vol 15 (special supplement) 2018

científica dental

www.cientificadental.es
www.coem.org.es

Indexed in: IME (Índice Médico Español), IBECS, LATINDEX y GOOGLE SCHOLLAR

coem
Ilustre Colegio Oficial de Odontólogos y Estomatólogos de la Iª Región

SPECIAL SUPPLEMENT 2018
volumen 15

contents

editorial

Dr. Jesús Calatayud Sierra
Director de la revista *Científica Dental* del Ilustre Colegio Oficial de Odontólogos y Estomatólogos de la Iª Región.

As we do every year, and for this, our 5th year, *Scientific Dental* is pleased to issue this special supplement in English with the articles published throughout the 2018 calendar year that received recognition in the three award categories; namely, best scientific article, best clinical case and best first scientific work by a new author. Moreover, we've included the three finalists in these categories as well, so in total we are publishing six excellent scientific articles that readers can peruse in open access at our web address, www.cientificadental.es. It goes without saying, of course, that any readers who might wish to do so may also access these works in Spanish at the same Internet address, as they have already been published.

In this issue, there are three original works and three interesting clinical cases for our readers to enjoy, covering aspects of surgery, implantology, periodontics and dental traumatology.

As always, our thanks for their contributions go out all those fine individuals who make this magazine possible; editors, reviewers and, especially, the authors, to whom we are grateful for the high quality of the work they have submitted, and, last but never least, our readers, whose enrichment is the ultimate goal of all these efforts.

To all a cordial greeting,

Dr. Jesús Calatayud

Director of *Científica Dental*

Clinical case

Vertical guided bone regeneration with d-PTFE membrane

Jiménez-Tundidor, Raquel
Graduate in Dentistry. San Pablo-CEU University. Specialist in Prosthetic Implants, School of Dentistry. Complutense University of Madrid (UCM).

Marco, José Ricardo
Doctor of Medicine. UCM.

Marco, Paula
Dentistry student.
European University of Madrid.

López-Quiles, Juan
Doctor of Medicine. Contracted Professor. School of Dentistry. UCM.

Published in spanish Científica Dental Vol. 15. Nº 2. 2018
www.cientificadental.es

ABSTRACT

The purpose of this article is to describe, step by step, the technique of Guided Bone Regeneration (GBR) for vertical ridge augmentation in extremely atrophic maxillary crests. In order to achieve this in a patient with significant bone deficit in the fourth quadrant, vertical bone augmentation was carried out using titanium-reinforced dense polytetrafluoroethylene (d-PTFE) membranes, as well as autogenous bone in combination with inorganic bovine bone in a 1:1 proportion. After nine months, significant vertical bone gain was formed. Measurements were taken both before and after surgery, which allowed for quantifying the results with an increase of 10 mm horizontally and 4 mm vertically. Three implants were placed on the ridge with newly formed bone and after one year of load, the new bone remained stable. This clinical case corroborates the effectiveness of the Guided Bone Regeneration technique. Two years after surgery, the high success rate of the implants placed after this surgical procedure allows us to affirm the efficacy of this technique for the rehabilitation of atrophic alveolar crests without showing relevant complications.

KEYWORDS

Guided Bone Regeneration; GBR; Vertical augmentation; Non-resorbable.

Indexed in:
- IME
- IBECS
- LATINDEX
- GOOGLE SCHOLAR

Correspondence address:
Raquel Jiménez Tundidor

School of Dentistry of the Complutense University of Madrid (UCM)
Plza. Ramón y Cajal s/n
CP 28040 Madrid
raqueltundidor@gmail.com
Tel. 91 398 19 67

Date received: 7 May 2018.
Date accepted for publication: 10 July 2018.

coem
Ilustre Colegio Oficial de Odontólogos y Estomatólogos de la Iª Región

INTRODUCTION

Increasing maxillary bone has become a predictable treatment in recent decades. There are several methods to carry it out such as bone distraction, onlay grafts or guided bone regeneration (GBR) with membrane. GBR, in the hope of being confirmed by new studies, appears to be a viable option for bone augmentation.

GBR is a therapeutic alternative that arises from traumatic or physiological reabsorption of the maxillary and mandibular bone tissues, giving rise to atrophic alveolar crests. In many instances these atrophies make implant treatment impossible, so techniques of this type can be of interest for restoring adequate bone support and allowing for rehabilitation by means of implants. Under ideal conditions, Guided Bone Regeneration combines the management of soft tissues and bone tissue, as well as aesthetics and functionality.

The high level of knowledge and surgical management that these surgeries require is more evident when dealing with vertical regenerations, since they are more compromised in terms of adjacent tissues that provide good support in order to provide stability for the graft as a source of bone-forming cells. This increase can be vertical or horizontal. In vertical GBR, it is preferable to use dense polytetrafluoroethylene (d-PTFE) membranes. However, when the increase is only horizontal, reabsorbable collagen membranes can be used.[1,2]

The application of techniques such as GBR for horizontal increase is well documented, with high rates of implant success and low complication rates.[2-4] The surgical application of these techniques for supracrestal regeneration was first described in 1994[5,6], when the first histological advances of vertical regeneration in humans and animals occurred. Some authors provide success rates of 94.7%, stating that bone increased vertically by GBR responds to the placement of osseointegrated implants in a manner very similar to native bone. There are few studies that describe long-term vertical GBR, but they do present positive results and with low complication rates.[5]

In this article, the objective is to evaluate the satisfactory result of vertical GBR in a clinical case, by means of autologous bone graft in combination with xenograft, to determine clinical and radiographic success, possible complications and success of the placed implants after prosthetic load. This shows the competitive role that this technique represents when faced with implant treatment in atrophic alveolar ridges.

CLINICAL CASE

The patient is a 62-year-old woman with no relevant medical pathology. The upper arch was rehabilitated by means of a fixed metal-ceramic tooth-supported prosthesis and the lower arch was previously restored by means of a skeletal.

After recent evaluation by cone-beam computed tomography (CBCT) at the level of the fourth quadrant, it was decided that the patient was not a candidate for implant treatment because of insufficient bone height and width. That is why it was decided to opt for a Guided Bone Regeneration treatment. The proposal for this technique arises due to figures of less than 8 mm in both width and height.

The clinical history was completed considering smoking as an excluding factor. In addition, considerations such as treating patients without periodontal disease or active endodontic lesions, having a sufficient amount of soft tissue and space for the bone implant were taken into account, as well as ensuring that the periodontium of the adjacent teeth is healthy. These must have moderate or scant bone loss since the bone peaks that hold these pieces are the ones that will help predict the regeneration that may be obtained in that area. The patient underwent previous antibiotic treatment that consisted of taking 2g of Amoxicillin two hours before surgery (Figures 1 and 2).

We proceeded to obtain plasma-rich fibrin (PRF). Penicillin was added to prevent possible infections. After this process the first incision was carried out,

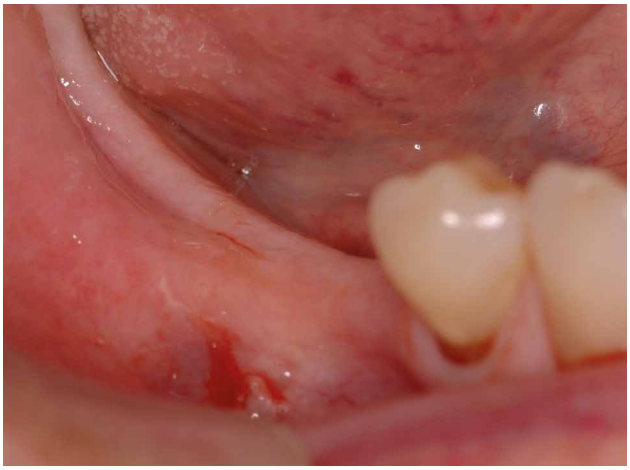


Figure 1. Vestibular view prior to surgery.

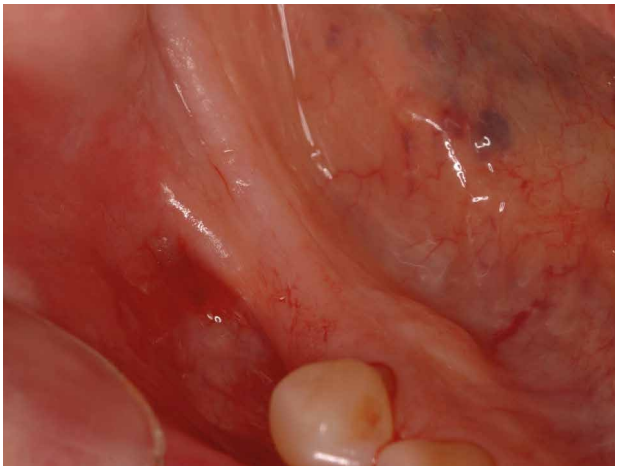
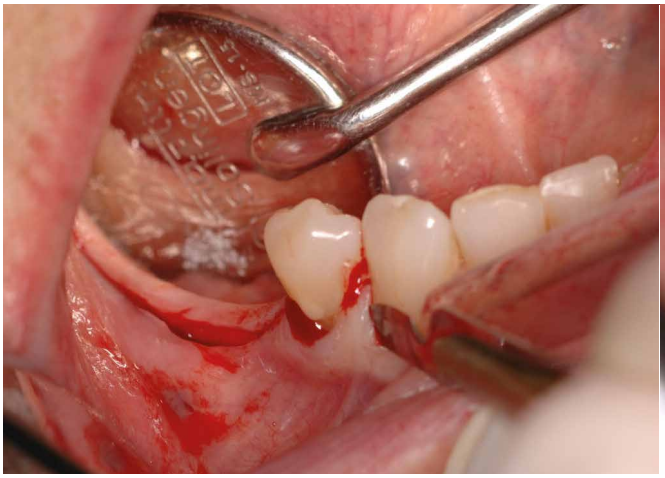


Figure 2. Occlusal view prior to surgery.



