SVOA Dentistry

ISSN: 2753-9172

ScienceVolks Open Access

Research Article

Orthognathic Surgery Using Clear Aligners: State of the Art

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https://doi.org/10.58624/SVOADE.2025.06.025

Received: August 07, 2025

Published: September 13, 2025

Citation: Mancilla Uribe J, Martínez Guzmán C, Estrada Caceres F, Letelier Albornoz MI. Orthognathic Surgery Using Clear Aligners: State of the Art. *SVOA Dentistry 2025,* 6:5, 153-157. doi: 10.58624/SVOADE.2025.06.025

Abstract

Introduction: Orthognathic surgery is a common procedure for correcting dentofacial anomalies, traditionally preceded and followed by orthodontic treatment with fixed appliances. However, in recent decades, orthodontics has evolved with the use of digital technologies and a growing demand for aesthetic and customized options, such as clear aligners. These removable, computer-generated devices offer an aesthetic and functional alternative for the orthodontic preparation of patients undergoing orthognathic surgery.

Methods: A manual literature review search was carried out in the PubMed and EBSCO databases by two researchers, using acombination of keywords “orthognathic surgery” AND “clear aligner” AND “orthodontics”. Regarding the criteria For inclusion, bibliographic reviews, observational studies, clinical trials, clinical guidelines, systematic reviews and meta-analyses published between 2015 and 2025, in English or Spanish were considered. Animal studies and letters to the editor were excluded. Finally, 13 articles were included in this revision.

Conclusion: The benefits of aligners include improved oral hygiene, less soft tissue discomfort, the absence of dietary restrictions, and improved patient-reported quality of life. Comparative studies have shown that, after surgery, patients treated with clear aligners report less pain, greater aesthetic satisfaction, and improved social adjustment compared to those treated with fixed appliances. Clear aligners represent an effective and aesthetic alternative to traditional braces in the context of orthognathic surgery, offering precise results, good occlusal stability, and high patient acceptance.

Keywords: *Orthognathic Surgery, Clear Aligner, Orthodontics*

Introduction

Orthognathic surgery is a commonly used procedure to correct dentofacial anomalies, with approximately 10,000 interventions performed in the United States in 2008.[1]

Over the past two decades, orthodontics has undergone significant transformations driven by technological advances and a growing patient demand for aesthetic and personalized treatments. This has promoted the development of more aesthetic treatment options, as well as the use of virtual planning and CAD/CAM technologies.

Clear aligner treatment represents an orthodontic technique based on a series of customized, computer-generated plastic aligners that gradually guide the teeth into proper alignment. Its popularity has increased considerably due to its aesthetic appeal, as they are virtually invisible during use.[2]

Initially, clear aligners were primarily indicated for mild malocclusions. However, their use in orthodontic treatments combined with complex surgical procedures, such as Le Fort I osteotomy, bilateral sagittal osteotomy, and genioplasty, has been limited.[3]

Orthognathic treatment of dentofacial malformations requires a multidisciplinary approach. This includes a presurgical orthodontic phase to decompensate the dentition and align the teeth in relation to their bony base, followed by surgical correction of skeletal discrepancies, and concluding with a post-surgical orthodontic phase aimed at optimizing occlusion and facial aesthetics.[4]

In patients with severe mandibular deformities, the position of the teeth can mask underlying bone discrepancies. Therefore, it is essential to eliminate dental offsets to reveal the true extent of the bone deformity.[5]

Presurgical orthodontic treatment focuses on eliminating all dental offsets in all three spatial planes, avoiding movements that may predispose to relapse.[6]

The main objective of this research article is to describe the state-of-the-art use of clear aligners in orthognathic surgery.

Materials and Methods

A manual literature review search was carried out in the PubMed and EBSCO databases by two researchers, using a combination of keywords “orthognathic surgery” AND “clear aligner” AND “orthodontics”. Regarding the criteria

For inclusion, bibliographic reviews, observational studies, clinical trials, clinical guidelines, systematic reviews and meta-analyses published between 2015 and 2025, in English or Spanish were considered. Animal studies and letters to the editor were excluded. Finally, 13 articles were included in this revision.

Results

Patients who underwent surgery first reported substantial and immediate aesthetic satisfaction at the beginning of the treatment course; the mean percentage of T0 to T1 reduction scores was 74.4% and 63.2% in the clear aligner and fixed appliance groups.[12]

The technique offers a better estimate of the available space for anterior tooth decompensation through the use of 3D virtual tooth movement software.[7]

The beneficial effects of clear aligners lie in their intrinsic removable nature, making teeth easier to clean.

This system also reduces soft tissue discomfort compared to that associated with fixed labial or lingual orthodontic appliances. Secondly, this system is not associated with any dietary restrictions, making it much easier for the patient to maintain normal oral hygiene and periodontal health.[5]

The plaque index was also significantly different at T2, with increasing values in the braces group throughout treatment and stable values in the Invisalign group. The latter group also had better results in terms of bleeding on probing, and the differences between groups were significant.[13]

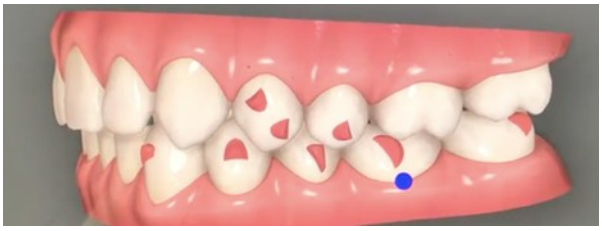

Figure 1. *Side view of the attachment in the use of aligner.*

Figure 2. *Front side of the attachment*

The study compared two groups of patients undergoing postoperative orthodontic treatment: one with clear aligners (Invisalign) and the other with traditional fixed appliances. Both groups followed the same surgical protocol. The results showed that the Invisalign group had better results in terms of quality of life from the beginning of the study (T0), with statistically significant differences at T2 on the OHIP-14 and OQLQ-22 questionnaires. The Invisalign group experienced less impact on their daily life and reported less pain compared to the fixed appliance group. The quality of life benefits observed in this study are consistent with previous research comparing both treatments.[13]

