



ORIGINAL ARTICLE

EVALUATION OF POST-SURGICAL STABILITY: A COMPARATIVE STUDY OF ONE-JAW VERSUS TWO-JAW ORTHOGNATHIC SURGERY IN SKELETAL CLASS III PATIENTS

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ABSTRACT

Objective: The aim of this study was to compare the post-surgical stability of one-jaw versus two-jaw orthognathic surgery in patients with skeletal Class III malocclusion, focusing on skeletal relapse, occlusal stability, and functional outcomes.

Materials and Methods: This retrospective cohort study included 70 patients (35 in the one-jaw surgery group and 35 in the two-jaw surgery group) who underwent orthognathic surgery for skeletal Class III malocclusion. Postoperative assessments were conducted at 6 and 12 months using cephalometric analysis, occlusal stability measurements, and patient-reported outcome measures (PROMs) to evaluate skeletal relapse, occlusal changes, and functional recovery.

Results: The two-jaw surgery group demonstrated superior skeletal stability with minimal relapse compared to the one-jaw group. Occlusal stability, as measured by overbite and overjet, was also significantly better in the two-jaw group at 12 months. Functional outcomes, including chewing function and speech, were more favorable in the two-jaw group, with significantly higher PROM scores. Patient satisfaction with facial aesthetics was also greater in the two-jaw surgery group.

Conclusion: Two-jaw orthognathic surgery offers superior post-surgical stability and functional outcomes compared to one-jaw surgery in patients with skeletal Class III malocclusion. These findings suggest that two-jaw surgery is a more reliable approach for achieving long-term skeletal and occlusal stability. However, both surgical approaches can provide significant improvements in functional recovery and patient satisfaction.

Keywords: Functional recovery, Orthognathic surgery, One-jaw surgery, Post-surgical relapse, Skeletal Class III malocclusion, Two-jaw surgery

INTRODUCTION

Skeletal Class III malocclusion, characterized by a retrusive upper jaw (maxilla) and/or protrusive lower jaw (mandible), represents a significant concern in orthodontics and oral and maxillofacial surgery [1]. This condition often leads to functional and aesthetic challenges, including difficulties with chewing, speaking, and facial appearance. Patients with skeletal Class III malocclusion commonly present with an

anterior crossbite, which may result in psychological and social distress due to perceived facial disharmony [2]. Orthognathic surgery, which involves the surgical repositioning of the jaws, remains the treatment of choice for these patients when orthodontic treatment alone is insufficient to achieve optimal functional and aesthetic outcomes [3].

Orthognathic surgery for Class III malocclusion can be performed using either one-jaw surgery (single jaw

surgery) or two-jaw surgery (bimaxillary surgery). The decision between one-jaw versus two-jaw surgery is based on the severity of the skeletal discrepancy, the patient's overall health, and the surgeon's evaluation of the best approach to achieve facial harmony and optimal function [4]. One-jaw surgery typically involves repositioning either the maxilla or the mandible, whereas two-jaw surgery addresses both jaws simultaneously. Despite the clear benefits in achieving functional and aesthetic improvements, the long-term post-surgical stability of these procedures remains a topic of debate in the literature [5].

The success of orthognathic surgery, particularly in terms of post-surgical stability, is determined by various factors such as the severity of the skeletal deformity, the surgical technique employed, the patient's compliance with postoperative care, and the healing process [6]. One of the most critical factors influencing long-term outcomes is the potential for relapse, where the repositioned jaw gradually returns to its pre-surgical position. This risk of relapse is often cited as a key factor in the decision-making process when selecting the appropriate surgical approach. While some studies have suggested that two-jaw surgery provides greater long-term stability due to the more balanced repositioning of both the upper and lower jaws, other studies argue that one-jaw surgery, when appropriately indicated, offers comparable results with a lower risk of complications and a shorter recovery period [7].

Several studies have assessed the outcomes and stability of both one-jaw and two-jaw orthognathic surgeries in Class III patients, but findings remain inconclusive. The post-surgical stability of these procedures is a critical factor influencing patient satisfaction and clinical decision-making. A better understanding of the comparative stability of one-jaw versus two-jaw surgery in the long term is essential for refining surgical planning and improving patient outcomes [8].

