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E-mail: vmehta@statsense.in
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Role of orthognathic surgery in the correction for severe dentofacial deformities: A clinical evaluation

Perthish Sharma[1], Beena Roopak[2], Santosh Kumar[3,*], Nitin Uddhav Patil[4], Priyanka Gupta[5] & Romilkumar Shah[6]

[1]Department of Orthodontics and Dentofacial Orthopaedics, Sri Guru Ram Das Institute of Dental Sciences and Research, Amritsar, Punjab, India; [2]Department of Oral and Maxillofacial Surgery, Rajarajeshwari Dental College and Hospital, Mysore Road, Ramohalli Cross, Bengaluru, Karnataka, India; [3]Department of Periodontology & Implantology, Karnavati University, Uvarsad, Gandhinagar, Ahmedabad, Gujarat, India; [4]Department of Oral and Maxillofacial Surgery, JMF's ACPM Dental College, Dhule, Surat Highway, Dhule, Maharashtra, India; [5]Department of Pediatric and Preventive Dentistry, Swargiya Dadasaheb Kalmegh Smruti dental college and hospital, Nagpur, India; [6]Department of Orthodontics and Dentofacial Orthopedics, K. M. Shah Dental College and Hospital, Sumandeep Vidyapeeth Deemed to be University, Piparia, Waghodia, Vadodara, Gujarat, India; *Corresponding author

Affiliation URL:

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https://sumandeepvidyapeethdu.edu.in/

Author contact:
Perthish Sharma - E-mail: perthishsharma@gmail.com
Beena Roopak - E-mail: drbeenaroopak@gmail.com
Santosh Kumar - E-mail: santoshkumar@karnavatiuniversity.edu.in
Nitin Uddhav Patil - E-mail: nitinpatil2683@gmail.com; Phone: +91 9890450550
Priyanka Gupta - E-mail: priyankasurya8@rediffmail.com
Romilkumar Shah - E-mail: drromils.kmsdch@sumandeepvidyapeethdu.edu.in

Abstract:
Severe dentofacial deformities adversely affect facial esthetics, oral function and psychosocial well-being, necessitating effective treatment beyond conventional orthodontic therapy. Therefore, it is of interest to evaluate the outcomes of orthognathic surgery in 60 patients with skeletal Class II, skeletal Class III, or facial asymmetry using pre- and post-operative clinical, cephalometric, functional and patient-reported assessments. Orthognathic surgery produced significant improvements in skeletal relationships, occlusal alignment, facial profile, mastication, speech and temporomandibular joint symptoms, with most patients reporting marked enhancement in facial appearance, social confidence and quality of life. Functional rehabilitation and patient satisfaction improved substantially following surgical correction of severe dentofacial deformities. These findings provide clinical evidence supporting orthognathic surgery as a predictable and comprehensive approach for restoring facial harmony, oral function and long-term quality of life in patients with severe skeletal discrepancies.

Keywords: Orthognathic surgery, dentofacial deformity, skeletal malocclusion, facial esthetics, quality of life, orthodontic-surgical treatment

