



Corticotomy, orthodontic microsurgery in patient with reduced periodontium. Report of a clinical case

Corticotomía: Microcirugía ortodóntica en paciente con periodonto reducido: Caso clínico

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ABSTRACT

Introduction: Treatment of a patient afflicted with periodontitis, malocclusion, periapical pathosis and reduced periodontium often requires a combination of several surgical techniques as well as inter-disciplinary treatments aimed at achieving optimum results.

Objective: Presentation of corticotomy technique in patient with reduced periodontium aimed at orthodontic treatment success in lesser time and with minimum alteration of periodontal tissues.

Methodology: 42 year old female patient suffering from localized moderate chronic periodontitis. Orthodontic diagnosis emitted pointed out meso-facial skeletal Class III. Surgery undertook to elevate a flap, with papilla preservation, to eliminate periapical lesion in tooth number 12, and bone filling of the defect. GTR was performed on tooth number 23. Corticotomy of the upper arch was undertaken with electrical scalpel. **Results:** Six weeks after surgery, clinical changes were observed in the horizontal and vertical overbite, no other clinical or radiographic changes were observed. Seven months after surgery the patient presented stable occlusion, and achieved functional and aesthetic results. **Conclusions:** Corticotomy represents an alternative for adult patients suffering from tooth malposition and reduced periodontium.

Key words: Corticotomy, papilla preservation, periapical surgery, tissue regeneration.

Palabras clave: Corticotomía, preservación de papila, cirugía periapical, regeneración tisular guiada.

RESUMEN

Introducción: El tratamiento de un paciente con periodontitis, maloclusión, patosis periapical y periodonto reducido, generalmente requiere la combinación de distintas técnicas quirúrgicas y tratamientos interdisciplinarios con el fin de obtener resultados óptimos.

Objetivo: Presentar la técnica de corticotomía en paciente con periodonto reducido para el éxito en el tratamiento ortodóntico, en un menor tiempo y con mínima alteración en los tejidos periodontales.

Metodología: Paciente femenino de 42 años de edad con periodontitis crónica moderada localizada, lesión periapical, diagnóstico ortodóntico: Clase III esquelética mesofacial; la cirugía consistió de la elevación de un colgajo con preservación de papila, eliminación de lesión periapical en el diente 12 y llenado óseo del defecto, además de RTG en el diente 23 y corticotomía de la arcada superior usando el bisturí piezoeléctrico. **Resultados:** Clínicamente a las 6 semanas se observaron cambios en la sobremordida vertical y horizontal sin cambios clínicos ni radiográficos. A los 7 meses la paciente presenta una oclusión estable, con resultados estéticos y funcionales. **Conclusiones:** La corticotomía es una alternativa para pacientes adultos con malposición y periodonto reducido.

INTRODUCTION

Loss of teeth or periodontal attachment can be the cause of extrusion, spacing and tilting of bicuspid and molars. This can cause collapse of posterior occlusion and reduction of vertical dimension.

Orthodontic treatment can be an auxiliary tool of periodontal therapy facilitating thus aesthetic and restorative treatment.¹

Orthodontic treatment is based on the principle that effect is equal to force. That is to say, if prolonged pressure is applied to a tooth, this tooth will experience mobilization when surrounding bone experiences a remodeling process. Since bone response is conditioned by periodontal ligament, tooth movement

will fundamentally be an action of the aforementioned ligament.²

Conventionally, periodontal therapy in adult patients suffering from reduced periodontium and orthodontic involvement, is reflected in prolonged

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treatments which might compromise the patient's financial possibilities, whereby he might not be able to afford them. Treatment results are unpredictable since bone behavior can vary and cause failure or relative success. For the aforementioned reasons, patients might well become reluctant to accept long term treatments. Orthodontic micro-surgery or corticotomy might be an alternative for orthodontic treatment in patients with reduced, healthy periodontium.^{3,4}