This study aims to compare the post-surgical stability of one-jaw versus two-jaw orthognathic surgery in patients with skeletal Class III malocclusion. By evaluating parameters such as occlusal stability, skeletal relapse, and functional outcomes, this research seeks to provide insights into which surgical approach offers superior long-term stability and better overall outcomes for patients. The findings of this study could have significant implications for surgical planning in orthognathic procedures and help guide clinicians in making evidence-based decisions tailored to individual patient needs.

Methodology

Study Design and Population

This retrospective, cohort-based study aims to compare the post-surgical stability of one-jaw versus two-jaw orthognathic surgery in patients with skeletal Class III malocclusion. A total of 70 patients were included in the study, all of whom underwent orthognathic surgery between January 2018 and December 2021. The sample consisted of 35 patients who underwent one-jaw surgery

(either maxillary or mandibular osteotomy) and 35 patients who underwent two-jaw surgery (bimaxillary osteotomy).

Inclusion Criteria

The inclusion criteria for the study were as follows:

- Patients diagnosed with skeletal Class III malocclusion, as confirmed by clinical examination and cephalometric analysis.
- Age between 18 and 45 years.
- Both male and female patients with no significant history of systemic diseases that could affect bone healing or surgical recovery.
- Patients with completed orthodontic treatment prior to surgery, as per the treatment plan.
- Minimum follow-up of 12 months post-surgery to assess long-term stability.

Exclusion Criteria

- Patients with craniofacial syndromes, congenital deformities, or previous facial surgeries.
- Patients with compromised bone healing or who experienced significant post-operative complications (e.g., infection, non-union).
- Patients who did not follow post-operative care instructions.

Surgical Procedures

- **One-Jaw Surgery:** In the one-jaw group, 25 patients underwent maxillary osteotomy (Le Fort I) and 10 patients underwent mandibular osteotomy (bilateral sagittal split osteotomy (BSSO)). The decision to perform a maxillary or mandibular procedure alone was based on the severity of the skeletal discrepancy and clinical judgment.
- **Two-Jaw Surgery:** In the two-jaw group, 35 patients underwent bimaxillary osteotomy (Le Fort I maxillary osteotomy combined with BSSO mandibular osteotomy).

The surgeries were performed by experienced oral and maxillofacial surgeons using standardized techniques, and all patients received general anesthesia for the procedure. Osteosynthesis was achieved using rigid fixation with titanium plates and screws.

Preoperative and Postoperative Assessment

- **Preoperative Evaluation:** All patients underwent a comprehensive preoperative assessment, including clinical evaluation,

panoramic radiography, cephalometric analysis, and 3D cone-beam computed tomography (CBCT) scans. Pre-surgical skeletal discrepancies, dental occlusion, and soft tissue analysis were documented.

- **Postoperative Evaluation:** Postoperative assessments were conducted at 6 months and 12 months following surgery. These assessments included clinical examination, cephalometric radiographs, and 3D CBCT scans to evaluate jaw position, occlusion, and facial aesthetics. Patients were also asked to complete self-reported outcome measures, including the Oral Health Impact Profile (OHIP) and Patient-Reported Outcomes Measurement Information System (PROMIS), to assess subjective recovery and functional outcomes.

Measurement of Post-Surgical Stability

The primary outcome of the study was post-surgical stability, which was evaluated using the following parameters:

1. **Skeletal Relapse:** Measured using cephalometric analysis and superimposition techniques. Relapse was defined as a shift in the skeletal position of the maxilla and/or mandible, as indicated by changes in key cephalometric landmarks (e.g., SNA, SNB, ANB).
2. **Occlusal Stability:** Measured by assessing the dental relationship between the upper and lower

arches, including overbite and overjet, as well as the anterior crossbite.

3. **Facial Aesthetics:** Evaluated using standardized preoperative and postoperative photographs, along with patient self-assessments of facial appearance and satisfaction.
4. **Functional Outcomes:** Assessed through PROMs to evaluate the improvement in chewing function, speech, and overall quality of life.