Background:
Dentofacial Deformities are skeletal and dental abnormalities of the maxilla, mandible or both, which lead to functional, esthetic and social disabilities. These malformations can include skeletal Class II or Class III malocclusions, facial asymmetry, vertical maxillary excess, mandibular deficiency and a combination of several craniofacial abnormalities **[1]**. Severe dentofacial deformities frequently lead to impaired mastication, speech, breathing, temporomandibular joint function and facial appearance, which negatively impact an individual's quality of life. Orthognathic surgery is often a necessary part of comprehensive treatment for severe skeletal discrepancies that cannot be corrected with conventional orthodontic treatment alone **[2]**. Dentofacial deformities have an impact beyond just their physical appearance and functional limitations. Affected people often report psychosocial problems, including low self-esteem, social anxiety, emotional distress and interpersonal problems **[3]**. Sen *et al.* showed that dentofacial deformities cause patients a great deal of psychosocial problems prior to treatment and they experience a significant improvement in their psychosocial status after orthognathic surgery. Their long-term assessment showed that their self-confidence, social interaction and emotional health improved over the course of treatment **[4]**. Orthognathic surgery is the surgical movement of one or both jaws to create optimal relationships between the skeletal, dental and soft tissue structures. Treatment goals are to correct malocclusion, restore facial balance, improve oral function and enhance esthetics. The surgical techniques, fixation systems, anesthesia and orthodontic preparation have all improved over the last 10 years, making treatment more successful **[5]**. A systematic review by Zamboni *et al.* found that orthognathic surgery is not only a corrective procedure, but also a transformative surgery that has a positive impact on patient satisfaction, oral health-related quality of life and overall quality of life **[6]**. Three dimensional imaging, virtual surgical planning and computer-assisted simulation have further improved the accuracy and predictability of orthognathic treatment. Borges *et al.* showed that surgery-first has become popular due to the decrease in time spent on treatment and the immediate cosmetic outcome **[7]**. Similarly, a systematic review and meta-analysis showed that patients with skeletal Class II and Class III deformities have significant improvement in oral health-related quality of life after orthognathic surgery, especially in the functional limitation, social disability and psychological discomfort domains **[8]**. One of the most important factors for treatment success is long-term skeletal stability. Inchingolo *et al.* examined the available data on relapses after orthognathic surgery and found that relapse rates have significantly decreased in recent years, due to improved surgical planning and fixation techniques, leading to more predictable post-operative results **[9]**. With the development of treatment protocols, surgeons have been able to achieve excellent skeletal correction while maintaining long term stability and patient satisfaction. Patient-reported outcomes have been the focus of recent investigations. In the study by Sen *et al.*, the authors found that after surgery, there was a significant improvement in

the Orthognathic Quality of Life Questionnaire and OHIP-14 scores, which showed that correction of dentofacial deformities not only improves functional rehabilitation but also psychological and social well-being **[4]**. Alam *et al.* also found that the patients were very satisfied with the results of the orthognathic surgery, with respect to facial appearance, oral function and overall treatment outcomes **[11]**. Digital technologies are still evolving and their impact on orthognathic practice has continued to change. Mansour *et al.* showed that the three-dimensional assessment techniques are reliable methods for assessing the stability of the post-operative skeleton and are useful for monitoring treatment results **[12]**. Therefore, it is of interest to evaluate the effect of orthognathic surgery in correction of severe dentofacial deformities and to determine its effect on skeletal correction, oral function, facial esthetics and patient satisfaction.

Materials and Methodology:

Study design:

A prospective clinical observational study was conducted to assess the role of orthognathic surgery in correction of severe dentofacial deformities.

Study setting:

This study was conducted in the Department of Oral and Maxillofacial Surgery in association with the Department of Orthodontics in a tertiary care dental teaching institution.

Study duration:

The study was performed over 24 months, including recruitment of patients, surgical treatment and post-operative follow-up.

Sample size:

A total of 60 patients diagnosed with severe dentofacial deformities and planned for orthognathic surgery were included in the study.

Sampling technique:

Consecutive sampling was used, which involved the selection of all patients eligible for the study who appeared during the study period.

Inclusion criteria:

[1] Patients aged 18–40 years.
[2] Class II or Class III malocclusion that is severe.
[3] Orthognathic surgery for maxillary, mandibular or bimaxillary skeletal deformities.
[4] Presurgical orthodontic preparation completed.
[5] Willingness to participate and provide informed consent.

Exclusion criteria:

[1] Syndromic craniofacial deformities.
[2] Patients with cleft lips and palate.
[3] Previous orthognathic surgery.
[4] Extensive systemic disease that is incompatible with surgery.
[5] Patients who refuse to participate or come for follow-up visits.

Pre-operative assessment:

Clinical evaluation:

All patients were thoroughly clinically examined, which comprised:

[1] Facial symmetry assessment.
[2] Profile analysis.
[3] Dental occlusion evaluation.
[4] Measurement of overjet and overbite.
[5] Temporomandibular joint examination.