In orthodontic treatment, corticotomy can be considered as intermediate therapy, between orthognathic surgery and conventional orthodontics.⁵ This technique is based upon its biological mechanism which in turn is based upon the process of regional acceleration (RAP). In 1983, Frost showed the fact that adverse regional stimuli of sufficient magnitude could cause accelerated activity and reorganization in soft and bony tissues. He named RAP this cascade of healing physiological processes. This process is characterized by the activation of localized remodeling process. This process accelerates healing, especially after surgery which caused cortical bone injury. This surgical lesion can be considered a reinforcing agent for RAP induction.⁶

Surgical procedures for simplified orthodontics can be divided into two categories:

1. Corticotomy or decortication
2. Osteotomy

Corticotomy can be described as a surgical technique in which only cortical bone is cut, perforated, or mechanically altered, until reaching medullary bone which remains intact. On the contrary, osteotomy undertakes to perform surgical incisions through cortical bone until reaching medullary bone. It generally implies formation or separation of a new bone segment.⁷

When comparing conventional orthodontics with corticotomy, the advantages of this latter are:

1. Greater application in malocclusion treatments (reduction of dental movements and lesser need for extractions)
2. Decrease in treatment time
3. Increase in alveolar volume and more comprehensive maintenance of the periodontium structure (preexistent bone dehiscences and fenestrations, correction with the use of bone grafts)
4. Alveolar re-modeling to improve a patient's profile if the case so warrants
5. Simultaneous use with other procedures (impacted teeth)⁸

To perform this technique, a pre-operative analysis is required. This analysis must include periapical, panoramic and lateral skull X-rays. The use of computerized axial tomography (CAT) might facilitate the analysis. This analysis must include assessment of the following points.⁹

- M-D Dimension between one tooth and the next
- Root position and direction
- Tri-dimensional position of tooth

To perform a corticotomy, rotational systems, saws, and electrical scalpel have been used.¹⁰ This latter one offers a minimally invasive surgical technique: its procedure decreases risk to surrounding soft tissues and important structure lesions, such as vessels, nerves and mucosa.^{11,12} Bone surgery with electrical hand-piece is a new technique used for osteotomy and osteoplasty which uses a ultra-sound surgical device. This technique was created and developed as a response to the need to reach higher levels of precision and safety in bone surgery procedures, when compared to techniques which use manual and rotary instruments. The device is characterized by ultrasonic vibrations with 29kHz frequency and 60/200Hz rank. Due to its characteristics, micro-vibration allows for a selective cut of just mineralized structures, causing no damage to soft tissues which remain in good condition, even in the case of being accidentally contacted. Micrometric vibration guarantees a precise cut procedure, and at the same time maintains a blood free site. This is due to the physical phenomenon of cavitation by irrigation. The device becomes then manageable and allows control during surgery, providing greater safety, especially in anatomically difficult areas. Patients experience less stress, anxiety or fear. This technique reduces osteocyte damage and allows survival of bone cells.^{12,13} Osteotomies can be performed with minimum risk of temperature increase and bone necrosis.¹⁴

Among its clinical applications we can count: corticotomy, bone distraction, sinus elevation, harvesting of block graft, harvesting of particulate graft, cortical expansion.¹⁴

In recent years, periodontal therapy objectives have been defined in many ways. The periodontal therapy key concept is to achieve periodontal health, and therefore satisfy the patient with respect to aesthetics, function, requirements or demands.

Conventional periodontal treatment includes non-surgical treatment as well as an array of surgical approaches. The aim of these treatments is to improve the periodontium's clinical condition with

the aid of a reparation process. That is to say, the condition resolves through the healing of periodontal tissues. Especially in the last two decades, great interest has been observed in an attempt to regenerate periodontal tissues through Guided Tissue Regeneration (GTR). This is a procedure used in clinical practice to achieve this aim through the formation of new cement, periodontal ligament as well as alveolar bone.¹⁵

Periapical surgery is a surgical procedure through which a periapical lesion is removed, nevertheless preserving the causal tooth. Therefore, with this technique we achieve the following.