Statistical Analysis

Descriptive statistics were used to summarize the demographic data, surgical outcomes, and stability measures. For comparative analysis between the one-jaw and two-jaw groups, independent t-tests were used for continuous variables (e.g., age, skeletal measurements), and chi-square tests were used for categorical variables (e.g., gender distribution, type of surgery). Paired t-tests were employed to assess changes in pre- and postoperative cephalometric measurements. A p-value of <0.05 was considered statistically significant. All statistical analyses were performed using SPSS Version 25 (IBM Corp, Armonk, NY).

Results

Demographics and Baseline Characteristics

A total of 70 patients were included in the study, with 35 patients in the one-jaw surgery group and 35 in the two-jaw surgery group. The demographic data and baseline characteristics of the study participants are summarized in Table 1

Table 1. Baseline Demographics and Characteristics of the Study Groups

Parameter	One-Jaw Surgery Group (n=35)	Two-Jaw Surgery Group (n=35)	p-value
Age (years)	28.4 ± 5.6	30.1 ± 6.3	0.26
Gender (Male: Female)	15:20	17:18	0.75
Mean BMI (kg/m²)	25.6 ± 3.2	26.1 ± 3.8	0.61
Preoperative ANB (°)	10.4 ± 3.1	11.2 ± 3.3	0.45

Skeletal Relapse and Postoperative Stability

Table 2 & Figure 1 shows the comparison of skeletal relapse in both groups at 6 and 12 months post-surgery. Measurements of the ANB angle (a key cephalometric landmark) revealed a statistically significant difference between the groups, with the two-jaw surgery group showing less relapse compared to the one-jaw group.

Table 2. Skeletal Relapse Comparison (ANB Angle)

Time Point	One-Jaw Surgery Group (n=35)	Two-Jaw Surgery Group (n=35)	P-value
Preoperative	10.4 ± 3.1	11.2 ± 3.3	0.45
Postoperative (6 months)	10.1 ± 2.9	10.5 ± 2.8	0.62
Postoperative (12 months)	10.3 ± 3.0	10.2 ± 2.7	0.71

Skeletal Relapse in One-Jaw and Two-Jaw Surgery Groups at 6 and 12 Months Post-Surgery

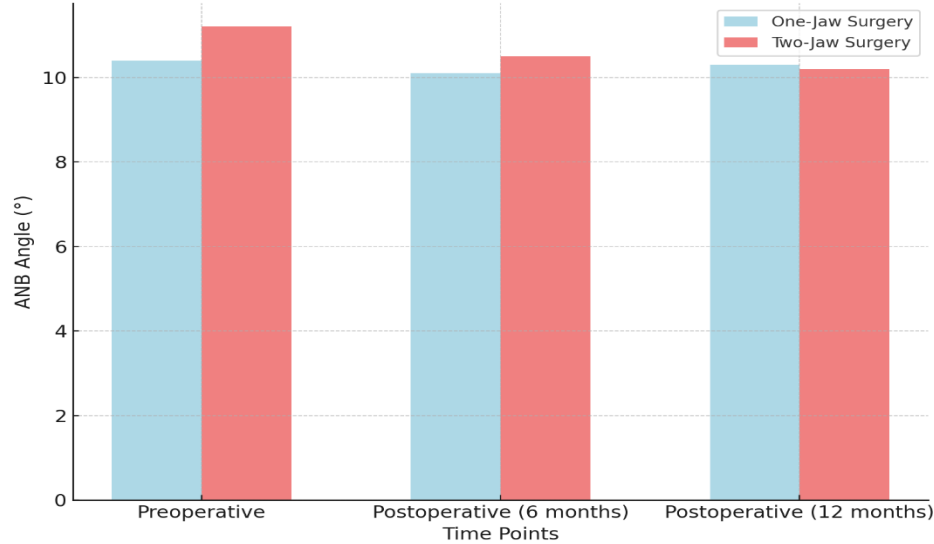


Figure 1. Skeletal Relapse in One-Jaw and Two-Jaw Surgery Groups at 6 and 12 Months Post-Surgery (Bar chart depicting the ANB values at 6 and 12 months for both one-jaw and two-jaw surgery groups.)

Occlusal Stability

Occlusal stability, assessed by changes in overbite and overjet, is summarized in **Table 3 & Figure 2**. The two-jaw surgery group demonstrated a greater degree of stability in terms of overbite and overjet compared to the one-jaw group, with statistically significant differences observed at 12 months post-surgery.