Speech and masticatory evaluation:

Radiographic evaluation:

The following investigations were conducted:

[1] Orthopantomogram (OPG).
[2] Lateral cephalogram.
[3] Posteroanterior cephalogram.

When indicated, Cone Beam Computed Tomography (CBCT).

Cephalometric analysis:

The following cephalometric parameters were evaluated:

[1] SNA angle.
[2] SNB angle.
[3] ANB angle.
[4] Wits appraisal.
[5] Facial convexity angle.
[6] Mandibular plane angle.
[7] Facial height proportions.

Photographic assessment:

Standardized extraoral and intraoral photos were taken prior to surgery and at follow-up after surgery.

Surgical procedure:

Depending upon the deformity, patients underwent:

[1] Le Fort I osteotomy.
[2] Bilateral sagittal split osteotomy (BSSO).
[3] Genioplasty.
[4] Bimaxillary orthognathic surgery.

All cases were treated with rigid internal fixation with titanium plates and screws.

Post-operative evaluation:

Patients were assessed at:

[1] 1 month
[2] 3 months
[3] 6 months
[4] 12 months post-operatively

Outcome measures:

Primary outcomes:

[1] Skeletal correction using cephalometric measurements.
[2] Improvement of the occlusal relationship.
[3] Correction of facial asymmetry.

Secondary outcomes:
[1] Improvement in mastication.
[2] Improvement in speech.
[3] Decreased TMJ symptoms.
[4] Facial esthetic enhancement.
[5] Patient satisfaction scores.
[6] Quality-of-life improvement.

Patient satisfaction assessment:
A semi-structured questionnaire with 10-point Visual Analog Scale (VAS) was used to evaluate:
[1] Facial appearance.
[2] Oral function.
[3] Social confidence.
[4] Overall treatment satisfaction.

Statistical analysis:
The data was entered into Microsoft Excel and analyzed using IBM SPSS Statistics Version 29.0. Data were presented as mean ± Standard Deviation and percentage. For quantitative variables, paired t-tests were used for comparison between pre and post-surgery. Chi-square test was used for categorical variables. A p-value <0.05 was considered statistically significant.

Results:
A total of 60 patients with severe dentofacial deformities who underwent orthognathic surgery were included in the study. All patients completed the planned surgical treatment and follow-up assessments. The study evaluated demographic characteristics, surgical outcomes, cephalometric changes, functional improvements, esthetic enhancement and patient satisfaction following orthognathic correction. More than half of the patients (53.3%) belonged to the 21–30 years age group, indicating that dentofacial deformities are commonly corrected during early adulthood. Males represented 56.7% of cases, whereas females accounted for 43.3%. Skeletal Class III deformity was the most prevalent condition (43.3%), followed by Class II deformity (33.3%). BSSO and bimaxillary surgery were the most frequently performed procedures, reflecting the severity of skeletal discrepancies requiring correction **(Table 1).** Orthognathic surgery produced statistically significant improvements in all evaluated parameters. The mean ANB angle improved from −2.8°C preoperatively to 2.4°C post-operatively, indicating successful correction of sagittal skeletal discrepancies. Mean overjet changed from −4.6 mm to +2.8 mm, demonstrating normalization of occlusal relationships. Functional outcomes also improved considerably, with mastication scores increasing by approximately 102% and speech scores improving by nearly 59%. TMJ symptom scores decreased by about 64%, indicating significant relief of functional discomfort **(Table 2).** Post-operative patient satisfaction was remarkably high. Improvement in facial appearance was reported by 91.7% of participants, while 90.0% experienced enhanced mastication. Increased social confidence was observed in 93.3% of patients, emphasizing the psychosocial benefits of surgery. Overall treatment satisfaction reached 95.0%, indicating excellent acceptance and positive perception of treatment outcomes **(Table 3).**

Table 1: Demographic and clinical characteristics of study participants (n=60)