Figures 3 and 4. Initial incision.

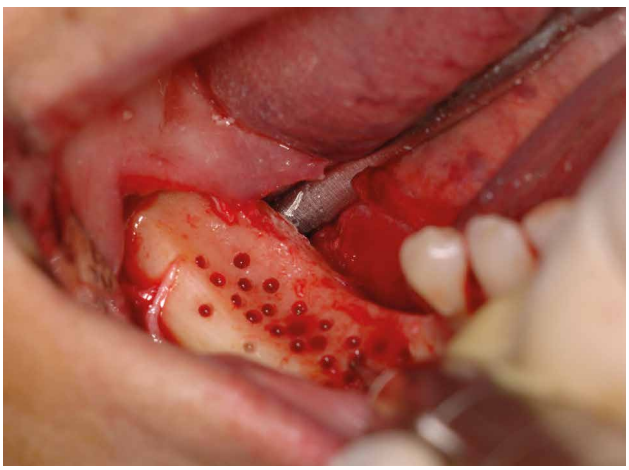


Figure 5. Perforation of the cortical bone.

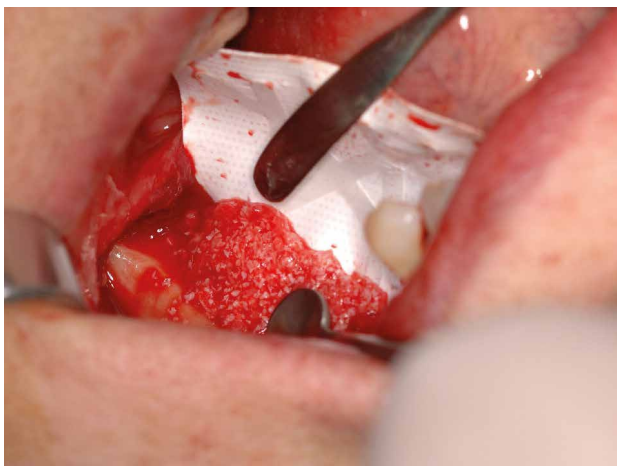


Figure 6. Placement of the regeneration material.

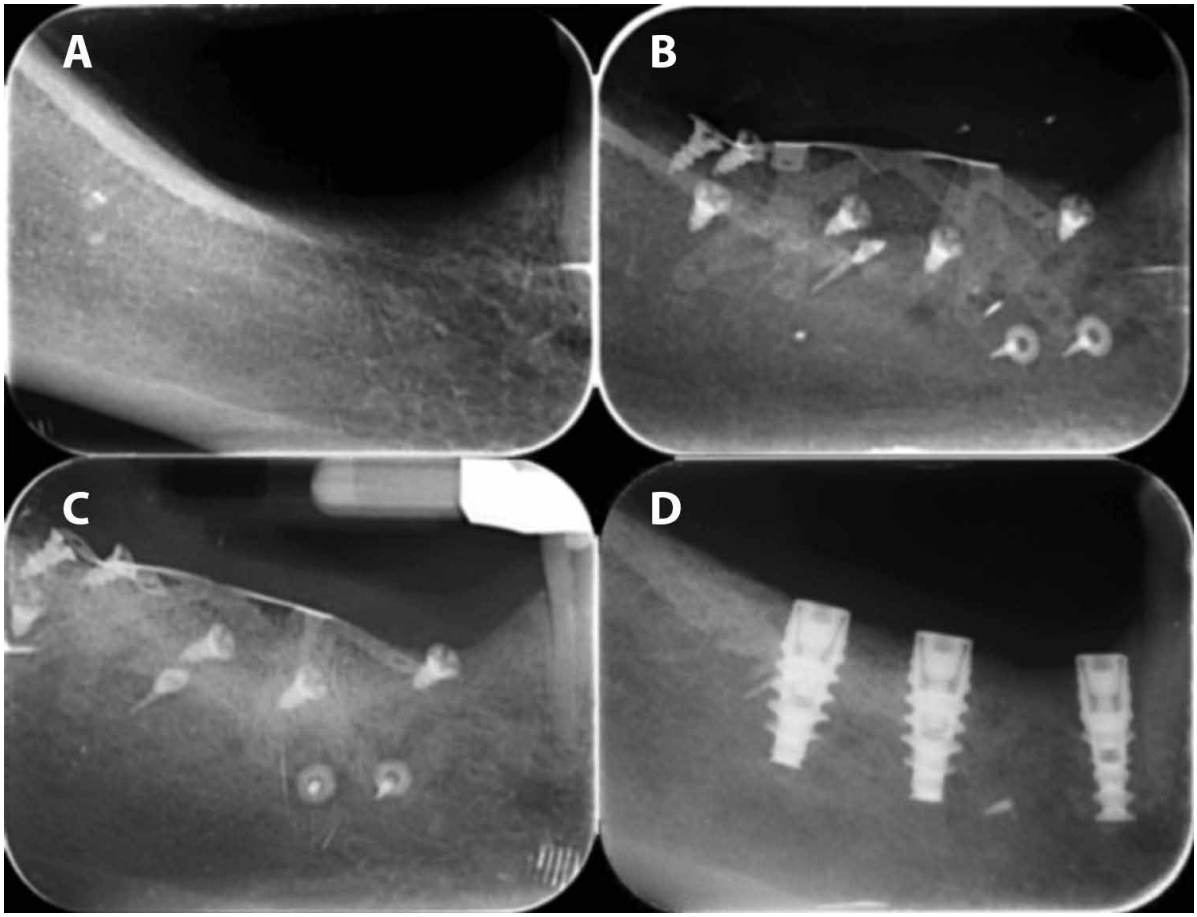


Figure 7. A) Prior to surgery. B) At the time of surgery. C) Follow-up at 5 months. D) Placement of the implants at one year.

for which a number 15c scalpel was required. This was a full-thickness supracrestal incision on the keratinized gingiva and two incisions perpendicular to it, two teeth mesial from the defect and two distal to it (Figures 3 and 4). Care was taken to not damage both the papilla and the periodontium of the adjacent tooth, as well as the palatal artery if it was the maxilla or the mental nerve in the case of the mandible. The incision was made diagonally on the ascending branch of the jaw. The objective is to obtain a safety flap with sufficient extension so that it is possible to make a primary closure both vertically and horizontally, well vascularized, wide and with vitality, in order to facilitate adequate surgical access. A total thickness gingival detachment was performed up to at least 5 mm below the bone defect, paying attention to the mental nerve outlet.

With the help of a disposable curved Safescraper scraper (Geistlich, Princeton, United States), autologous bone was obtained using the branch branch of the mandible as a donor area. A sufficient quantity of bone was obtained to occupy the bone defect using a mixture of bone and particulate bone mineral, Bio-Oss (Geistlich, Princeton, United States) in a 1:1 ratio, reducing the amount of bone to be obtained, using the least invasive technique and reducing postoperative discomfort.

Using the handpiece and a small round burr, the mandibular cortex was prepared by performing numerous cortical perforations whose purpose was to facilitate a greater flow of blood cells (Figure 5). A non-resorbable d-PTFE membrane was used, reinforced with a Cytoplast Ti-250 titanium mesh (Osteogenics, Lubbock, United States). The objective is to establish

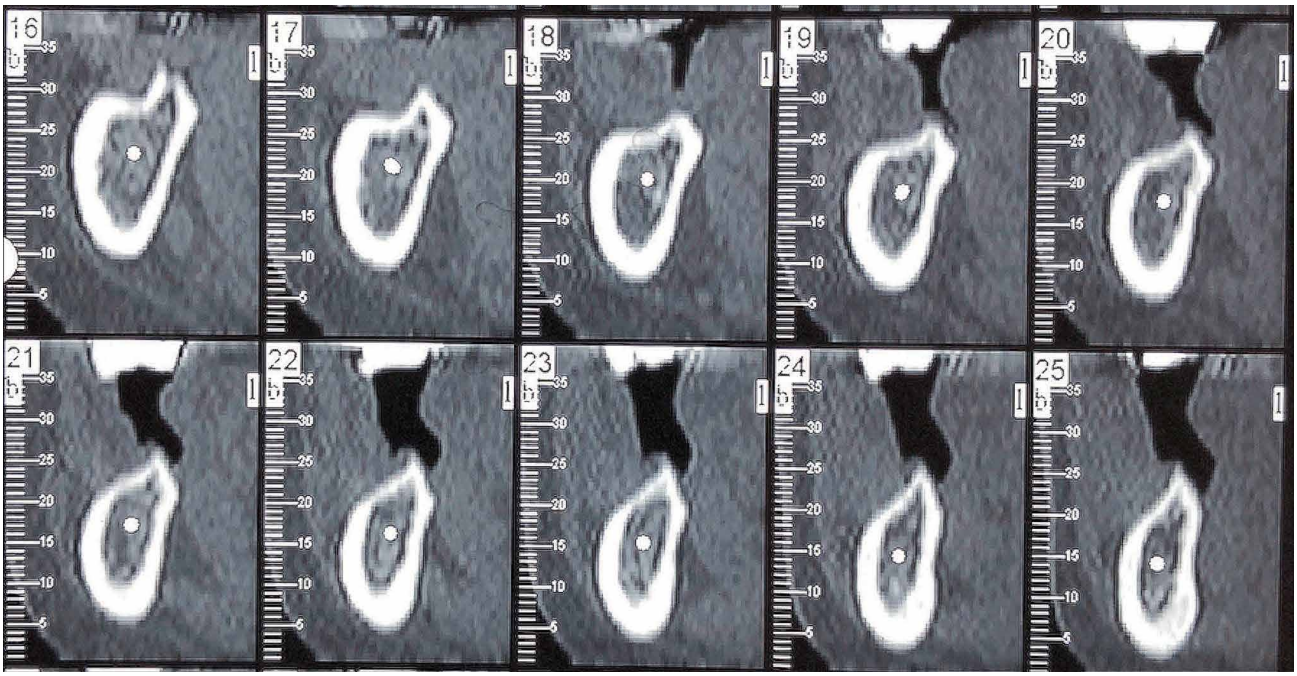


Figure 8. CBCT prior to surgery.