1. Remove focus of infection with apical curettage, if the case so warrants, performing an apicoectomy.
2. Preserve the causal tooth through appropriate root canal treatment as well as apical seal through an apicoectomy and retrograde obturation.¹⁶

MATERIALS AND METHODS

CLINICAL CASE PRESENTATION

Forty two year old female, in general good health, referred by the Periodontics Service of the National School of Dentistry, National University of Mexico for periodontal treatment follow-up. Periodontal assessment was performed. Emitted diagnosis was moderate, localized chronic periodontitis in the lower molar region with generalized reduced periodontium (*Figures 1 to 3*). Recommended treatment was accelerated orthodontics with corticotomy, using electrical scalpel along with surgical treatment.

Radiographic assessment was performed. A periapical lesion in tooth number 12 was observed (*Figure 4*). Inter-consultation with the endodontics department was requested. Root canal treatment was

performed. A conventional phase I was undertaken, with personal plaque control, removal of calculus, tooth polishing, root scraping and smoothing of periodontally compromised teeth. Once re-assessment took place, surgery was programmed.

SURGICAL TECHNIQUE

The patient was subjected to local anesthesia covering palate and vestibular area, from one bicuspid to the opposite (teeth 15-25), a total thickness flap was performed, following papilla preservation technique (Takei 1984).¹⁷ Following this technique, semi-lunar incisions were performed in the palate papillae. After this, intra-groove incisions were undertaken with no involvement of inter-proximal soft tissue. The flap was then moved from palatine to vestibular position (*Figure 5*). A periapical lesion was located in tooth number 12. A fenestration in tooth number 23 was observed. The lesion was debrided and the root apex was beveled with a diamond burr. The defect was treated with tetracycline dissolved in physiological solution (*Figures 6 and 7*). Corticotomy was undertaken with vertical cuts (*Figure 8*) among the roots, at an approximate depth of 2 to 3 mm, with the aim of reaching medullar bone. A «Y» cut was performed to preserve an intact alveolar crest (*Figures 9 and 10*).³

Vertical cuts were apically joined with a horizontal cut at a distance of 3-5 mm from the apex. Damage to the tooth was thus avoided (*Figure 11*). Once the cuts were performed, the defect in tooth number 12 was filled with xenograft. In tooth number 23 guided tissue regeneration (GTR) was undertaken in the fenestration with xenograft, with the help of a resorbable collagen membrane. The flap was repositioned, and vertical suture points were applied (*Figure 12*).



Figures 1 to 3. Initial photographs clearly showing outward inclination of anterior teeth with presence of anterior open bite and horizontal and vertical overbite.

INDICATIONS AND POSTOPERATIVE CARE

Amoxicillin plus clavulanic acid 875 mg/125 1 tablet every 12 hours for 8 days were prescribed as antibiotic. Ketocorolac 10 mg 1 tablet every 8 hours



Figure 4. Pre-surgical panoramic radiograph. Tooth 12 shows root canal treatment with periapical lesion.

was prescribed as analgesic, and Ibuprofen, 400 mg 1 tab every 8 hours for 3 days was prescribed as antiinflammatory drug.

Indications to the patient were as follows: fresh and soft diet, avoid chewing on the operated area, use 0.12% chlorhexidine mouthwash twice a day. Avoid brushing the affected site until sutures are removed. Patient was recalled after 8 days for revision, and after 15 days for removal of suture points. Orthodontic treatment was activated after 8 days. The arches were changed weekly during the first four months, which is the period of greater RAP biological effect.⁴⁻¹³

RESULTS

There were control visits every month until 7 months had elapsed. At that point in time, treatment was deemed completed. Healing and postoperative period took place reasonably well, with no alterations



Figure 5. Approach with full thickness flap is shown, using papilla preservation technique.



Figures 6 and 7. Debridement and cleansing of periapical lesion.



Figure 8. Initiation of corticotomy with electrical scalpel.



