

Correlation between levels of patient satisfaction and the value of cephalometric skeletal analysis in post-orthognathic surgery patients



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Abstract

Objective: The purpose of this study was to analyze the level of patient satisfaction after orthognathic surgery and the correlation between the patient satisfaction level after orthognathic surgery and the results of the cephalometric skeletal analysis.

Material and Methods: This study were patients who had orthognathic surgery either BSSO, Osteotomy Le Fort 1, or Double Jaw Surgery. First, the subjects filled out a questionnaire about patient satisfaction after orthognathic surgery, the second was taking cephalometric radiographs which were then analyzed by the Steiner method by measuring the angles of SNA, SNB, ANB, and GoGN-SN.

Results: The results of the study on 10 research subjects showed that all questionnaire scores were in the "satisfied" category. Cephalometric skeletal analysis of all cephalograms showed 50% normal SNA angle, 10% normal SNB angle, 80% normal ANB angle, and 90% normal GoGN-SN angle. The Concordal Kendall test results show the correlation coefficient value of 0.534 or 53.4%.

Conclusion: On average, patients are very satisfied with the orthognathic surgery they have undergone. There is a correlation between the level of patient satisfaction after orthognathic surgery and the results of the cephalometric skeletal analysis.

Keywords: Cephalometric skeletal analysis, Orthognathic surgery, Patient satisfaction
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Introduction

Dentofacial abnormalities are deviation or imbalance of facial proportions as well as poor tooth relationship that disturbs the aesthetics of the facial profile. Dentofacial abnormalities can result in impaired jaw function, tooth connection, and facial appearance.¹ Malocclusion is an abnormal occlusion characterized by disharmony in the relationship between the arch and teeth or an abnormal portion of the tooth.²

Evaluating esthetics is an important part of post-treatment evaluation because the main reason for orthodontic treatment is to address psychosocial problems related to facial and dental appearance. Beauty and facial attractiveness are easy to see but difficult to measure. Although it is subjective, we can attempt to measure and explain the interesting phenomena of beauty by describing them numerically and geometrically. Asymmetrical and distorted facial appearance is the main cause of facial esthetic problems, whereas a proportional appearance is acceptable although not always beautiful.^{1,3-8}

Surgical treatment in most cases of skeletal Class III malocclusion includes mandibular retrusion, maxillary protrusion, or a combination of both. Although in this case, the visible problem was a

long face and mandibular prognathism with an excess of one-third of the lower face, orthognathic surgery was performed including Le Fort I osteotomy with posterior impact with maxillary advancement, followed by auto rotation and mandibular setback using Bilateral Sagittal Split Osteotomy (BSSO) technique.^{7,8}

One of the evaluation after orthognathic surgery is looking at the relationship between the upper and the lower jaw and the relationship between the jaw and the cranium, by looking at changes in angles that can be measured through cephalometric analysis. There are many methods for analyzing skeletal disorders with cephalometric analysis, including Steiner, Downs, and Wendel Wylie analysis. Steiner analysis is an analysis that is simple, easy to understand, and produces maximum clinical information with minimal methods.⁹⁻¹¹

Orthognathic surgery can be performed on either the lower or upper jaw or both. After the aesthetic correction is done, it will usually increase the morale and confidence of the patient. Malocclusion has a major impact on both people and society in terms of quality of life, anxiety, functional boundaries, and emotional state.¹²

The level of patient satisfaction is the difference between perceived performance and expectations. Patients are becoming increasingly aware of

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physical appearance and psychosocial problems associated with malocclusion and appearance, where these problems have a major impact on a person's quality of life.^{4,7}

The purposes of this study were to analyze the level of patient satisfaction after orthognathic surgery and the correlation between the level of patient satisfaction after orthognathic surgery and the results of the cephalometric skeletal analysis.

Material and Methods

The subjects of this study were taken from patients who had undergone orthognathic surgery at the Oral and Maxillofacial Surgery Department Hasan Sadikin Hospital (RSHS) and the Dental Hospital of Padjadjaran University Bandung in 2015 - 2020. The number of samples in this study was 10 people. The study was conducted from February 2020 to July 2020. This research was conducted in two stages. First, the subjects filled out a questionnaire about patient satisfaction after orthognathic surgery, then took a cephalometric radiograph, then the cephalograms were analyzed using the Steiner method by measuring the SNA, SNB, ANB, and GoGN-SN angles. Included in the inclusion criteria in this study were patients with a diagnosis of dentofacial disorders / skeletal malocclusion and patients who had undergone BSSO orthognathic surgery and or Le Fort 1 osteotomy, while the exclusion criteria in this study were patients who were not cooperative and cephalometric radiographs could not be read / tracing.

The minimum sample size is determined with a 95% confidence level and a 95% power test. The estimated correlation coefficient that is considered

clinically is 0.8 so that the sample size can be calculated :

$$n = \left\{ \frac{1,6 + 0,78}{0,5 \ln[(1 + 0,8)/(1 - 0,8)]} \right\}^2 + 3$$

$$= 10,45 \approx 10 \text{ people}$$

Based on the calculation results, the minimum number of samples in the study to be taken is 10 people.