a physical barrier between the immature bone tissue and the soft tissues. Fixation of this material is done by micro-screws or thumbtacks, always starting by fixing the lingual or palatal part. A preparation based on Fibrin-Rich Plasma obtained by plasmapheresis and a combination of autologous bone and Bio-Oss bone mineral (Geistlich, Princeton, United States) in a 1:1 proportion was placed inside the membrane (Figure 6). Penicillin was also added. In this case, a resorbable Derma collagen membrane was placed (OsteoBiol, Torino, Italy). Finally, the flap was closed. In order to release the flap, firm and horizontal cuts were made in the periosteum, thus achieving greater elasticity of the flap. A 3-0 monofilament d-PTFE suture from Cytoplast® was used to suture. First, mattress sutures were placed 4 mm from the incision line. Single and interrupted sutures were also placed in the same material to close the edges of the flap and leave at least one 4 mm thick layer of connective tissue between the membrane and the oral epithelium.[7] The close contact formed between both connective tissue provides

a barrier to avoid exposure of the membrane, since increasing contact facilitates healing. The vertical incisions were stitched with simple stitches. During the first week after surgery, antibiotic, analgesic and anti-inflammatory treatment was prescribed; Amoxicillin 750 mg every 8 hours, Ibuprofen 600 mg every 8 hours and Metamizole 1 capsule every 6 hours, in case of pain. At three weeks, with the tissue sufficiently mature, the stitches were removed. Nine months later, a second procedure was performed to remove the membrane. One year after the surgery, the implants were placed (Figure 7).

DISCUSSION

Vertical bone augmentation has proven to be a satisfactory treatment when using d-PTFE membranes with titanium reinforcement, PRF and a combination of autologous bone with particulate bone mineral an a 1:1 ratio.

Many authors such as Jovanovic et al.[6] and Urban et al.[8] do not perform this technique in smoking patients, as the vasoconstrictor effects of tobacco strongly compromise post-surgical healing.

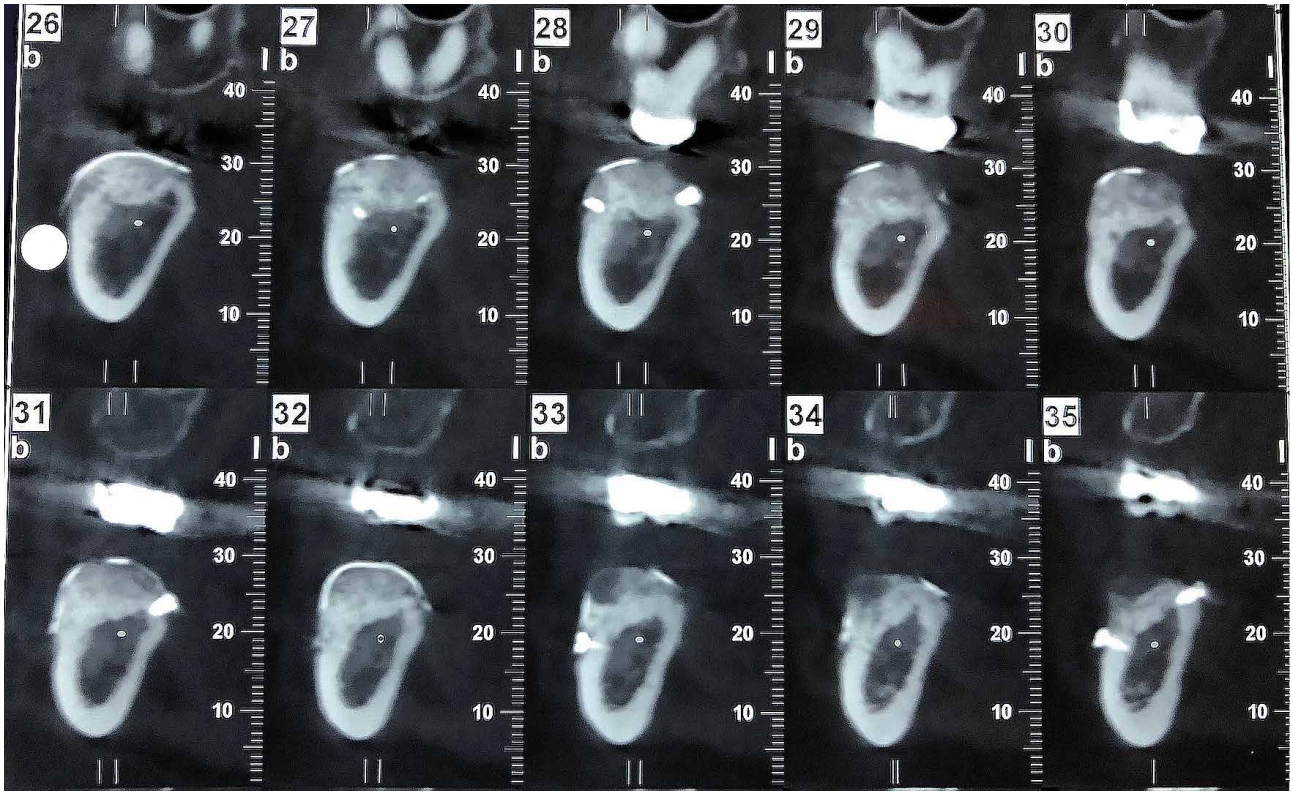


Figure 9. CBCT 5 months after surgery.

Autologous bone represents an ideal matrix to support the newly formed bone, providing an immunologically compatible source of viable bone cells, good osteoconductive scaffolding, in addition to the precursor growth molecules necessary for bone formation.

It is essential that the membrane provides high stability to the graft.[7] In the event that the edges of the membrane are not well adapted, a second membrane would be placed. Authors such as Jovanovic et al.[6] and Urban et al.[8] recommend the use of native collagen membranes, but their reabsorption is quite fast, from 4 to 6 weeks. Closure of the flap is of vital importance because the fact that a primary closure is achieved without any tension and thus does not press our graft at all is what will determine the surgical success or failure.[1] From a personal point of view, the authors of this article have preferred the use of non-resorbable sutures. Resorbable sutures usually do not support much tension. In addition, there is always some inflammation in the surrounding tissue due to the metabolic process of inflammation. However, if a resorbable suture would appear on the market that would allow tension without loosening the knot and degradation would be via simple hydrolysis, it could also be suitable for this surgery.

Complications such as membrane exposure and/or subsequent infection was documented in 2.7% of cases, reflecting an improvement over previous articles that present figures between 12.5% and 17%.[5] Despite this, the long-term results where implant placement was performed, show vertical bone regeneration of up to 12 millimeters, with the use of autologous bone chips being indispensable.[5,7] In this clinical case, no relevant complication occurred. One way to minimize the risk of membrane exposure would be to release the closure flap widely so that there is no tension. In addition, the application of penicillin in the graft is recommended to prevent possible infections. The bone gain achieved in this case was 10 mm horizontally and 4 mm vertically,

in accordance with the expectations provided by other authors. The success of the three implants placed was 100% 14 months after placement, which coincides with the results presented by Urban et al. in other studies.[8]

Future long-term studies are needed to be able to determine the technique's predictability. On the other hand, studies included do not have a significant sample size; it would be interesting for subsequent studies to contribute a greater number of cases and a greater long-term follow-up.

CONCLUSIONS

A vertical increase of 4 mm was achieved as well as a horizontal increase of 10 mm (Figures 8 and 9).

After two years, the regenerated bone achieved adopted a density very similar to that of native bone. In numerous articles, it was concluded that histologically, the bone obtained possessed characteristics very similar to those of the original bone.

The guided bone regeneration carried out in this patient made it possible to rehabilitate the posterior sector using implants, which showed 100% survival after 14 months of placement.

Guided bone regeneration seems to be a predictable technique according to the protocols; however, more studies are required to be able to adapt this technique to daily clinical practice.

References

1. Urban IA, Monje A, Nevins M, Nevins ML, Lozada JL, Wang H-L. Surgical management of significant maxillary anterior vertical ridge defects. Int J Periodontics Restorative Dent 2016; 36(3): 329–37.
2. Urban I, Lozada J, Wessing B, Suárez-López del Amo F, Wang H-L. Vertical bone grafting and periosteal vertical mattress suture for the fixation of resorbable membranes and stabilization of particulate grafts in horizontal guided bone regeneration to achieve more predictable results: A technical report. Int J Periodontics Restorative Dent 2016; 36(2): 153–9.
3. Esposito M, Grusovin MG, Kwan S, Worthington HV, Coulthard P. Interventions for replacing missing teeth: Bone augmentation techniques for dental implant treatment. Aust Dent J 2009; 54(1): 70–1.
4. Vega DS. Principios básicos en Regeneración Ósea Guiada. Acta Bioclínica 2012; 2(3): 94–121.
5. Urban IA, Jovanovic SA, Lozada JL. Vertical ridge augmentation using guided bone regeneration (GBR) in three clinical scenarios prior to implant placement: a retrospective study of 35 patients 12 to 72 months after loading. Int J Oral Maxillofac Implants 2009; 24(3): 502–10.
6. Jovanovic SA, Schenk RK, Orsini M, Kenney EB. Supracrestal bone formation around dental implants: an experimental dog study. Int J Oral Maxillofac Implants 1995; 10(1): 23–31.
7. Urban IA, Lozada JL, Jovanovic SA, Nagursky H, Nagy K. Vertical ridge augmentation with titanium-reinforced, dense-PTFE membranes and a combination of particulated autogenous bone and anorganic bovine bone–derived mineral: a prospective case series in 19 patients. Int J Oral Maxillofac Implants 2014; 29(1):185–93.
8. Urban I, Caplanis N, Lozada JL. Simultaneous vertical guided bone regeneration and guided tissue regeneration in the posterior maxilla using recombinant human platelet-derived growth factor: a case report. J Oral Implantol 2009; 35(5): 251–6.

