



Modified lingual arch as auxiliary in the mechanics for lower molar verticalization. Case report

Arco lingual modificado como auxiliar en la mecánica de verticalización de un molar inferior: reporte de un caso

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ABSTRACT

Molars commonly have mesial angulation positions as result of the loss or absence of the adjacent tooth and of permanent molar impaction. This molar inclination is related to bone defects, periodontal pockets and extrusion of antagonist molars. **Objective:** To upright a lower molar with modified fixed appliances. **Case report:** Female patient 22 years of age; skeletal class II, class II division I malocclusion, convex profile; absence of four first premolars, mild crowding, second lower right molar (OD 47) with an important buccal-mesial inclination. **Treatment:** A modified lingual arch with distal arm extension was performed with a distal extension arm from which elastomeric chains were attached to a lingual button on the lower molar. **Results:** For 8 months the elastic chain was activated until the position of the 47 allowed placement of the appliances to continue with the leveling phase through orthodontic mechanics.

Key words: Lingual arch, lower molar, uprighting.

Palabras clave: Arco lingual, molar inferior, verticalización.

RESUMEN

Los molares comúnmente presentan posiciones mesioanguladas como resultado de la pérdida o ausencia de un diente y por la impacción de molares permanentes. Esta inclinación del molar está relacionada con defectos óseos, bolsas periodontales y extrusión de molares antagonistas. **Objetivo:** Verticalizar molar inferior con aparatología modificada fija. **Presentación del caso:** Paciente femenino de 22 años de edad; clase II esquelética con maloclusión clase II división I, perfil convexo; ausencia de los cuatro primeros premolares, sin apiñamiento con ligeras rotaciones dentales, segundo molar inferior derecho (OD 47) con importante inclinación vestibulo-mesial. **Tratamiento:** Elaboración de arco lingual modificado con brazo de extensión distal, del cual se conectan cadenas elásticas hacia un botón adherido al molar inferior. **Resultados:** Durante ocho meses la cadena elástica fue activada hasta que la posición del órgano dental 47 permitiera la colocación de aparatología para continuar con la fase de nivelación con mecánica ortodóntica.

INTRODUCTION

Molar verticalization is a treatment usually required in two situations: when the molars have suffered mesial inclination towards the space left by an extracted or absent tooth and when there is impaction of permanent molars. Molar mesial inclination is related to bone defects, periodontal pockets, distal migration of premolars, extrusion of the antagonist among other effects. There are different methods for uprighting molars orthodontically. However, each case should be analyzed biomechanically to avoid unwanted side effects.^{1,2} The case hereby presented shows an effective method for uprighting molars using a modified lingual arch with a distal extension arm which has in its back end a hook to hold elastic modules or chains. The lingual arch is normally performed in a 0.9 or 1-millimeter thick round wire that follows the lingual contour of all teeth. It may be soldered or

inserted in lingual boxes soldered to molar bands, i.e. it may be fixed or removable. The lingual arch exerts a continuous force since it is cemented 24 hours a day so the patient cannot remove it. One of its most

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important functions is as a space maintainer when there is premature loss of deciduous teeth. It helps prevent molar mesialization. Likewise, the lingual arch may be used as a secondary forces stabilizer when exerting a force in the arch that we do not want to have an impact on the molar.³⁻⁵

Eventually, orthodontics has introduced new techniques and mechanisms to its treatments for improving the inclination of mesially inclined lower molars with a more ideal accuracy each time and with a minimum of maintenance. Molar verticalization depends on producing a rotation movement by which the inclination is corrected. The suggested magnitude of movement ranges between 100 to 200 g/mm.^{6,7}

APPLIANCES FOR MOLAR VERTICALIZATION

Nowadays there is a diversity of devices that may be grouped together or differentiated according to the movement biomechanics they produce.

- 1. Verticalization with extrusion:** these devices use common tip-back mechanisms such as the one proposed by Weiland and Bantleon (1992). In this appliance springs or loops, known as cantilevers, are inserted in the tube of the inclined molar and engaged in the anterior sector. They are generally made with steel or TMA archwires and their caliber varies from 0.016" x 0.022" to 0.018" x 0.025". Tunkay (1980) used springs in T, Marcotte (1998) employed helicoids in a continuous 0.018" x 0.025" archwire to achieve molar verticalization and intrusion of the anterior segment.⁶⁻¹⁰
- 2. Verticalization with intrusion:** this difficult movement is achieved basically in two ways: with a dual cantilever and with «V» bends mechanisms. The dual cantilever appliance employs one of its arms to upright and the other to counteract the extrusive force and intrude. It was first described by Weiland (1992) and Melsen (1996). Other