Research is preceded by submitting ethical eligibility and a research permit. After the research permit is obtained with Number 612/UN6. KEP/EC/2019, the research procedure begins by providing information about the research procedures to be carried out to the research subject. Subjects willing to participate will be asked to sign the Informed Consent Form. If the research subject has completed filling out the patient questionnaire, a cephalometric x-ray will be taken, then the subject's participation in this study is declared to have ended. Then the cephalometric x-rays were carried out for cephalometric analysis. Furthermore, data from questionnaires and cephalometric measurements were analyzed.

The results of the questionnaire obtained as research data were scored and grouped into 3 groups, namely dissatisfied, satisfied, and very satisfied. Furthermore, the research data in the form of cephalometric analysis results were categorized into normal and abnormal. The two research data were then tested for correlation using the Concordal

Table 1. Value of Post-Surgical Patient Satisfaction Questionnaire (PSPSQ)

Subject No.	Question									Total Score	Satisfaction Category
	1	2	3	4	5	6	7	8	9		
1	6	7	5	5	5	5	5	5	5	48	Very Satisfied
2	5	6	5	5	5	5	5	6	5	47	Very Satisfied
3	5	6	5	6	5	5	4	6	5	47	Very Satisfied
4	7	6	6	7	5	5	6	5	4	51	Very Satisfied
5	7	6	7	7	6	7	6	5	6	57	Very Satisfied
6	5	5	6	5	5	7	4	6	7	50	Very Satisfied
7	5	5	7	7	7	6	6	6	5	54	Very Satisfied
8	5	6	6	5	5	6	6	5	6	50	Very Satisfied
9	5	5	6	6	5	5	4	6	6	48	Very Satisfied
10	5	6	5	6	5	5	4	6	5	47	Very Satisfied
Total	55	58	58	59	53	56	50	56	54		

Results

The measurement of the satisfaction level of patients who had undergone orthognathic surgery was carried out through the post-surgical patient satisfaction questionnaire (PSPSQ) of orthognathic surgery that was filled in by the subjects. The questionnaire consists of 9 questions which are rated on a scale of 1-7. The total value of the questionnaire for each research subject was then categorized into 3 groups, namely dissatisfied (total score 9-27), satisfied (total score 28-45), very satisfied (total score 46-63). Table 1 shows the questionnaire scores of each research subject.

The results showed that the questionnaire scores of all research subjects were in the "very satisfied" category. The lowest total score of all subjects was 47 and the highest total score was 57. The lowest total score of all questions was 50, namely in question number 7 regarding current respiratory satisfaction, while the highest total score was 59, namely in question number 4 regarding current bites satisfaction.

The cephalometric skeletal analysis was carried out by measuring the value of 4 angles on the post-orthognathic cephalometric radiographs of each subject. The four angles are SNA angle with a normal value of $82^\circ \pm 4^\circ$, SNB angle with a normal value of $80^\circ \pm 4^\circ$, ANB angle with a normal value of $2^\circ \pm 2^\circ$, and GoGN-SN angle with a normal value of $32^\circ (+8^\circ / -12^\circ)$. Not all cephalometric skeletal analysis after orthognathic surgery showed normal values.

Table 2 shows the summary of the cephalometric skeletal analysis after orthognathic surgery in the subjects. SNA angle measurement showed that

5 subjects (50%) were in the normal value range and 5 subjects (50%) were abnormal. SNB angle measurement shows that 1 subject (10%) was in the normal value range and 9 subjects (90%) were abnormal. ANB angle measurement showed that 8 subjects (80%) were in the normal value range and 2 subjects (20%) were abnormal. GoGN-SN angle measurement shows that 9 subjects (90%) were in the normal value range and 1 (10%) subjects were abnormal.

Bivariate analysis was used to test the research hypothesis. In the bivariate analysis, the relationship between patient satisfaction levels after orthognathic surgery and the results of the cepha-lometric skeletal analysis were tested. The results of the first and second stages of research were then tested with the Concordal Kendall correlation test. The results of this correlation test can be seen in Table 3.

The results of the Concordal Kendall correlation test, the relationship between the level of patient satisfaction after orthognathic surgery, and the results of cephalometric skeletal analysis Table 3 show that the correlation coefficient value is 0.534 or 53.4%. The positive correlation coefficient indicates a unidirectional relationship between the level of patient satisfaction after orthognathic surgery and the results of cephalometric skeletal analysis, meaning that the better the cephalometric skeletal analysis score, the higher the level of patient satisfaction, and vice versa.

