack of information about surgical risks[12].

Maxillary advancement and superior repositioning can lead to nasal tip elevation and alar base augmentation [13]. In this study, the nasolabial and nasofacial angles increased, and the nasofrontal angle decreased after orthognathic surgeries. All measurements were done nine months after surgeries to allow relative subsiding swelling and reduce the possible effect on patients' attitudes. Regardless of the maxillary advancement and anterior or posterior impaction, nasal tip modification increased nasal width, and nasal rotation in an upward direction occur. A possible explanation for these changes is a new positioning of the anterior nasal spine with soft tissue dissection[3].

The satisfaction of surgical outcome depends on self-confidence, higher self-concept levels, and social interaction after treatment[14]. More than 85% of the patients were satisfied with the results of orthognathic surgeries[12, 15]. Physical disability, psychological disability, and social disability scores changed in patients with class II and III deformities[16]. The frontal view was an essential and persuasive part of facial attractiveness, which was followed by the profile view[17] .A positive correlation between the nasal tip protrusion-nose height index reduction and aesthetic improvements after surgery was found[17].

## CONCLUSION

It seems, patients' satisfaction with their nose improved after orthognathic surgeries. Patients' attitude was not associated with nasal morphologic changes.

## ACKNOWLEDGMENTS

Not applicable.

## CONFLICT OF INTEREST

Non-declared.

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