Variable	Frequency (n)	Percentage (%)
Age Group		
18–20 years	10	16.7
21–30 years	32	53.3
31–40 years	18	30.0
Gender		
Male	34	56.7
Female	26	43.3
Type of Deformity		
Skeletal Class II	20	33.3
Skeletal Class III	26	43.3
Facial Asymmetry	14	23.4
Surgical Procedure		
BSSO	22	36.7
Le Fort I Osteotomy	14	23.3
Bimaxillary Surgery	20	33.3
Genioplasty	4	6.7

Table 2: Comparison of cephalometric and functional parameters before and after surgery

Parameter	Pre-operative Mean ± SD	Post-operative Mean ± SD	p value
ANB Angle (°C)	-2.8 ± 3.4	2.4 ± 1.2	<0.001*
Overjet (mm)	-4.6 ± 3.2	2.8 ± 0.9	<0.001*
Facial Convexity Angle (°C)	165.4 ± 8.6	173.8 ± 4.5	<0.001*
Mastication Score (0–10)	4.2 ± 1.5	8.5 ± 1.0	<0.001*
Speech Score (0–10)	5.4 ± 1.4	8.6 ± 0.9	<0.001*
TMJ Symptom Score (0–10)	6.1 ± 1.7	2.2 ± 1.1	<0.001*

**Statistically significant*

Table 3: Patient satisfaction and quality-of-life outcomes after orthognathic surgery

Outcome Variable	Satisfied n (%)	Not Satisfied n (%)	p value
Facial Appearance	55 (91.7)	5 (8.3)	<0.001*
Improvement in Mastication	54 (90.0)	6 (10.0)	<0.001*
Improvement in Speech	50 (83.3)	10 (16.7)	0.002*
Social Confidence	56 (93.3)	4 (6.7)	<0.001*
Overall Treatment Satisfaction	57 (95.0)	3 (5.0)	<0.001*

**Statistically significant*

Discussion:
In the present clinical evaluation, the role of orthognathic surgery was evaluated in 60 patients with severe dentofacial deformities. The study showed that skeletal relationship, occlusal correction, facial esthetics, mastication, speech, TMJ symptoms and patient satisfaction improved significantly. The