appliances are made of superelastic wires such as the MUST and the Sander.¹⁰⁻¹³

- 3. Verticalization with a mesiodistal component:** this movement might be useful in impacted molars where space is needed for uprighting distal molars. There are different appliances described for this purpose such as the Lang (Hantelman modification) that uses a thick wire welded distally to the molar. Other appliances used for this purpose are the uprighting loop «piggyback» and those that use NiTi wires for molar distalization.¹⁴ At present it is becoming increasingly more frequent the use of mini-screws to achieve the desired orthodontic movements.

CASE REPORT

A female patient of 22 years of age was diagnosed as a skeletal class II with a class II division I malocclusion and convex facial profile. She had extractions of teeth #14, 24, 34 and 44 due to a previous orthodontic treatment, mild crowding in both arches and tooth #47 with a severe bucco-mesial inclination. Studies were conducted for developing a treatment plan. Within conventional orthodontic mechanics, at the alignment and leveling stage, the main objective focused in bringing the lower right second molar into the mandibular arch. The patient referred that during her previous orthodontic treatment, mini-implants were placed for uprighting that molar and failed so we opted for an alternative treatment through the elaboration of a modified appliance as an auxiliary for orthodontic movement.

CONSTRUCTION OF THE LINGUAL ARCH

Pre-fabricated bands of lower left and right first molars were tried on the patient to take an impression and begin the design of the appliance. In the work model with the bands placed, a transverse line was



Figure 1. Modified lingual arch, distal extension arm with hook.

outlined over the cingulum of the anterior teeth, continuing in a distal direction at the level of the middle third of the lingual surfaces of the teeth. Vertical loops were drawn towards gingival at the level of second premolars and the design was continued until

the bands placed in the second permanent molars. 0.036" stainless steel archwire was used which was contoured in the anterior region making contact with the lingual face of the anterior teeth, following the previously drawn design and bending the loops with

