



Micro-osteoperforations for accelerating tooth movement during canine distalization, split-mouth study. Case report

Micro-osteoperforaciones para acelerar el movimiento ortodóncico en distalización canina, estudio en boca dividida. Reporte de un caso

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ABSTRACT

Recent publications done in well-recognized journals of orthodontics, assure that micro-osteoperforations (MOP) enhance the process of bone remodeling and accelerate dental movement. Its application is easy, fast and can be performed by the orthodontist. **Objective:** The objectives are to evaluate and compare canine distalization time in young patients, by using both an acceleration technique through MOP and a conventional technique in a split-mouth design. 1. Find the best procedure to accelerate an orthodontic treatment with extractions. 2. Decrease treatment time. **Material and methods:** Canine distalization was performed on 10 young patients whose treatment plan included first premolar extractions. MOP was performed in the first premolar extraction zone of the right quadrant. A mini-implant was placed between the second premolar and the first molar in order to obtain absolute anchorage. Traction was applied by using power chains on both sides. In the left quadrant canine distalization was performed through conventional methods. **Results:** The obtained results in the side where MOP was performed, show a significant reduction in the procedure time when compared with conventional treatment. **Conclusions:** Canine distalization acceleration using MOP in patients with extractions leads to highly effective results; up to 41% faster space closure. This results in a shorter and more comfortable orthodontic treatment for the patient.

Key words: Micro-osteoperforations, mini-implant, canine distalization.

Palabras clave: Micro-osteoperforaciones, mini-implantes, distalización canina.

RESUMEN

Diferentes investigaciones aseguran que las micro-osteoperforaciones (MOP) aumentan el proceso de remodelado óseo y aceleran el movimiento dental, su aplicación es fácil, rápida y la puede realizar el ortodoncista. **Objetivo:** Los objetivos son evaluar y comparar el tiempo de distalización canina en pacientes jóvenes con la técnica de aceleración mediante MOP y técnica convencional en boca dividida; y encontrar el mejor procedimiento para acelerar un tratamiento de ortodoncia con extracciones y disminuir el tiempo de tratamiento. **Material y métodos:** Se llevó a cabo la distalización de caninos en 10 pacientes jóvenes cuyo plan de tratamiento incluía extracción de primeros premolares, se practicó MOP en la zona de la extracción del primer premolar del cuadrante derecho, se colocó un mini-implante entre el segundo premolar y primer molar para obtener un anclaje absoluto, haciendo la tracción con cadena elástica en ambos lados, en el cuadrante izquierdo la distalización de canino se llevó a cabo con procedimiento convencional. **Resultados:** El resultado que se obtuvo en el lado que se practicó MOP muestra una disminución considerable en el tiempo empleado para este procedimiento comparado con el método convencional. **Conclusiones:** Acelerar la distalización canina con micro-osteoperforaciones en pacientes con extracciones resulta muy eficaz hasta un 41% de cierre de espacios más rápido y con ello un tratamiento de ortodoncia más corto y cómodo para el paciente.

INTRODUCTION

The main concern of patients before starting orthodontic treatment is how long it will take to complete the orthodontic treatment.

The main setback occurs in treatment of class II patients who require first premolar extractions to distalize the canines. This procedure leads to a longer treatment time.

In the last few years several devices and treatment options have made the orthodontic process more efficient and comfortable but not faster.

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At present new techniques have been introduced to accelerate tooth movement such as corticotomies and application of prostaglandin E2, but these procedures are painful and costly since they require another specialist to perform them. However, techniques of micro-osteoperforations have been developed recently which increase the process of bone remodeling, have a quick and easy application and can be performed by the orthodontist without pre-surgical discomfort.

BACKGROUND

The main resistance to tooth movement was the cortical plates of the bones and the interruption of its continuity. The procedure involves the reflection of total thickness flaps to expose buccal and lingual alveolar bone, followed by the interdental cuts through cortical bone and barely penetrate into the medullary bone to accelerate orthodontic movements.¹⁻³

Duker used Kole's basic technique in dogs to investigate if the cuts affected dental vitality. It was concluded that neither the pulp nor the periodontal tissues were damaged during orthodontic tooth movement after the corticotomy and interdental cuts were performed.⁴

Frost in 1983 described the regional acceleratory phenomenon (RAP) as the local response to a noxious stimulus. He described a process by which a tissue is formed faster than the normal regional regeneration process. Through the improvement of the various stages of healing, this phenomenon makes scarring occur 2-10 times faster than normal physiological healing.^{5,6}

Arias and Márquez Orozco in 2006, based on these findings formulated the hypothesis that the limited and shallow drilling of the buccal or labial cortical plate of the maxilla would be sufficient to increase the expression of inflammatory cytokines, speeding up the process of bone remodeling and therefore the speed of tooth movement.²

Mani Alikhani et al. in 2013 stated that micro-osteoperforations are an effective, safe and comfortable procedure that accelerates tooth movement significantly and could result in shorter orthodontic treatments.⁷ They mention that this new minimally invasive technique stimulates the activity of cytokines to accelerate the remodeling of the alveolar bone.

The regional acceleration phenomenon (RAP) begins from the lesion with a maximum acceleration and declines using corticotomies. RAP begins within days of the injury and it usually reaches its peak at

1-2 months. It usually lasts 4 months in bones and may take from 6 to 24 months and more to disappear.⁸ Acceleration has been used primarily in patients with biprotrusion and skeletal anchorage to distalize the anterior segments.⁹

Different techniques have been used to achieve faster tooth movement. Throughout history, there have been studies of different methods: prostaglandins, corticosteroids, hormones, electric currents and magnetic fields, mechanical vibration, corticotomies and micro-osteoperforations.^{7,10-19} By combining corticotomies and skeletal anchorage, better results are achieved without secondary movements.^{20,21} This serves as well for the distalization of segments.²²

Linkow in 1969 described for the first time the use of implants as orthodontic anchorage in patients, by using them for retraction of the upper anterior teeth. Several authors have used them as well to perform different movements.²³⁻²⁷ Kuroda in 2009 determined that for canine distalization using TADs between the roots of the second premolar and first molar a NiTi spring with 100 grams of force must be used.²⁸ In the mandibular arch min-screws may be used in patients with biprotrusion.²⁹

Mini implants placed at 90° may be a better option in orthodontic treatments due to a greater resistance to forces and therefore, more stability.³⁰

Giuliano Maino in 2013 described an anchoring system with self-drilling titanium mini-screws with immediate loading called Spider Screw TM. This anchoring system may be used for different types of orthodontic movements due to the immediate loading using between 50 and 250 g. Mini-screws do not have osseointegration, which facilitates their removal.^{31,32}

CASE REPORT

Diagnosis

A female patient of 14 years of age was referred to the Orthodontics Clinic of the Faculty of Dentistry, Torreon Unit of the Universidad Autónoma de Coahuila for presenting moderate crowding and lack of eruption of an upper canine. While performing the medical and dental history it was found that the health status of the patient was apparently healthy, no pathological data were observed during the oral examination; she did not have pain, or any manifestation of temporomandibular joint disorders.

The analysis of the facial photographs revealed a dolichofacial patient, oval face, straight nose, biprocheilia and coincident facial and dental midlines (*Figures 1A-1C*).

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