Figure 9. 3 mm depth which ensures total cortical perforation up to the point of reaching spongy bone.



Figure 10. Cuts in «Y» shape to preserve alveolar crest.



Figure 11. General view of cuts performed in the upper arch.



Figure 12. Suture with suspensory sutures to stabilize the flap and re-position papillae.



Figure 13. Frontal view 6 months after surgery. Occlusal stability and bite closure can be observed.



Figure 14. Occlusal view. Control visit at 6 months; retro-inclination can be observed.



Figure 15. Postoperative lateral view at 6 months. Retro-inclination of upper teeth can be observed, improving thus patient's occlusion and profile.

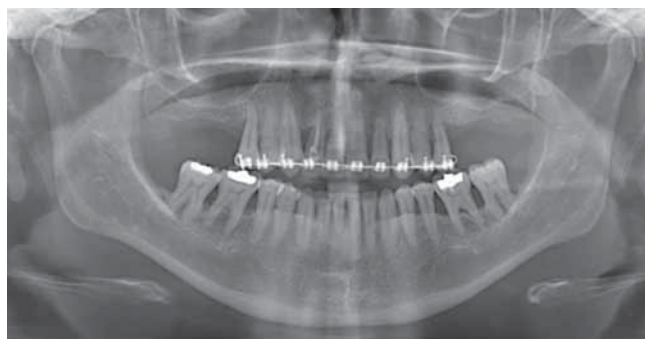


Figure 16. Control radiographic view where stability in root surfaces can be observed without resorption as well as better alignment.

in the periodontal tissues. As orthodontic treatment progressed, favorable changes were observed clinically and radiographically. Changes were favorable in the position of the teeth. From lateral and occlusal perspective, positive changes were observed in the position of the teeth. Anterior teeth were tilted to the back, anterior bite was achieved, as well as occlusal harmony. All these factors yielded acceptable esthetic results (*Figures 13 to 15*). At a seven month evolution point, there was bone filling at the area of the apex of tooth number 12. There was no compromise of apexes of teeth involved in the corticotomy process (*Figure 16*).

DISCUSSION

Kôle, in 1959, described an osteotomy which included alveolar cortical bone removal with the use of chisels.^{4,18} Wilcko, in 2001, described another procedure which was undertaken with palatine and vestibular approach. De-corticalization was performed with the help of a rotatory system. This technique, although yielding satisfactory results, was considered aggressive as well as very invasive.^{8,19}

Vercellotti, in 2007, proposed performing corticotomies with the use of an electrical scalpel, following vestibular approach, and performing a cut in «Y» shape to preserve the alveolar crest. With the aforementioned technique he achieved satisfactory results with a minimally invasive technique and lesser amount of trauma.³ In 2009, Dibart published the description of a corticotomy technique through the mucosa, which he called Piezocision. This technique was less invasive than the former, nevertheless offering the same results.²⁰ These new alternatives provided advantages inasmuch as they decreased orthodontic treatment time in patients possessing intact

periodontium, or, as in this case, reduced periodontium. Better results are thus obtained with less aggressive procedures.

Authors of the present article mention the fact of the existence of 60 to 70% decrease in treatment time when compared to traditional orthodontic treatment. This is a physiological treatment based on the event of regional acceleration and maintenance of proper blood supply, which is essential. This procedure represents an alternative for adult patients with reduced periodontium and/or young patients with intact periodontium.

CONCLUSIONS

The corticotomy procedure described in this article, decreased orthodontic treatment time causing minimum tissue trauma, even though it took place in a reduced periodontium. Description of results obtained in this case indicated that there were no untoward effects in the periodontium; this was clinically evident.

This technique granted us efficiency and stability of orthodontic movements. Teeth were able to move up to a third or a fourth in lesser time. Bearing in mind surgical access of bone structures, this procedure was mainly designed for the movement of anterior teeth, with papilla preservation, to attain esthetic results, greatly avoiding root resorption.

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