Original article

Degree of knowledge of dental trauma among primary school teachers in the Community of Madrid

Granja Pachecho, Belén
Alfonso X El Sabio University (UAX) Dentist. Expert in Pediatric Dentistry UAX.

Riolobos González, Mª Fe
Dentist, Universidad Complutense Madrid (UCM), Tenured Professor, Expert in Pediatric Dentistry UAX.

García-Navas Fernández de la Puebla, Lourdes
UCM Dentist, Tenured Professor, Expert in Pediatric Dentistry UAX.

Published in spanish Científica Dental Vol. 15. Nº 2. 2018
www.cientificadental.es

ABSTRACT

Aim: To analyze the degree of knowledge and mode of action of Primary Education teachers in a traumatic dentoalveolar emergency during school hours.

Methods: A validated questionnaire with 10 multiple choice questions was applied to 159 teachers. It evaluated the knowledge about emergency and traumatic dental injuries among primary school teachers. Public, charter and private schools in the Community of Madrid participated.

Results: More than half of the sample have basic knowledge of course of action. 84% can distinguish between temporary and permanent teeth. 67.92% believe that the tooth must be returned to its original position, although only 13.84% would reimplant it.

Conclusions: It is necessary to raise awareness about the importance of the initial actions after dental trauma in order to reduce post traumatic sequelae.

KEYWORDS

Trauma questionnaire; Dental trauma; Teacher training.

Indexed in:
- IME
- IBECS
- LATINDEX
- GOOGLE SCHOLAR

Correspondence address:
Mª Fe Riolobos

C / Puerto de Navacerrada 21, · 3-D
28220-Majadahonda. Madrid
Tel. 609 540 908
mriolgon@uax.es

Date received: 6 November 2017
Date accepted for publication:
5 June 2018.

coem
Ilustre Colegio Oficial de Odontólogos y Estomatólogos de la Iª Región

INTRODUCTION

Currently, the second most common cause of dental office visits is dental trauma, the first being tooth decay. Most injuries occur in the upper anterior teeth, which can cause mastication problems, problems with diction due to the interposition of the tongue or fingers, and psychological implications both if the trauma occurs at very early ages or in pre-adolescence.[1,2] Andreasen found a prevalence of 30% of lesions in the primary dentition and 22% in the permanent dentition.[3] In turn, Sánchez and García Godoy found a prevalence of 28.4% in children between 3 and 13 years old.[4] Gallego and Martínez obtained a prevalence of 17.4% between 11 and 14 years old in their study[5]; García-Pérez et al. Reported a higher prevalence of 21.65% between 8 and 11 years of age, more frequently in the male sex.[6] In Spain, in the work by Zaragoza et al., published in the book by García Ballesta et al., the authors found an incidence of dental trauma of 5.6% in school children aged 6-12 years.[2]

The etiology of dental trauma varies depending on the age: in the first years of life children begin to walk and run, so they occur at home and daycare. During school age, traumas are due to falls and collisions in schools; and in adolescence the main cause is usually due to the practice of higher intensity and risky sports in schools and sports facilities.[3,7]

Other predisposing factors are Angle Class II, increased prominence, lip incompetence and mouth breathing.[6,8]

The prognosis and evolution of traumatized teeth will depend directly on immediate and correct attention from parents or schoolteachers at the time of the accident. It is necessary that these actors have a basic understanding about action protocols since these accidents should always be treated as an emergency, going immediately to the dentist's office to make a proper diagnosis and to implement the appropriate therapeutic approach, thereby helping to reduce post-traumatic sequelae.[8]

In the published literature, we can find studies carried out in countries such as Iran, Cuba, China, Brazil and Paraguay, among others, in which they have analyzed the knowledge that schoolteachers have about dental trauma. All come to the common conclusion that teachers do not have adequate or sufficient knowledge to act correctly in this type of emergency. These studies have also been carried out on parents and hospital medical personnel, arriving at the same results.[9,10]

The aim of this paper is to analyze the level of knowledge of primary school teachers in schools of the Community of Madrid when faced with a traumatic dental emergency situation. In addition, the paper seeks to raise awareness about the importance of immediate action and to make known a basic action.

MATERIALS AND METHODS

A descriptive cross-sectional study was carried out in 13 public, charter and private schools in the Community of Madrid. The final sample consisted of 159 questionnaires made to primary school teachers. Participation by the teaching staff was voluntary and anonymous.

The questionnaire identified the sex of the adult, age, level of education and years of professional experience. It consisted of 2 blocks with a total of 10 multiple-choice questions with one correct answer -in some questions there was another option that could be considered "acceptable"- on knowledge and emergency primary care when faced with a dental trauma. The answers were based on the 2015 dental trauma protocols published by the American Association of Dental Injuries (AADI), as follows: 0 points for the wrong answer, 1 point for the acceptable answer, 2 points for the correct answer.[10] This questionnaire was previously validated in other international published articles. The data obtained were analyzed statistically by means of descriptive analysis[11] (Annex).

RESULTS

159 primary school teachers participated in the study, 133 women (83.65%) and 26 men (16.35%), with an average age of 40 years. The level of education for the majority of those surveyed was Diploma (n = 88), followed by Graduates (n = 55). The professional experience of the respondents ranged from 1 to 40 years (6 = 13.71 years).

The first Clinical Case in the survey presented the case of a 9-year-old boy who broke two upper teeth. Faced with this situation, the teachers had to identify the type of dentition and the treatment that the situation would require. 84% answered correctly that they are probably permanent teeth (Figure 1), and 58% answered that they would pick up the pieces of broken teeth and with their parents would send the child quickly to the nearest dentist (Figure 2).

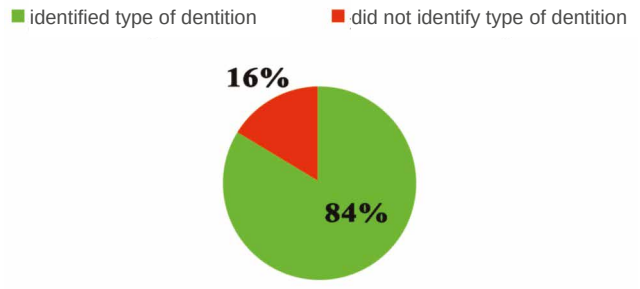


Figure 1. Clinical Case 1 (Answers): Identification of the type of dentition: temporary or permanent.

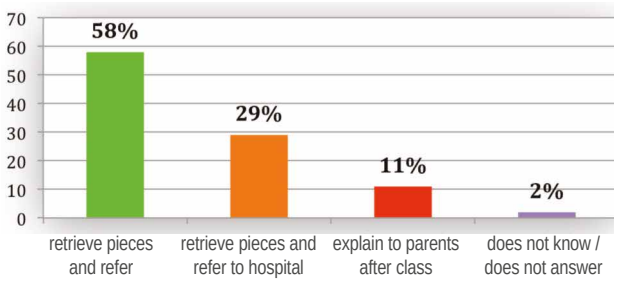


Figure 2. Clinical Case 1: distribution of results on the measures that the teaching staff would adopt when faced with dental trauma in permanent dentition.

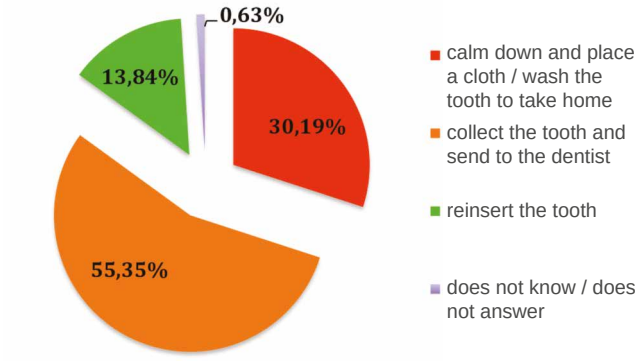


Figure 3. Distribution of the answers according to the measures to be carried out after a dental avulsion in permanent dentition.

The second case report presented the situation in which a 13-year-old girl suffers from dental avulsion of an upper tooth: 55.35% answered that she would pick up the tooth and take the child to the dentist. However, the option of reimplanting the avulsed tooth at the time of the accident was only pointed out by 13.84% of the teaching staff (Figure 3).

In the block of questions on knowledge of the management of an avulsed permanent tooth, the fourth question tried to discern whether the teacher would reposition an avulsed tooth in the child's mouth, resulting in 23% of those who indicated they would (Figure 4). On the other hand, 66.67% know that an avulsed temporary tooth cannot be repositioned in the mouth (Figure 5), and 77.36% are aware that the child has to go immediately to the nearest dentist due to the importance of the loss of a tooth, or in the first 30-60 minutes after avulsion (Figure 6) (Questions 4-6).