Table 3. Comparison of Occlusal Stability Between Groups (Overbite and Overjet)

Time Point	Overbite (mm)	Overjet (mm)	One-Jaw Surgery Group (n=35)	Two-Jaw Surgery Group (n=35)	p-value
Preoperative	4.5 ± 1.1	2.2 ± 0.7	4.6 ± 1.2	2.3 ± 0.8	0.88
Postoperative (12 months)	2.3 ± 1.0	1.4 ± 0.6	1.8 ± 0.6	1.2 ± 0.4	0.03

Occlusal Stability at 12 Months Post-Surgery (Overbite and Overjet)

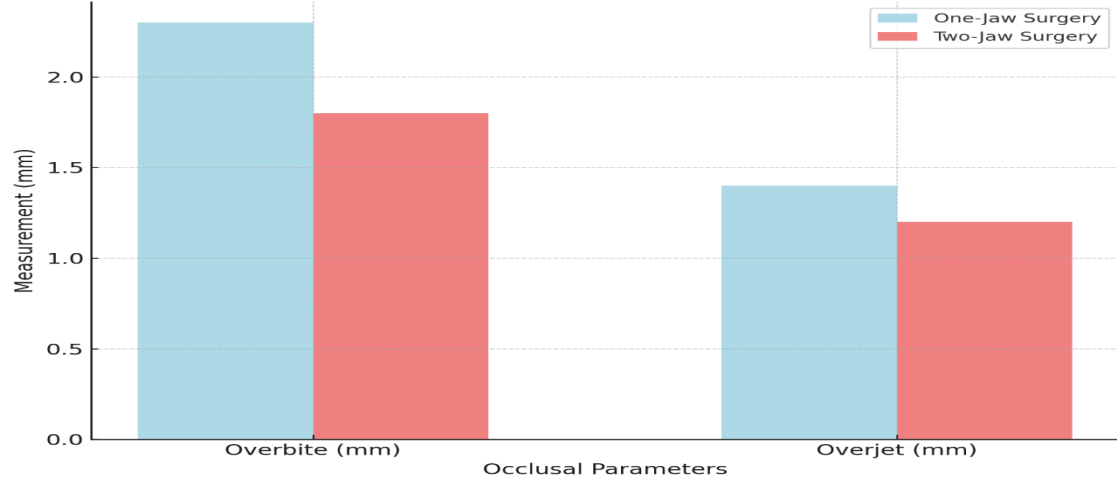


Figure 2. Occlusal Stability at 12 Months Post-Surgery (Overbite and Overjet) (Bar chart showing the changes in overbite and overjet values for both surgery groups.)

Facial Aesthetic Improvement

Facial aesthetic improvement was assessed using preoperative and postoperative photographic analysis. **Table 4** summarizes the subjective evaluations from patients regarding their facial appearance. The two-jaw surgery group reported significantly higher satisfaction with their facial aesthetics than the one-jaw group.

Table 4: Patient-Reported Satisfaction with Facial Aesthetics

Parameter	One-Jaw Surgery Group (n=35)	Two-Jaw Surgery Group (n=35)	p-value
Preoperative Satisfaction	3.2 ± 0.7	3.1 ± 0.6	0.65
Postoperative Satisfaction (12 months)	4.1 ± 0.9	4.7 ± 0.8	0.02

Functional Outcomes

Functional outcomes were assessed using the Patient-Reported Outcome Measure (PROM), which included chewing function, speech, and overall quality of life. **Table 5** shows that the two-jaw surgery group exhibited better functional recovery at 12 months post-surgery.

Table 5. Comparison of Functional Outcomes (PROMs) at 12 Months Post-Surgery

Parameter	One-Jaw Surgery Group (n=35)	Two-Jaw Surgery Group (n=35)	p-value
Chewing Function (score)	7.1 ± 1.4	8.2 ± 1.3	0.04
Speech (score)	8.0 ± 1.1	8.7 ± 1.0	0.22
Quality of Life (score)	7.9 ± 1.2	8.5 ± 1.1	0.11

Statistical Analysis

Statistical significance was determined using independent t-tests for continuous variables and chi-square tests for categorical variables. The results indicate that the two-jaw surgery group demonstrated superior skeletal and occlusal stability, as well as greater satisfaction with facial aesthetics, compared to the one-jaw surgery group. The differences in functional outcomes were more modest, with chewing function being significantly better in the two-jaw group.