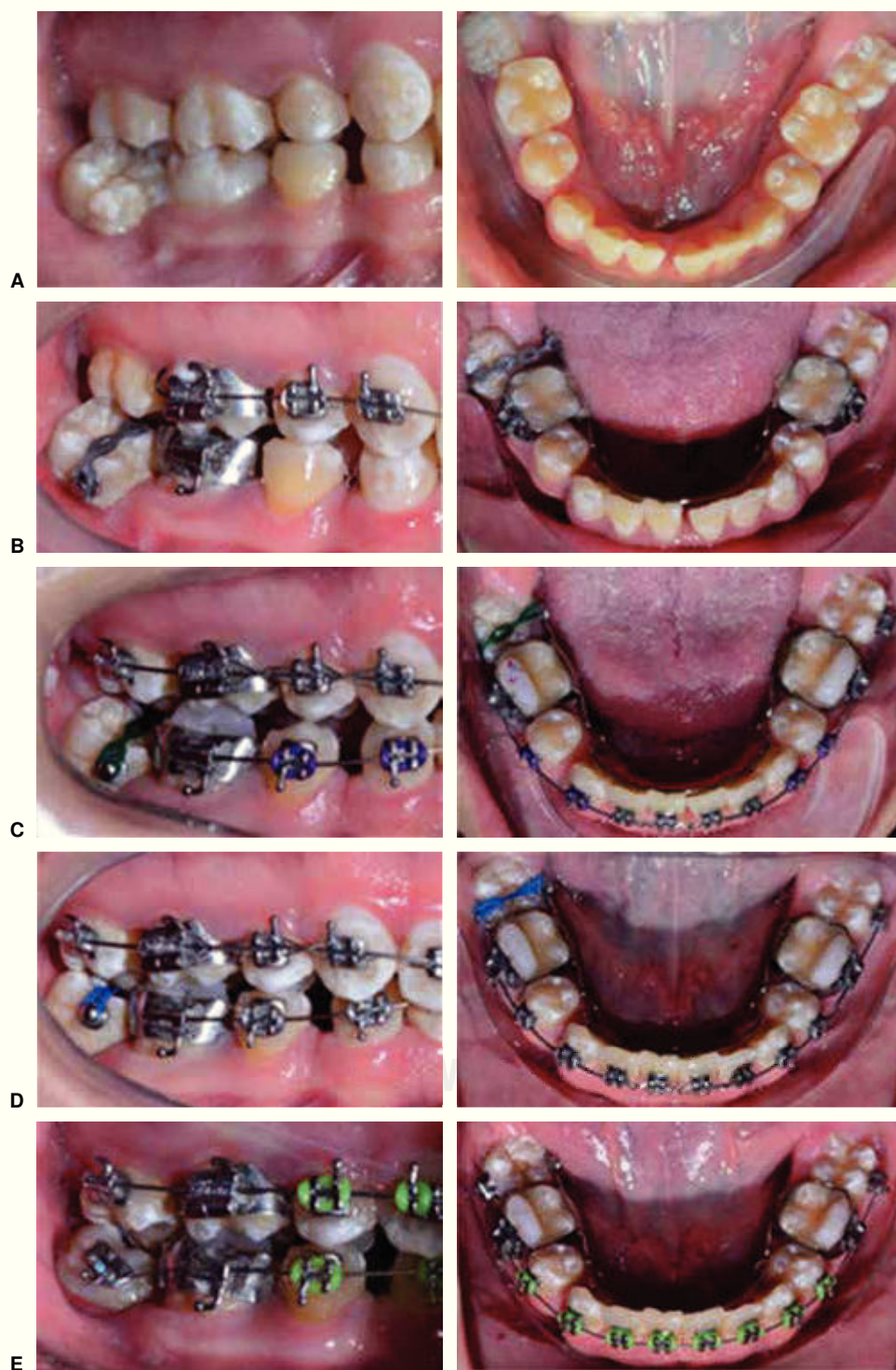


Figure 2.

A) Initial photographs, **B)** 0.022" slot MBT appliance placement with modified lingual arch and lingual button on the buccal surface of the lower second molar activated through elastomeric chains and posterior bite turbos, **C and D)** elastomeric chain activation, **E)** 0.022" slot tube placement on the lower right second molar to continue its uprighting by means of orthodontic appliances.

the aid of pliers, leaving distal extensions on both sides thus facilitating the welding process. In the extension on the right side the wire was extended to the level of the second molar, strengthened with a horizontal bend towards mesial. At its end, a hook in a distal direction was added, which will serve to hold elastic chains. In the laboratory the arch was fixed to the model in order to weld it. Afterwards, the excess material was removed and the arch was polished until a smooth and shiny surface was obtained. The modified lingual arch was washed and cleansed to be tried in the patient. It was cemented with glass ionomer, removing the material surpluses and finally verifying the occlusion (Figure 1).

TREATMENT PROGRESS

Treatment began in February 2015 by placing 0.022" slot MBT appliances on the upper arch and the modified lingual arch in the lower. A bondable lingual button was placed on the labial surface of the second molar over its more mesial and gingival portion. That attachment was connected by means of elastomeric chains to the distal arm extension of the modified lingual arch. One month later, lower appliances were placed and posterior bite turbos were incorporated to eliminate any interference which might prevent uprighting of the second molar. During a period of 8 months the elastomeric chain was activated with a force of approx. 150 g, until the position of the second molar was corrected enough for tube placement. Subsequently, the leveling phase was continued with conventional orthodontic mechanics (Figure 2A-E).

DISCUSSION

Loss of the first molars is quite frequent, with the consequent inclination of the second molars. Uprighting of the lower molars may benefit the patients in their function and periodontal health. According to Harfin, one of the goals of molar uprighting is to prevent dental plaque accumulation thus reducing the formation of periodontal pockets and ensuring that all teeth receive forces as parallel as possible to their long axis.¹⁵⁻¹⁷ In a detailed literature review regarding mesially inclined molar uprighting, a wide variety of appliances used over the years for molar verticalization may be found. Sakima T (1999) shows an evolution (from 1962 to 1998) of more than 30 appliances, with different designs, either removable or fixed, continuous

arch or cantilever type.¹⁸ However in this case a modification of a lingual arch with a distal extension is described as a simple and efficient auxiliary for molar uprighting.

CONCLUSIONS

Mesially inclined lower molar uprighting is a possible movement as long as the required biomechanical aspects are carefully considered, as it is necessary to know the type of force system necessary to produce a given center of rotation and the magnitude of optimal forces to move the tooth. The lingual arch is a versatile appliance that may be used in different areas of orthodontics and pediatric dentistry. In the case hereby presented it was used as the best treatment option available for the molar uprighting thus obtaining through a simple and efficient method, the desired results with the advantage permitting at the same time, the use of mechanics of conventional orthodontic treatment.

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