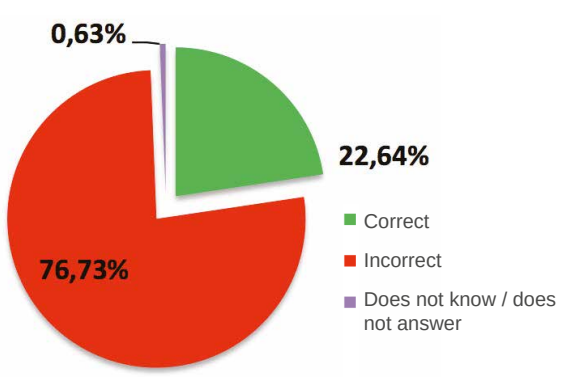


Figure 4. Response to question number 4 of the questionnaire.

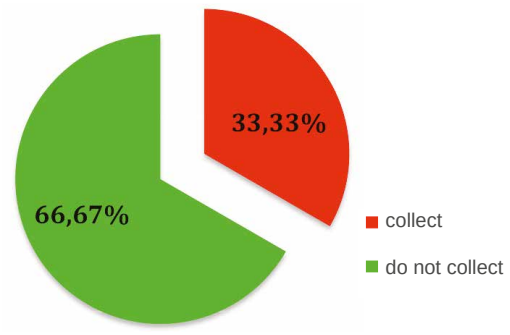


Figure 5. Response to question 5 of the questionnaire

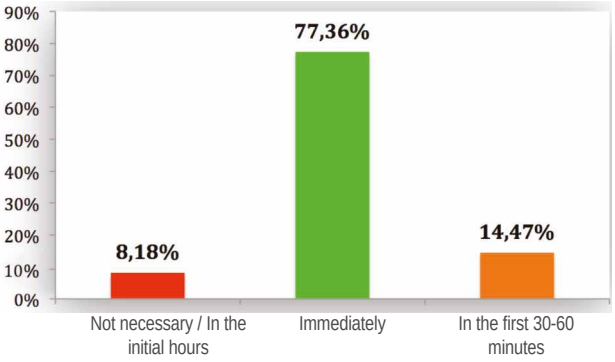


Figure 6. Response to question 6 of the questionnaire.

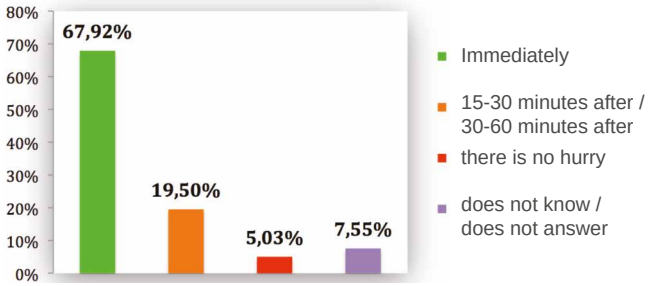


Figure 8. Response to question 8 of the questionnaire.

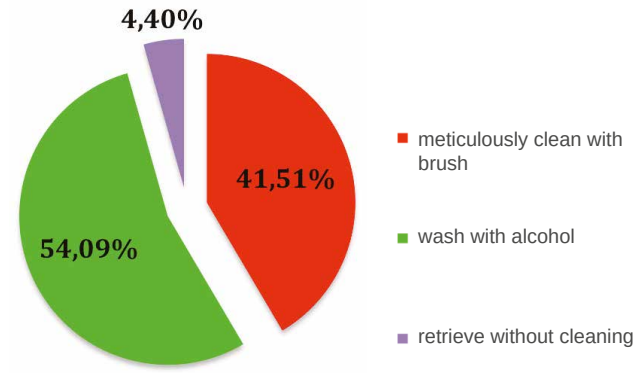


Figure 7. Distribution of responses according to the means used to wash an avulsed tooth before reimplanting it.

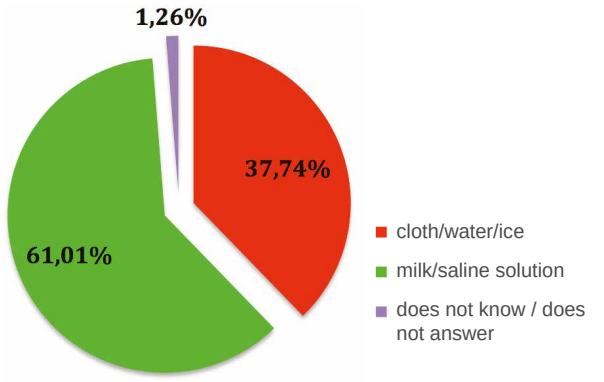


Figure 9. Distribution of responses according to the storage medium chosen to transport the avulsed tooth.

If they had to reimplant a tooth, only 54.09% would first clean it with water; the remaining percentage would clean it meticulously with a brush, with alcohol or would not clean it (Question 7) (Figure 7).

In the eighth question: "When do you think the tooth should be replaced to its original position?", 67.92% of teachers replied immediately after the injury, and 19.50% would reimplant it between 15 and 60 minutes later (Figure 8).

Regarding the means of transport to carry the avulsed tooth, 61.01% would transport it in milk or saline and 37.74% in water, ice or in a handkerchief (Question 9) (Figure 9).

All the teachers surveyed (100%) responded to the last question that, in the event of a dental trauma, they would immediately go to the nearest dentist.

Finally, a final section was added that allowed any teacher who would like to write down any suggestion. Most of the schools surveyed recognized that the knowledge they possess on the subject is insufficient and that they would like to receive information on the action protocol for these dental emergency situations.

DISCUSSION

With this study, we wanted to assess the degree of knowledge about dental trauma among a group of teachers from the population of Madrid.

After carrying out a review of the published literature, we have found studies conducted in countries such as Sweden, the United States, Iran, Cuba, China and Brazil, where they would go with the child to the dentist); In the study conducted by Mori in Brazil[13], 18.8% would reimplant the tooth and 60.6% would seek a dentist. In other works such as Bahrami's, 54% would not reimplant the tooth and

80.8% would go to the dentist, and in the McIntyre study, the percentage of teachers who would go with the child to the dentist is somewhat higher, 87%%.[14,15]

Research has been carried out on the knowledge of parents, medical professionals and teachers. Works similar to this one, carried out exclusively on primary school teachers, are those of Bahrami in Sweden, McIntyre in the United States, Chan in Hong Kong, Cabañas in Latin America, Azeredo in Brazil, among others (Table).[10,13-15]

In the case of trauma to the upper teeth in a 9-year-old child, 84.28% of the teachers who participated in our study were able to identify permanent and temporary teeth. This is a high percentage compared to the study conducted by Azeredo in Brazil, in which only 41.5% recognized the upper teeth of an 8-year-old child as permanent dentition.[16]

In this situation, 57.86% of the professors surveyed picked up the pieces of broken teeth and, together with their parents, would send the child to the nearest dentist. This result is very similar to that reported in the studies carried out by Gallego (63.2%) and Cuesta (58%) 6, both carried out on teachers in Cuba.[7,12]

In the case of dental avulsion of a permanent tooth, 13.84% of teachers surveyed would reimplant the tooth and 55.35% would go to the nearest dentist immediately; meaning, a percentage that was too low, taking into account the importance of reimplantating a permanent tooth in the mouth quickly after a dental emergency.

This attitude has been observed in other works such as that of Cabañas in Paraguay[9] (6.38% would reimplant the tooth and 84.40%

Regarding the reimplantation of the avulsed tooth, prior to carrying it out, 54.09% of the professors would wash it

Table. Summary of the most relevant studies carried on teachers consulted in the bibliography.

AUTHORS	COUNTRY	NUMBER OF SUBJECTS	PROFESSION	LEVEL OF KNOWLEDGE
Cabañas et al., 2013[9]	Paraguay	141	Teachers of Primary Education, 1st cycle, 2nd cycle and Physical Education.	• Moderate knowledge in 50%. • Regular conduct in 47%.
Raoof et al., 2012[16]	Iran	422	Teachers of Primary Education.	Inadequate level of knowledge regarding dental trauma.
Gallego, 2009[7]	Cuba	49	Physical Education Teachers.	Insufficient knowledge and skills on immediate actions when faced with trauma.
Chan et al., 2001[17]	China	166	Secondary School Physical Education Teachers	Inadequate knowledge when faced with dental trauma.
Azeredo et al., 2016[11]	Brazil	205	High school teachers.	• They are not trained to act correctly when faced with a dental emergency. • The knowledge they possess has no scientific basis.
Cuesta et al., 2009[12]	Cuba	58	Teachers of Primary and Secondary Education	The level of knowledge to carry out immediate management and abilities when faced with trauma are insufficient

with water and

41.51% would clean it thoroughly with a brush or alcohol, since they believe that it is necessary to disinfect before re-introducing it into the oral environment, according to the final comments; this is an incorrect procedure since the fibers of the periodontal ligament would be eliminated, fundamental for improving the viability of the reimplantation. In the studies reviewed, such as those by Gallego[7], Raoof[16] and Chan[17], we found response variations from 40.8% to 66.3% in which the respondents would wash the tooth with water.

As stated in the IADT and Save a Tooth™ protocols, the ideal solution for transporting an avulsed permanent tooth is Hank's balanced solution. This medium is not mentioned in any of the articles reviewed, since the questionnaires only reflect the most accessible media in the school environment.

As for the means of transport they would choose to transport the tooth to the dentist, 61.01% of the surveyed population would immerse it in milk or saline and 37.74% in water, ice or a handkerchief. We found differences with studies such as those of Gallego[7], Cabañas[9], Raoof[16] and Chan[17], since in all of these the majority answered that they would transport the tooth on a paper napkin or handkerchief (30.6%, 40.4%, 42 % and 31.9%, respectively).