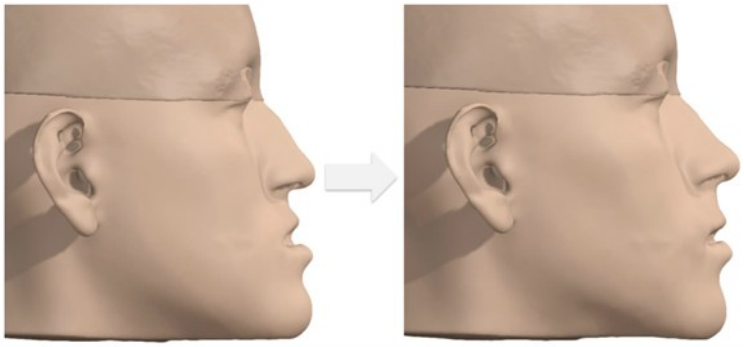

Figure 3. *Pre – Post op soft tissue prediction in orthognathic surgery.*

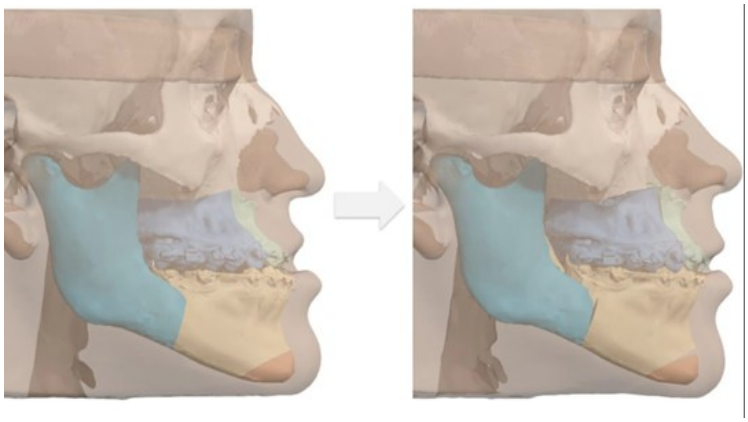

Figure 4. *Pre – Post op bone tissue prediction in orthognathic surgery.*

Discussion

Orthodontic pre-surgical treatment

During presurgical orthodontic treatment for Class III malocclusion, orthodontists attempt to align teeth, eliminate occlusal interference, and retract labially tipped incisors to prepare for orthognathic surgery.[4]

They also demonstrated that clear aligners can be effective in managing the orthodontic phase of orthognathic surgery treatment. The 6-year follow-up highlighted the stability of the treatment over time.[7]

Recently, clear aligners or aligners combined with mini-implants have shown some promising results in the treatment of mild to moderate Class II skeletal hyperdivergence. The majority of treated patients were mild cases with incisor extrusion and minimal evidence of posterior tooth intrusion. However, recent retrospective studies have evaluated the associated dental and skeletal changes after treatment with clear aligners.[8]

Surgery first with aligner

The recently introduced "surgery-first" approach in orthognathic surgery has gained popularity among patients due to the immediate improvement in the facial profile and the significant reduction in overall treatment time compared to the conventional approach.[2]

A surgery-first or early surgery approach is proposed to shorten the treatment course while ensuring treatment impact, providing a better patient experience, and reducing financial and time costs.[7]

The first surgical approach has been reported to primarily treat Class III skeletal abnormalities; however, Class II patients also have strict indications for it. Class II patients can be classified into two groups: high-angle Class II and low-angle Class II; both cases represent two distinct entities, with different facial patterns (hyperdivergent and hypodivergent, respectively).[9]

Segmental Maxillary Surgery

Multisegmental maxillary osteotomies allow precise control and versatility of surgical movements in a single procedure. They are indicated to correct transverse discrepancies, vertical anomalies such as anterior open bites, dentoalveolar segmentation, arch shape abnormalities, and closure of extraction spaces. Although effective, the movements performed may present a higher risk of relapse, especially in cases of increased transverse dimension or closure of anterior open bites. Relapse is due to multiple factors, including stretching of the thick, inelastic palatal mucosa.[10]

They used CAD/CAM technology to fabricate a rigid clear aligner that offers complete cusp coverage of the maxillary and mandibular dentition, replacing intermediate and permanent splints. The snap-on nature of this tray allows for rapid and precise positioning of the jaws in desired positions without the need to rely on orthodontic wires or brackets. Furthermore, one of the main advantages of this modality is complete control of individual alveolar segments by controlling torque thanks to the complete seating of the tooth crowns within the tray during arch alignment. This method can be particularly advantageous in multi-unit Le Fort osteotomies. Despite the limitations of clear aligners, there are benefits compared to conventional fixed appliances, including shorter patient adaptation to this treatment, fewer functional impairments such as speech impairment, similar treatment costs, and improved camouflage that maintains a better aesthetic appearance and acceptability to patients. However, it requires optimal patient cooperation.[11]

Conclusion

The use of clear aligners as an alternative to conventional fixed orthodontics, both in the pre- and post-surgical phases of orthognathic surgery, has proven effective. This modality not only allows for precise clinical and functional results, but also significantly improves aesthetics, oral hygiene, and comfort during treatment. The removable nature of the aligners makes them easier to use and contributes to greater patient satisfaction by meeting both functional and aesthetic expectations.

Conflict of Interest

The authors declare no conflict of interest.

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