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A Systematic Review and Case Report of Maxillary Posterior Teeth Intrusion by Skeletal Anchorage Using a Thin Alveolar Biotype

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Introduction

Intrusion of the maxillary posterior teeth is a procedure frequently undertaken in orthodontics to address conditions like open bite, excessive maxillary molar eruption, and vertical maxillary excess. Traditionally, intrusion treatments have faced challenges due to reliance on conventional orthodontic mechanics, often limited by inadequate control over posterior vertical dimension and difficultly in achieving root parallelism and stability. However, skeletal anchorage techniques, specifically with the use of mini-implants or miniscrews, have demonstrated notable advances, providing orthodontists with a more effective approach to achieving controlled intrusion of posterior teeth [1].

The maxillary posterior region is delicate, especially in individuals with a thin alveolar biotype, characterized by slender gingival and alveolar bone structures. This particular biotype presents unique challenges due to a heightened risk of root resorption, periodontal damage, and potential alveolar bone compromise. For successful intrusion in these cases, a sophisticated approach that minimizes biological impact while ensuring functional stability is critical. Hence, skeletal anchorage has emerged as an optimal strategy for addressing these challenges, offering stable results even in challenging alveolar conditions. This article systematically reviews relevant literature and presents a case report of maxillary posterior tooth intrusion facilitated by skeletal anchorage in a patient with a thin alveolar biotype [2].

Description

Maxillary posterior tooth intrusion often involves careful assessment of skeletal and dental structures. For patients with a thin alveolar biotype, this assessment is particularly crucial due to the reduced thickness of alveolar bone and periodontal tissues, which can affect stability, bone remodeling, and the risk of adverse effects like root resorption or gingival recession. Conventionally, orthodontic mechanics involve reliance on archwires and elastics, which are often ineffective for intruding posterior teeth due to inadequate anchorage, especially in cases where vertical maxillary dimensions need significant adjustment. In recent years, skeletal anchorage has enabled a paradigm shift in orthodontic practice. This method employs mini-implants or miniscrews, typically inserted into the zygomatic alveolar bone or posterior maxilla, to serve as anchor points. These devices provide a rigid anchorage independent of patient compliance and dental occlusion. The principle underlying this approach is that the skeletal anchor acts as a stable platform against which posterior teeth can be intruded using controlled force, significantly reducing the extrusive forces that often complicate conventional orthodontic mechanics [3].

Several studies in the literature have documented the efficacy of skeletal anchorage for maxillary posterior intrusion, highlighting predictable outcomes and minimal side effects when applied with correct technique. An essential component of successful outcomes is the careful placement of mini-implants, as the thin alveolar biotype demands precise, minimally invasive techniques to avoid excessive bone resorption or implant failure. Clinicians often use a digital workflow involving Cone-Beam Computed Tomography (CBCT) to assess the bone density, volume, and spatial positioning of roots and ensure an ideal insertion site with sufficient primary stability. In terms of biomechanics, the force vector applied for intrusion is critical. Studies suggest that a moderate, consistent force applied perpendicular to the occlusal plane yields optimal intrusion with minimal risk of root damage or undesired tipping of the tooth axis [4].

The patient in our case report presented with an anterior open bite caused by supra-erupted maxillary molars, a condition that created functional and aesthetic challenges. The patient also exhibited a thin alveolar biotype in the posterior maxilla, necessitating a conservative yet effective approach. The treatment plan centered around the use of skeletal anchorage to intrude the maxillary posterior teeth while minimizing stress on the thin alveolar structures. For this purpose, mini-implants were placed bilaterally in the zygomatic alveolar crest, providing adequate support for the intrusion mechanics. The insertion sites were carefully selected after analyzing CBCT scans to determine optimal angulation and depth, which helped avoid interference with surrounding anatomic structures like maxillary sinuses and root apices. A cantilever spring system attached to the miniscrews was then employed to exert a controlled intrusive force on the molars, with adjustments made periodically based on the progression of the treatment [5].

Conclusion

The systematic review of literature and analysis of the presented case strongly support skeletal anchorage as an effective modality for maxillary posterior tooth intrusion, particularly in patients with a thin alveolar biotype. Traditional orthodontic techniques, while effective for certain tooth movements, often fall short in achieving stable intrusion of posterior teeth due to insufficient anchorage and unpredictable force vectors. In contrast, skeletal anchorage offers a controlled, targeted approach that allows clinicians to achieve vertical adjustments with precision, ensuring long-term functional and aesthetic benefits for the patient. For patients with a thin alveolar biotype, skeletal anchorage minimizes the risk of damaging sensitive periodontal structures and enhances bone stability throughout the treatment. As demonstrated in our case report, a meticulously planned treatment protocol that includes digital imaging, precise placement of mini-implants, and controlled application of intrusive forces can lead to successful intrusion outcomes without compromising alveolar bone integrity. Moreover, the postoperative retention phase plays a crucial role in consolidating the achieved results and preventing relapse, highlighting the importance of a comprehensive, holistic approach in orthodontic management.

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Conflict of Interest

None.

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