Valdepeñas et al., recently published in 2016 a work similar to this research, but carried out on primary healthcare personnel: doctors, dentists, nurses and dental hygienists; in relation to the immediate management of dental trauma at the accident site, all the groups presented limited knowledge, except for the group of dentists, who obtained an adequate result. However, they found that 92% of dentists had inadequate notions about updated protocols in primary care in consultation for dental trauma and its follow-up.[18]

All the aforementioned studies, including ours, indicate that the level of knowledge of schoolteachers on the subject treated is inadequate and insufficient, as well as lacking the ability to act in the correct manner. Therefore, they recommend increasing knowledge about the action protocol in these cases. In addition, the teachers are aware of this and claim they need to have more information as indicated in the final comments of the questionnaire (Table). Public entities should be informed of the existence of protocols in cases of trauma, which can be accessed freely through the web, public hospitals, public hospitals, scientific dental societies, and that they represent a primary resource.

CONCLUSIONS

More than half of the teachers surveyed have basic knowledge on how to act when faced with trauma, but not correct and adequate knowledge, although 100% are aware that in the event of dental trauma, it is necessary to go immediately to the nearest dentist.

We want to all attention to the need to provide training courses to primary school teachers in order to raise awareness of the importance of quick and appropriate initial action, to reduce sequelae and post-traumatic risks associated with these dental emergencies.

APPENDIX

QUESTIONNAIRE ON KNOWLEDGE OF DENTAL TRAUMA BY PRIMARY SCHOOL TEACHERS

SEX	□ Male	□ Female
AGE	□ 25-30 years	□ 30-40 years
	□ 40-50 years	□ ≥50 years
EDUCATION LEVEL	□ Diplomate	□ Graduate
	□ Doctorate	□ Master's

PROFESSIONAL EXPERIENCE / TEACHING YEARS:

.....

SCHOOL:.....

CIRCLE THE OPTION THAT YOU CONSIDER CORRECT FROM THE FOLLOWING 10 QUESTIONS.

CASE I

During recess, a 9-year-old boy was hit in the face with a soccer ball. 2 upper teeth were broken.

1) Are those upper teeth that have been broken likely to be temporary (milk) or permanent (definitive)?:

a. Temporary (milk) teeth.
b. Permanent (definitive) teeth. c. I do not know.

2) Which of the following measures would you consider the most appropriate?:
a. Pay no mind, rinse with water only.
b. Collect the pieces of broken teeth, and after classes, get in touch with their parents to explain what happened.
c. Collect the pieces of broken teeth and with their parents quickly send the child to the nearest dentist.
d. Collect the pieces of broken teeth and with their parents quickly send the child to a nearby hospital emergency room.

CASE II

During class change, a 13-year-old girl falls down the stairs and hits her mouth. Your mouth is bleeding and you can see that there is a missing upper tooth, which has completely left the mouth (dental avulsion).

3) What would you do?:
a. I would calm the girl and provide a handkerchief to bite to stop the bleeding.
b. I would wash the tooth and give it to the girl to take it home.
c. I would pick up the tooth and take the child to the dentist. d. I would reposition the tooth in its original site in the mouth.

KNOWLEDGE OF MANAGEMENT OF AN AVULSED TOOTH

4) Would you replace a tooth in its place that due to a blow has completely left the mouth (dental avulsion)?:
a. Yes b. No

5) In the case of a milk tooth that has left the mouth due to a blow (dental avulsion), Do you think it should be reimplanted?:
a. Yes b. No
c. I do not know

6) If a permanent tooth, as a result of a blow, has left the mouth (dental avulsion), when would it be advisable to go to the nearest Dentist?:
a. It is not necessary to go to the Dentist. b. Immediately.
c. In the first 30-60 minutes after the accident. d. In the first hours after the accident.

7) Suppose you decide to replace the tooth that has come out of its place in the mouth in its original place. Before picking it up, what would you do with it?:
a. I would clean it thoroughly with a brush. b. I would wash it with water.
c. I would wash it with alcohol.
d. It would not be necessary to clean it, would be relimplant it without doing anything else.

8) When do you think that reimplantation of the tooth in its original place should be done?:
a. Immediately.
b. At 15-30 minutes after the blow.
c. At 30-60 minutes after the blow.
d. There is no hurry to reimplant.

9) Assuming that the tooth is not repositioned in its original place immediately, what means of storage or transport would you use to transfer the tooth to the dentist?:
a. A handkerchief. b. Water
c. Milk.
d. Saline solution e. Ice.

10) In summary, when faced with any dental trauma, when would you advise going to the nearest Dentist?:
a. It is not necessary to go to the dentist.
b. As soon as possible.
c. In the first week after the accident.

WE APPRECIATE YOUR COOPERATION IN THIS KNOWLEDGE QUESTIONNAIRE.

If you want to add or suggest anything, you can point it out below.

References

1. García C, Pérez L, Castejón I. Prevalence and etiology of dental trauma. A review. RCOE 2003; 8: 134-41.
2. García-Ballesta C, Pérez-Lajarin L. El Problema. Clasificación, etiología y patogenia. En: Traumatología oral. Madrid: Editorial Ergon. 2003. Cap.2: 19-38.
3. Andreasen JD. Lesiones traumáticas de los dientes. La Habana: Editorial Científico Técnica; 1989: 21-31.
4. Sánchez AV, García-Godoy F. Traumatic dental injuries in 3 to 13 years old in Monterrey, Mexico. Endo Dent Traumatol 1999; 6 (2): 63-5.
5. Gallego J, Martínez R. Traumatismos dentales en niños de 12 -14 años en el municipio San José de las Lajas. Rev Cubana Estomatol 2004; 41 (2). Versión online.
6. García Pérez N, Legañoa Alonso J, Alonso Montes de Oca, C, Montalvo Céspedes N. Comportamiento de los traumatismos dentoalveolares en niños y adolescentes. Arch Med Camagüey 2010; 14 (1). Versión Online.
7. Gallego Rodríguez J. Nivel de conocimientos sobre el manejo inmediato de los traumas dentales en profesores de educación física. Medimay Disponible en: http://revcmhabana.sld.cu/index.php/rcmh/article/view/413/html. Consultado 13/4/17.
8. Jamidez Herrera Y, Romero Zaldívar E, Pérez Cedrón R, López Hernández, P. Evaluación a corto plazo de dientes traumatizados después de la aplicación de tratamientos. AMC 2010, 14 (6): 1-10. Versión Online.
9. Cabañas A, Jacquett N, Chirife MT. Nivel de conocimiento y conducta de docentes de educación escolar básica de escuelas públicas frente a casos de avulsión y fractura dentaria. Rev Odontopediatr Latinoam 2013: 3 (1): 52-62.
10. Guidelines for the evaluation and management of traumatic dental injuries. International association of dental traumatology. Edición 2015. Disponible en: https://www.iadt-dentaltrauma.org. Consultado 20-5-2017.
11. Azeredo L, Silva A, do Couto AM, Seixas E, Homsi N, Santos L. Traumatic dental injury in permanent teeth: knowledge and management in a group of Brazilian school teachers. Dental Traumatol 2016; 32: 269-73.
12. Cuesta MT. Conocimientos, habilidades, necesidades de aprendizaje sobre traumatismos dentoalveolares en docentes de primaria y secundaria básica Plaza 2009. Disponible en: http://files.sld.cu.
13. Mori GG, Turcio KHL, Borro VPB, Maurisso AM. Evaluation of the knowledge of tooth avulsión of school professionals from Adamtina, Sao Paulo, Brazil. Dent Traumatol 2007;23 (1): 2-5.
14. Bahrami B, Nikbakhsh M. School staff´s attitude on management of dental trauma in Stockholm, Sweden. Disponible en: http://www.ki.se/odont/cariologi_endodonti/97B/BittaBahrami_MahsaNikbakhsh.pdf.
15. McIntyre JD, Lee JY, Trope M y Vann WF Jr. Elementary school staff knowledge about dental injuries. Dent Traumatol 2008; 24: 116-21.
16. Raoof M, Zaherara F, Shokouhinejad N, Mohammadalizadeh S. Elementary school staff knowledge and attitude with regard to first-aid management of dental trauma in Iran: a basic premise for developing future intervention. Dent Traumatol 2012; 28: 441-47.
17. Chan AWK, Wong TKS, Cheung GSP. Lay knowledge of physical education teachers about the emergency management of dental trauma in Hong Kong. Dent Traumatol 2001; 17 (2): 77-85.
18. Valdepeñas Morales J, Adanero Velasco A, Planells del Pozo P. Estado actual de los conocimientos sobre el manejo de los traumatismos dentales en los profesionales sanitarios de Atención Primaria de la Comunidad de Madrid. Estudio piloto. Cient Dent 2016; 13 (2): 113-122.

Original article

Coronectomy as a treatment alternative to extraction of the lower third molars. A systematic review

Maidagan Valderrama, A
3rd Year Master's Resident. Master of Oral Surgery and Implantology. Hospital Virgen de la Paloma. Madrid.

Martínez Rodríguez, N
Professor of the Master's of Oral Surgery and Implantology Program. Hospital Virgen de la Paloma. Madrid.

Barona Dorado, C
Professor Department of Dental Clinical Specialties. School of Dentistry. Universidad Complutense de Madrid (UCM).

Fernández Cáliz, F
Professor, Department of Dental Clinical Specialties. School of Dentistry (UCM).

Leco Berrocal, MI
Professor, Department of Dental Clinical Specialties. School of Dentistry (UCM).

Indexed in:
- IME
- IBECS
- LATINDEX
- GOOGLE SCHOLAR

Correspondence address:
Agustín Maidagan Valderrama
C / Ancora Nº8 4ºC
28045 Madrid
agustinmaidaganvalderrama@hotmail.com
Tel: 639171360

Date received: 19 March 2018.
Date accepted for publication: 14 June 2018.

coem
Ilustre Colegio Oficial de Odontólogos y Estomatólogos de la Iª Región

Published in spanish Científica Dental Vol. 15. Nº 2. 2018
www.cientificadental.es

ABSTRACT

Introduction: Due to the close relationship of the third molar roots with the inferior alveolar nerve (IAN), involvement of this nerve is one of the common postoperative disorders. As an alternative to the extraction, a new procedure called coronectomy was introduced in 1984. The aim of this work is to perform a systematic review of the literature in order to know the results and complications of third molar coronectomy in relation to the IAN in order to verify if it is an adequate procedure.

