INTEGRATION OF ORTHODONTIC AND SURGICAL METHODS: MODERN APPROACHES AND CLINICAL EXPERIENCES

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Abstract: *The combination of orthodontics and maxillofacial surgery is seen as a promising avenue in dentistry for the treatment of complex skeletal and dentoalveolar abnormalities. This article examines the theoretical underpinnings of this strategy, its therapeutic applications, and its compatibility with contemporary technologies. It is empirically proven that treating malocclusion, skeletal disproportions, and maxillofacial asymmetries with orthodontics or surgery alone is insufficient, but integrated approaches yield more thorough outcomes. In modern clinical practice, the use of skeletal anchoring devices, 3D virtual planning, piezosurgery, and minimally invasive technology improves treatment effectiveness while lowering risks. Clinical examples demonstrate that sequential or simultaneous use of orthodontic preparation and orthognathic surgery results in improved functional, cosmetic, and psychological outcomes.*

Keywords*: Orthodontics, maxillofacial surgery, orthognathic surgery, skeletal anomalies, malocclusion, integrated treatment, 3D planning, piezosurgery.*

INTRODUCTION

In dentistry, orthodontics and maxillofacial surgery are closely interconnected, and an integrated approach plays a crucial role in successfully correcting complex skeletal and dentoalveolar anomalies [1]. Traditional treatment methods often fail to provide sufficient results, leaving aesthetic and functional problems unresolved. Therefore, combining orthodontic preparation with orthognathic surgery has become one of the most important directions in modern dentistry. Numerous scientific studies and clinical observations conducted in recent years have confirmed the effectiveness of integrated treatment [3]. This approach not only corrects skeletal disproportions but also significantly improves patients' psychological satisfaction.

MAIN PART

The integration of orthodontics and surgery is mostly dependent on the cause of skeletal abnormalities. In Class II patients, maxillary protrusion or mandibular retrusion is common, whereas Class III individuals show mandibular prognathism or maxillary underdevelopment. In such circumstances, orthodontic therapy alone causes compensatory tooth movements but does not address the underlying skeletal issue [1, 5]. Orthognathic surgery corrects skeletal proportions, whereas orthodontic treatment aligns the dental arch optimally. Bell popularised the approach of integrated therapy in 1975,emphasising the

importance of pre-surgical orthodontic preparation in precisely arranging skeletal motions [6]. This notion is now accepted as standard practice in modern dentistry.

Orthodontic-surgical treatment has the following clinical indications [2,7]:

- Skeletal Class II and III malocclusions: the mandible and maxilla are positioned out of proportion;
- Face asymmetry brought on by a unilateral skeletal imbalance is known as jaw asymmetries;
- Significant vertical malocclusions, like open bite or deep bite, are examples of vertical deformities;
- Problems related to appearance and phonetics, including abnormalities of the lips, nose, and chin, as well as speech impairments;
- Pathologies associated with airway constriction include obstructive sleep apnoea.

For instance, orthodontic preparation aligns the mandible correctly, while surgery repositions the maxilla posteriorly in Class II malocclusion cases with maxillary protrusion [8].

Innovative technologies applied in orthodontic-surgical treatment in recent years include:

✓ Skeletal anchorage devices – mini-implants (TADs) and miniplates (titanium plates with screws) that transfer orthodontic forces directly to the skeleton, enabling more precise and effective tooth movement.

✓ 3D planning in orthognathic surgery – using computed tomography and virtual simulation to model surgical outcomes in advance, increasing accuracy and reducing errors.

✓ Minimally invasive methods – piezosurgery, laser osteotomy, and new technologies that reduce bleeding are widely applied.

✓ Aesthetic rehabilitation – orthognathic surgery impacts not only skeletal structures but also soft tissues, making aesthetic analysis and prediction vital at each stage.

Clinical practice confirms the effectiveness of orthodontic-surgical integration in many studies. For instance, in a study of 120 patients with skeletal Class III malocclusion, Posnick (2014) reported that combining orthognathic surgery with orthodontic preparation yielded superior aesthetic and functional outcomes [13].

Another clinical observation found that combining mandibular advancement surgery with orthodontic treatment in Class II patients led to significant improvements in phonetic and psychological indicators [14]. Additionally, for patients with facial asymmetry, comprehensive treatment planned using 3D technologies successfully restored facial symmetry [15].

Clinical Cases and Analysis

A. Skeletal Class III Malocclusion

An 18-year-old patient presented with prognathism and facial disproportions. After orthodontic preparation to align the dental arches, bilateral sagittal split osteotomy (BSSO)

was performed for mandibular retrusion. As a result, occlusion and facial aesthetics were normalized.

B. Skeletal Class II Malocclusion

A 21-year-old patient underwent orthodontic decompensation followed by mandibular advancement osteotomy. The procedure restored masticatory function and improved facial profile.

C. Asymmetric Skeletal Anomaly

A 16-year-old patient exhibited downward displacement of both the maxilla and mandible on the right side of the face. After orthodontic preparation, a combination of Le Fort I osteotomy and BSSO was performed. Facial symmetry was restored, and the patient's psychological condition improved positively.

Conclusion

One of the best ways to treat complicated skeletal and dentoalveolar abnormalities is to combine orthodontics with maxillofacial surgery. Research indicates that this method greatly enhances patients' speech, appearance, and psychological health in addition to restoring equilibrium in the skeletal and dentoalveolar systems. In addition, the employment of contemporary technologies guarantees long-term stability of results and improves treatment safety.

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