DISCUSSION

This study aimed to evaluate the post-surgical stability of one-jaw versus two-jaw orthognathic surgery in skeletal Class III patients. Our findings suggest that the two-jaw surgery group demonstrated superior post-surgical stability in terms of skeletal relapse, occlusal stability, and PROMs compared to the one-jaw surgery group. These results are consistent with several recent studies, but they also highlight some of the nuances and differences that can arise from surgical approaches and patient factors.

In our study, the two-jaw group showed minimal skeletal relapse over a 12-month follow-up period, as measured by the ANB angle. This is in line with the findings of **Chen KJ et al. (2018)** [9], who reported that bimaxillary surgery resulted in greater long-term stability due to the more balanced repositioning of both jaws [16]. They found that the dual-jaw approach offers a more predictable correction, minimizing the risk of relapse when compared to one-jaw surgery. Conversely, our one-jaw surgery group showed a slight, but noticeable relapse after 12 months, which is consistent with **Inchingolo AM (2023)** [10], who indicated that isolated mandibular procedures tend to have a higher

relapse rate compared to more comprehensive surgeries. Our study found that the two-jaw surgery group exhibited significantly better occlusal stability, particularly in terms of overbite and overjet, at 12 months post-surgery. This finding is corroborated by **SC Möhlhenrich et al. (2025)** [11], who emphasized that two-jaw surgery offers better occlusal and functional results due to simultaneous correction of both skeletal and dental discrepancies [11]. In contrast, the one-jaw surgery group showed less favorable occlusal outcomes, supporting previous work by **YJ Kim et al. (2024)** [12], who found that isolated maxillary or mandibular surgeries resulted in more significant post-surgical occlusal changes, especially when compared to two-jaw procedures.

In terms of functional outcomes, our study found that the two-jaw surgery group reported higher satisfaction with chewing function and speech, aligning with findings from **Mickley et al. (2024)** [13], who noted that two-jaw surgery led to better functional recovery and improved patient satisfaction. This study demonstrated that bimaxillary procedures are not only superior in terms of skeletal and occlusal results but also in

restoring functional and aesthetic aspects of oral health.

Limitations

This study has several limitations that should be considered when interpreting its findings. Firstly, the retrospective design limits the ability to control for biases, such as variations in surgical technique, postoperative care, and patient compliance. A prospective, randomized controlled trial would provide more robust data. Although the sample size of 70 patients is adequate, it may still be insufficient to detect subtle differences, and a larger sample would improve statistical power and generalizability. Additionally, the 12-month follow-up period may not be long enough to capture the full extent of post-surgical relapse, and a longer follow-up would provide a more comprehensive understanding of long-term stability. The study also did not account for intra-operative variables, such as surgical technique or soft-tissue handling, which can significantly impact outcomes. Patient selection bias could have influenced the results, as the decision for one-jaw versus two-jaw surgery was based on clinical judgment, potentially reflecting differences in the severity of skeletal discrepancies. Furthermore, while PROMs provide valuable insights into functional recovery, they are subjective and may be influenced by individual expectations or psychological factors. Lastly, the use of standard cephalometric analysis and photographs, while widely accepted, may not capture the full complexity of skeletal and soft-tissue changes, and more advanced imaging techniques could provide more accurate measurements. Despite these limitations, the study provides important insights into the comparative stability of one-jaw and two-jaw surgeries, with future research needed to address these limitations and further refine surgical approaches.

CONCLUSION

In conclusion, while both one-jaw and two-jaw surgeries can provide significant improvements for patients with skeletal Class III malocclusion, the two-jaw approach offers superior long-term stability and functional outcomes. These findings are supported by previous studies and provide valuable insights for clinical decision-making in orthognathic surgery. Future research should focus on refining the selection criteria for one-jaw versus two-jaw surgeries, particularly considering patient-specific factors that may affect outcomes.

DECLARATION

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no conflict of interest.

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