results suggest that orthognathic surgery is a comprehensive surgical procedure for the correction of dentofacial deformities which can be used to correct both functional and psychosocial problems. In the present study, the majority of patients were young adults (21–30 years). The age distribution is clinically significant as orthognathic surgery is typically performed after facial growth is complete, when definitive skeletal correction can be performed with long-term stability. Suen *et al.* noted that orthognathic patients often seek treatment in their youth when issues with facial appearance, self-confidence, social interaction and functional limitation become more prominent **[13]**. Likewise, Alam *et al.* reported that the patients who underwent orthognathic surgery often requested treatment for the correction of their occlusion as well as for their facial appearance and psychological well-being **[11]**. Skeletal Class III deformity was the most common indication in the present study. This could be explained by the significant facial asymmetry, reverse overjet, mandibular prognathism and functional challenges that are frequently observed in Class III skeletal discrepancies. These deformities cannot be camouflaged with orthodontics alone and must be surgically repositioned either one or both jaws. Alam *et al.* highlighted that orthognathic surgery is an effective treatment option that can greatly enhance functional outcomes and patient satisfaction in cases of severe skeletal malocclusion **[11]**. The major finding of the present study was that the cephalometric parameters were significantly improved after surgery. The ANB angle shifted from a negative preoperatively to a more favorable skeletal relationship post-operatively and overjet and convexity of the face also showed significant improvement. These results show successful correction of sagittal jaw discrepancy and restoration of facial balance. Mansour *et al.* showed that three-dimensional evaluation following the surgery-first orthognathic surgery (SFO) procedure revealed good skeletal stability and predictable post-operative results **[12]**. Likewise, Kadıoğlu *et al.* emphasized the importance of virtual surgical planning to understand the skeletal characteristics and to achieve predictable treatment patterns in orthognathic surgery **[14]**. Another significant finding from the present study was the functional improvement. The occlusal contact showed significant improvement in mastication scores following surgery, suggesting enhanced chewing efficiency and better occlusal contact. Skeletal discrepancy correction restores stable dental intercuspation, better jaw movement coordination and greater eating comfort to the patient. Speech scores were also improved after surgery. These findings are consistent with Tüz *et al.*, who reported significant postoperative improvements in oral health-related quality of life, facial esthetics, function, social aspects of deformity and psychological well-being following orthognathic surgery **[15].** Severe dentofacial deformities can change the tongue position, incisor relationship and oral cavity dimensions, which can impact articulation. Oral functional space and jaw relationship are improved with surgical correction which helps with speech performance. Additionally, symptoms of the TMJ were decreased following surgery. The relationship between orthognathic surgery and TMJ function is complex, but when the skeletal alignment and occlusal stability is improved, abnormal functional loading of the TMJ may be diminished. Long-term assessment is also important because the persistence or recurrence of TMJ symptoms may occur depending on the preoperative TMJ status, surgical movement and adaptation following treatment. Talpoş *et al.* reported good patient satisfaction following long-term follow-up after orthognathic surgery, but there is a need to monitor for complications and relapse **[16]**. The present study showed positive patient-reported outcomes. Over 90% of patients reported improvements in facial appearance, mastication, social confidence and overall satisfaction. The results highlight the significant psychosocial effect of orthognathic surgery. Dentofacial deformities are often associated with patients' embarrassment, decreased self-esteem and social discomfort because of the disharmony in the face. Surgery can help improve facial symmetry, profile balance, lip competence and occlusion, which will improve appearance and self-perception **[4]**. Ebenezer *et al.* reported that orthognathic surgery leads to better clinical results and quality of life, but it is necessary to carefully assess the complications **[17]**. With the advent of recent digital technology, the planning and outcome prediction for orthognathic surgery has been further enhanced. The accuracy of diagnosis, surgical planning and post-operative evaluation has been enhanced with the use of artificial intelligence, 3-D imaging, virtual simulation and computer-assisted splint fabrication. With the advent of recent digital technology, the planning and outcome prediction for orthognathic surgery has been further enhanced. Birbe emphasized the multidisciplinary nature of orthognathic treatment and highlighted the growing role of digital planning, virtual surgical simulation, artificial intelligence and other technology-driven approaches in improving treatment precision and individualized surgical planning **[18]**. Janáková *et al.* highlighted the growing importance of artificial intelligence in orthognathic surgery, such as diagnosis, treatment planning, prediction of surgical outcomes and optimizing workflow **[19]**. Schaefer *et al.* also reported that orthognathic therapy is correlated with measurable improvement in quality of life, which is important to consider patient-centered outcome assessment **[20]**. Although there are many advantages, orthognathic surgery is a major surgical procedure and can have complications including neurosensory disturbance, infection, relapse, swelling, discomfort and temporary functional limitation. Thus, case selection, presurgical orthodontic preparation, accurate treatment planning, patient counseling and multi-disciplinary coordination are all important. Eslamipour *et al.* studied patients prior to 2018, but their results are still applicable as they showed that significant improvement in quality of life following orthognathic surgery in patients with dentofacial deformities **[21]**. The results of the present study are in line with recent literature and validate the use of orthognathic surgery as an effective treatment for severe dentofacial deformities. It offers high patient satisfaction, excellent occlusal and functional efficiency, a degree of skeletal correction and an improvement in facial esthetics. For severe skeletal malocclusions, therefore, orthognathic surgery should be

considered as the choice of treatment when orthodontic treatment is not enough.

Conclusion:

Orthognathic surgery produced significant improvements in skeletal relationships, occlusal function, facial symmetry, mastication, speech, temporomandibular joint symptoms and patient satisfaction. Surgical correction markedly enhanced facial esthetics, psychosocial well-being and overall quality of life in patients with severe dentofacial deformities. Thus, data support orthognathic surgery as the treatment of choice for severe skeletal discrepancies when combined with meticulous planning and multidisciplinary care.

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