Discussion

Measurements made using the orthognathic surgery post-treatment questionnaire in this study showed that all subjects were very satisfied with the results of the orthognathic surgery they underwent. This satisfaction consists of aspects of overall patient satisfaction, speech satisfaction, satisfaction with occlusion, satisfaction with lip closure, satisfaction with breathing, satisfaction with jaw joints and facial pain, and satisfaction with acceptance of lower lip and chin sensibility. The results of the questionnaire assessment also indicated that the study subjects were willing to undergo orthognathic surgery again if necessary and would recommend orthognathic surgery to others.

The results of this study are consistent with the study of Dantas et al. reporting the BSSO and Le Fort I surgical procedures, orthognathic surgery has a high level of satisfaction with aesthetic and functional outcomes. Eighty patients (97.6%) reported being satisfied with the treatment received and the surgical treatment results.¹² This

Table 2. Summary of Post Orthognathic Cephalometric Skeletal Analysis

Angles			%
SNA	Normal	5	50%
	Abnormal	5	50%
SNB	Normal	1	10%
	Abnormal	9	90%
ANB	Normal	8	80%
	Abnormal	2	20%
GoGN-SN	Normal	9	90%
	Abnormal	1	10%

Table 3. The results of the Concordal Kendall correlation test the relationship between patient satisfaction levels after orthognathic surgery and the results of cephalometric skeletal analysis

Correlation coefficient	Probability Value	Meaning
0.534	0.0003	Significant Strong Correlation

satisfaction assessment is in accordance with the main objectives of orthognathic surgery, namely improving impaired functions, such as mastication, speech, and breathing, obtaining good facial aesthetics, long-term care stability, optimally improving the dento-osseous structure, and shortening the treatment time.¹³

Al-Asfour et al. reported facial deformities that were corrected with bimaxillary jaw surgery (83.3%), Le Fort I (9.1%), and bilateral sagittal split osteotomy (7.6%). Improvement of facial appearance (91.3%), teeth appearance (97.0%), biting (96.3%), chewing (92.3%), and eating function (76.5%). Overall, 93.9% of patients reported better conditions after surgery, and the satisfaction rate was very high.¹⁴

Cephalometric analysis was used in this study as an instrument for post-surgical evaluation which is an important part of orthognathic surgical treatment. The use of Steiner skeletal analysis in this study was carried out for the reasons that this method is easy, fast, simple, and easy to understand. This analysis gives maximum clinical information and minimal measurement methods. Steiner divided his analysis into three parts, namely skeletal, dental and soft tissue analysis. The skeletal analysis relates to the relationship of the maxilla or mandible to the head, as well as the relationship between the maxilla and the mandible itself. Steiner skeletal analysis in the sagittal direction includes measuring the angles of SNA, SNB, ANB, while in the vertical direction, namely the angle of the occlusal plane to SN and GoGn to SN.^{8,9}

The results of this study indicate that 50% of the study subjects had normal SNA angles and 50% were abnormal. The SNA angle was obtained by measuring the anteroposterior position of the maxilla against the cranial base. If the maxilla is more forward from the base of the cranium, the angle increases or more than 86° or the maxilla is prognathized, conversely, if the maxilla is backward, the angle is smaller or less than 78° or the maxilla is retrognathized.⁸

The SNB angle measurement results in this study indicate that 10% of the research subjects have a normal SNB angle and the remaining 90% are not normal. The SNB angle determines the anteroposterior position of the maxilla and mandible to the cranium base. If the angle is greater than 84° then the position of the mandible is prognathic, if the SNB angle is smaller than 76° then the mandible is retrognathized.⁸

This study shows that 80% of study subjects have normal ANB angles and 20% are not normal.

The ANB angle is the anteroposterior position of the maxilla and mandible to the apical base, that is, the connection of the maxilla and mandible in the sagittal direction. This angle is the difference between SNA and SNB, normally it is 0°-4°. If greater than normal then the position of the mandible is relatively backward from the maxilla.⁸

Measurement of the GoGn-SN angle in this study showed that 90% of the study subjects had a normal GoGn-SN angle and 10% were abnormal. The angle of GoGn to SN is the angle of the lower edge of the mandible to the cranium, the normal values for the angle of GoGn to SN are 20°-40°. If this angle value is greater than normal, the mandibular plane growth is clockwise, if it is smaller than normal, the mandibular plane is anti-clockwise. This angle plays an important role in the growth of the mandible and face.⁸

The results of the correlation test of the relationship between the level of patient satisfaction after orthognathic surgery and the results of the skeletal cephalometric analysis showed a probability value of 0.0003 or $p < 0.05$. This value indicates that there is a significant relationship (significant correlation). These results indicate that there is a correlation between the level of patient satisfaction after orthognathic surgery and the results of the cephalometric skeletal analysis. This is consistent with the results of several studies in post-orthognathic surgery patients which showed that good orthognathic surgical treatment can provide high levels of patient satisfaction.^{12,14-15}

Conclusion

The level of patient satisfaction after orthognathic surgery is very satisfied and there is a correlation between the level of patient satisfaction after orthognathic surgery and the results of the skeletal cephalometric analysis.

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Conflict of Interest

We declare that we have no conflict of interest in this study.

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