Material and methods: A literature search was conducted in the Medline, Ebsco, Cochrane, Clinicaltrials and Sigle databases from 2000 to 2017.

Results and discussion: After applying the inclusion and exclusion criteria, 17 articles were analyzed, with a lower percentage of IAN lesion in the coronectomy procedure, as well as a lower indcidence of infection and dry socket compared to extraction.

Conclusion: It has been observed that the coronectomy procedure at the level of the lower third molars is a predictable procedure with few complications.

KEYWORDS

Coronectomy; Lower third molar; Inferior alveolar nerve; Tooth extraction.

INTRODUCTION

Extraction of the lower third molars is one of the most commonly performed procedures in dental surgery.[1] These must be removed when there is no space for eruption in the retromolar region, between the second molar and the mandibular branch.[2] If extraction is not performed, it may lead to the formation of odontogenic cysts or tumors.[2,3] Prophylactic extraction continues to be controversial, due to the close relationship of the root complex of these molars with the inferior alveolar nerve (IAN), the involvement of which is one of the possible postoperative complications. The incidence of permanent sensorineural alterations is between 0.1% to 1.1%[4-6] and the temporary alterations range between 4.5% and 22%, according to different studies.[7-9]

The relationship of the roots with the IAN can be interpreted by observing a series of signs on the panoramic radiograph such as deviation of the lower dental canal, narrowing and loss of continuity of the roof of the same, obscuration, narrowing and changes in the direction of the roots (Figure 1).

However, the most important radiographic test when diagnosing this relationship is Cone Beam Computed Tomography (CBCT)[11-14], which shows a 3D image of the area, making it possible to show the association between the IAN and the root complex.[12-14]

As an alternative to the extraction of the lower third molar, a new procedure was introduced in 1984 called coronectomy.[15] This consists of removing the crown of the tooth, leaving the roots buried in bone, thereby avoiding damage of the IAN.[15-22]

The surgical technique consists of a series of steps, which following application of the usual anesthetic technique used for these extractions, a vestibular flap with lingual detachment is fashioned and the crown is completely sectioned with a fissure bur a 45º angle, being later removed using forceps. Afterwards, the remaining fragmented infraosseous root fragments are reduced 2-3 mm with round bur and, finally, the bed is irrigated with saline water and sutured[16] (Figure 2).

This technique, however, has a series of contraindications, and it is not possible to perform when the roots are mobilized during the intervention or if there is injury at the

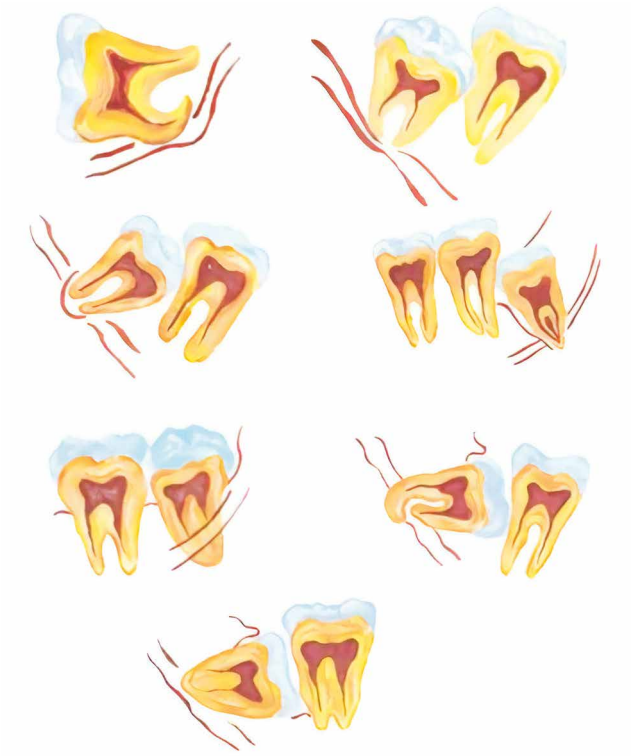


Figure 1: Relationship of the roots with the IAN (radiographic signs).

Figure 2: Coronectomy technique (Pogrel et al.,[17]).

level of the root, and in those molars that are impacted horizontally along the course of the IAN, due to the possibility of sectioning the nerve during removal of the crown.[16-33] This technique is not indicated in patients who are medically compromised due to diabetes, chemotherapy or previous radiotherapy, any type of immunological or bone disease, neurological disorders and craniofacial syndromes, as well as in patients who are under 16 years of age due to inadequate development of the roots.[16-33]

Many authors have considered coronectomy as a safe technique to avoid nerve damage of the IAN.[16-31]

Therefore, the objective of this work is to carry out a systematic review of the existing literature on the subject to know the results and complications of coronectomy in lower third molars in relation to the IAN and verify if it is an adequate procedure to avoid damage the nerve.

MATERIALS AND METHODS

The PICO question we have posed is the following:

- *P (PATIENTS): Patients with the lower third molar in close relationship with the IAN.*
- *I (INTERVENTION): Coronectomy of the lower third molar.*
- *C (COMPARISON): Coronectomy vs. Extraction*
- *O (RESULTS): Postoperative complications.*

A) Search strategy and types of studies

A systematic search of the existing literature has been carried out in the PubMed/Medline, Cochrane, Clinicaltrials, Ebsco and SIGLE information databases and information sources from January 1, 2000 to April 5 2017.

The words "Coronectomy" and "Third Molar" were used as a search algorithm, followed by a manual or pearling search of the articles included in this review.

- All articles that were Randomized Clinical Trials (RCTs), Controlled Clinical Trials (CCTs), Cohort Studies (CSs), Prospective Studies (PSs) and Retrospective Studies (RSs) where the coronectomy technique was performed on lower third molars that had a close relationship with the NDI, and had been radiographically diagnosed by orthopantomography and/or cone beam tomography, with a follow-up of patients greater than or equal to 6 months, and with a minimum of 40 Coronectomies performed were selected.

- We excluded those studies that were reviews of the literature, clinical cases, letters to the editor or expert opinions, with less than 40 coronectomy procedures, a follow-up of less than 6 months or where the radiographic diagnosis was not made by orthopantomography and/or cone beam tomography.

B) Search strategy and types of studies

The data were extracted independently by two reviewers, with the help of a data collection sheet, designed for that purpose (Table). The variables collected were: intra-operative procedure failure, loss of sensitivity of the IAN, presence of infection, dry socket, pain, wound dehiscence, migration of the roots and the need for reintervention to extract the roots.

RESULTS

A) Flow chart (Figure 3)

In the review of the literature, a total of 145 initial articles found in 5 different databases were obtained (78 in Medline, 11 in Cochrane, 1 in Clinical Trials, 55 in Ebsco and 0 in Sigle). Of these 145 initial articles, 50 of them were duplicates, leaving us with 94 articles.

After reading the titles and abstracts, we were left with 19 articles that met the inclusion criteria (31 articles were excluded after reading the title and 45 articles after reading the summary).

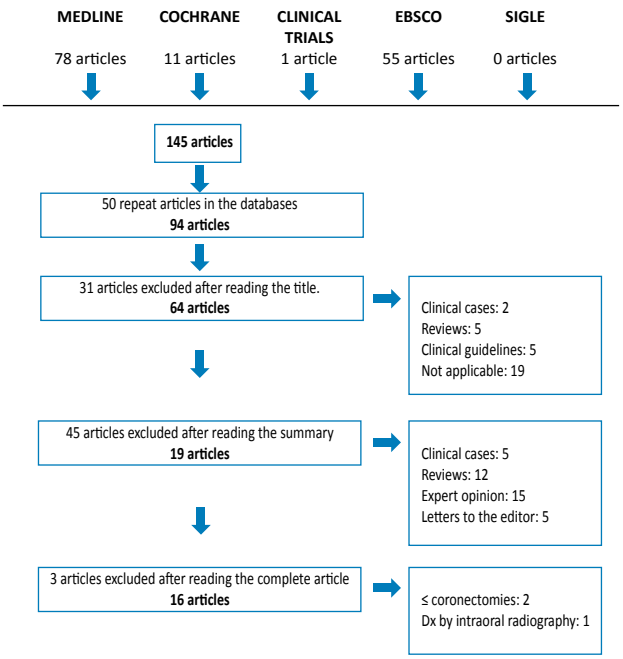


Figure 3. Flowchart.

Finally, once the complete articles were read, 2 of them were excluded for performing the coronectomy procedure in fewer than 40 patients and 1 article was excluded because the preoperative diagnosis was made using a peri-apical radiograph. The total number of articles included in this review was 16.

B) Qualitative analysis

Next, the results obtained will be mentioned, including in a table that includes the study variables together with the number of patients operated on, number of coronectomies performed and the follow-up of patients over time (Table).

Pogrel et al.,[17] conducted a study with a sample size of 41 patients who underwent 50 coronectomies. The diagnosis was by orthopantomography and follow-up was for 6 months. In 15 cases (30%) the roots migrated an average of 1.5 mm in 6 months. In 3 cases the roots had to be extracted, 2 of them due to exposure and the rest due to inadequate healing.

O'Riordan et al.,[18] performed 52 coronectomies in the same number of patients. The diagnosis was by orthopantomography and patient follow-up was for 24 months. 8 coronectomies failed (15.3%) during surgery, 3 patients (5.7%) had IAN paresthesia and another 3 had an

Table. Results of the articles includedy

AUTHORS	SAMPLE	Nº CORONECTOMIES	CORONECTOMIES FAILED	LOSS OF SENSITIVITY OF THE IAN	INFECTION	PAIN	ALVEOLAR OSTEITIS	WOUND DEHESCIENCE	% MIGRATION OF THE WOUND	RE-INTERVENTION	FOLLOW-UP
Pogrel et al.,[17] (2004)	41	50	------	0	0	------	0	1	30	3	6 months
O´Riordan et al.,[18] (2004)	52	52	8	3	3	------	------	0	------	3	24 months
Renton et al.,[20] (2005)	128	94	36	0	3	8	7	------	8,6	0	24 months
Leung et al.,[22] (2009)	231	171	16	1	9	66	0	------	62,2	1	24 months
Dolanmaz et al.,[23] (2009)	43	47	1	0	------	------	------	------	15,7	0	24 months
Hatano et al.,[19] (2009)	220	102	5	1	4	19	2	------	89,6	5	12 months
Cilasun et al.,[21] (2011)	124	88	2	0	1	1	0	------	------	1	30 months
Goto et al.,[24] (2012)	161	185	------	0	------	------	------	7	100	8	12 months
Leung et al.,[25] (2012)	108	155	0	1	6	58	------	------	97	4	36 months
Monaco et al.,[26] (2012)	37	43	0	0	------	1	1	------	48,8	1	12 months
Kohara et al.,[27] (2014)	92	111	------	1	9	------	1	10	90,9	10	36 months
Frenkel et al.,[28] (2014)	173	185	------	1	2	20	------	7	22,1	6	12 months
Monaco et al.,[29] (2015)	94	116	0	0	------	10	5	9	48,2	4	36 months
Ajbaje et al.,[30] (2015)	64	96	------	0	4	4	4	4	14,6	9	12 months
Leung et al.,[31] (2015)	458	612	------	1	2	190	1	------	------	19	60 months
Kouwenberg et al.,[32] (2015)	191	191	------	0	------	------	------	------	79	17	6 months

infection. Three reinterventions had to be performed due to recurrent infections.

In the study by Renton et al.,[20] with a sample size of 128 patients, the sample was divided into one group with 102 third molars for extraction and another group with 94 coronectomies. The diagnosis was made through orthopantomography and follow-up was for 24 months. Of the 94 coronectomies, 36 (38.2%) failed intraoperatively. In the extraction group, 19 (14.3%) cases of paresthesia were observed and in the coronectomy group 3 (3.1%) cases were observed. Infection occurred in 1 case from the extraction group and 3 from the coronectomy group. In terms of pain, 8 patients in the coronectomy group and 22 in the extraction group stated they had pain. Alveolar osteitis occurred in 7 patients in the coronectomy group and 10 in the extraction group. Migration of 5 roots (8.6%) of an average of 1.5 mm was observed during the first 6 months.

Leung et al.,[22] performed a RCT with a sample size of 231 patients with 171 coronectomies and 178 extractions. The diagnosis was by orthopantomography and follow-up was for 24 months. There were 16 failures (9.3%) during the procedure in the coronectomy group. There was one case of paresthesia (0.5%) of the IAN in the coronectomy group and 9 (5%) in the extraction group. Regarding infection, 9 cases were observed in the coronectomy group and 12 in the extraction group. 66 patients in the coronectomy group experienced pain compared to 102 patients in the extraction group. No case of alveolitis was reported in the coronectomy group versus the 5 cases of the extraction group. At 3 months, 62.2% of the roots had migrated 1.9 mm and 3.01 mm at 24 months, with the fastest migration in the first 3 months and decreasing during the following months. Finally, reoperation was necessary in only one patient due to root exposure.

Dolanmaz et al.,[23] in their study on 43 patients who underwent 47 coronectomies after diagnosis by orthopantomography, with a 24-month follow-up, observed only one failure (2.1%) during the intervention. 15.7% of the roots migrated from their origin, with an average of 2.3 mm at 6 months and 3.01 mm at 12 months.

Hatano et al.,[19] in their CCT on 220 patients performed 118 extractions (control group) and 102 coronectomies. The diagnosis was through CBCT and follow-up was for 12 months. At the time of surgery, 5 coronectomies failed (4.9%) and there were signs of IAN paresthesia in 6 patients (5.1%) in the control group and one case in the coronectomy group. Four patients (3.9%) underwent coronectomy and one (0.9%) in the extraction group. Pain was greater in coronectomies (19 cases) than in extractions (8 cases). Alveolitis was present in 10 cases in the extraction group compared to 2 in the coronectomy group. Regarding root migration, there were 87 cases (89.6%). Finally, reintervention was necessary in 5 patients in order to extract the roots, 4 due to infection and the rest due to exposure.

Cilasun et al.,[21] in their CCT, performed 88 coronectomy procedures and 87 extractions in 124 patients. The diagnosis was confirmed by CBCT and the follow-up was 30 months. In 2 patients (2.2%), coronectomy failed during surgery. In the extraction group there were 2 cases of paresthesia (2.3%) of the IAN and none (0%) in the coronectomy group. There was one case of infection in the extraction group and in the coronectomy group respectively. One patient had dry socket in the extraction group, none in the coronectomy group. One patient had to undergo reintervention to remove the roots.

Goto et al.,[24] diagnosed the patients using CBCT and performed 185 coronectomies with a follow-up of 12 months. Seven cases of wound dehiscence were observed. Migration occurred in 100% of the roots, with 3 mm of root movement at 12 months. Finally, 8 roots were reoperated, 1 due to pulpitis and the remaining 7 due to poor healing.

Leung et al.,[25] conducted a 36-month study with a sample size of 108 patients who underwent 155 coronectomies following diagnosis by orthopantomography. One case (0.6%) of IAN injury was observed, 6 cases of infection and 58 cases of pain. Migration of the roots was evaluated, occurring in 97% of cases. The mean migration was 1.9 mm at 6 months and 2.9 mm from 12 months up to 36 months. 4 roots underwent reintervention due to oral exposure.

Monaco et al.,[26] performed diagnostic workup with CBCT in 37 patients who underwent 43 coronectomy procedures. The study was 12 months and only 2 patients experienced pain and alveolitis respectively. 48.8% of the roots migrated during the first 6 months of follow-up, with an average of 1.9 mm. One root had to be removed due to postoperative pain.

Kohara et al.,[27] diagnosed 111 lower third molars in 92

patients using CBCT. At the 36-month follow-up, they observed one case (0.9%) of paresthesia, 9 cases of infection, one case of alveolitis and 10 cases of dehescence. Migration occurred in 90.9% of the roots, with an average of 1.84 mm at 3 months and 3.48 mm between 12 and 36 months. Reintervention was performed for the extraction of 10 roots, due to poor healing in 9 cases and one case of pulpitis.

Frenkel et al.,[28] performed a study on 173 patients who underwent 185 coronectomy procedures. The preoperative diagnosis was made with CBCT and the follow-up was 12 months. A single case of paresthesia (0.5%) of the IAN was observed, 2 cases of infection and 20 cases of pain. There was inadequate healing in 7 roots. 22.1% of the roots migrated, the average being 2.2 mm at 6 months and 3.2 mm at 12 months. It was necessary to reintervene in 6 patients (5 due to pain and one due to oral exposure).

Monaco et al.,[29] conducted a study on 94 patients with 116 coronectomies. The diagnosis was by CBCT and follow-up was 36 months. Among the complications observed were 10 cases of pain, 5 cases of alveolitis and 9 cases of delayed healing. 48.2% of the roots migrated, with an average of 1.85 mm at 3 months and 4.73 mm between 12 and 36 months. Reintervention of the roots was carried out in 4 cases due to exposure to the oral cavity.

In the study by Agbaje et al.,[30] coronectomies were performed on 64 patients after diagnosis by CBCT. The duration of the study was 12 months. There were 4 cases of infection, pain, alveolitis and dehiscence of the wound, respectively. Migration of the roots occurred in 14.6% of cases at 12 months and in 9 cases the roots were extracted.

The study by Leung et al.,[31] was carried out on 458 patients who underwent 612 coronectomies. The study lasted 60 months and the diagnosis was obtained by orthopantomography, observing only one case of IAN injury (0.1%), 2 cases of infection and 190 cases of pain. Migration of the roots after 24 months did not occur. In 19 cases it was necessary to reoperate to extract the roots.

Kouwenberg et al.,[32] conducted a study with a sample size of 191 patients and 191 coronectomies. The diagnosis was made by CBCT and follow-up was for 6 months. 79% of the roots migrated an average of 1.5 mm from their original position at 6 months. Seventeen patients were reoperated due to eruption of the remaining roots into the mouth.

DISCUSSION

The coronectomy procedure, described by Pogrel and cosl.,[17] in 2004, is an alternative to extraction of lower third molars that are in close relationship to the IAN, diagnosed by radiographic imaging.[17] Ideal diagnosis by imaging must be carried out using computerized tomography, after having performed a panoramic X-ray where we can observe the radiographic signs of proximity to the IAN.[12-14] In 8 of the studies analyzed, the diagnosis was made by orthopantomography and CBCT19,[21,24,26,27,29,30,32], while in the remaining studies only employed a panoramic radiograph.[17,18,20,22,23,25,28,31]

The percentage of intraoperatively failed coronectomies ranges from 38.2% in the study by Renton et al.[20] and 2.1% in the study by Dolanmaz et al.[23] The studies by Leung et al.[25] and Monaco et al.,[26,29] did not have any failures. Failures during the procedure are scarce, except in the study by Renton et al.,[20] due to the use of a technique that is different from the one described by Pogrel et al.[17], which maintains that the crown has to be completely sectioned using a hand-mounted burr, protecting the lingual nerve by means of a separator.

IAN injury in the cases of coronectomy was low. In the studies by Leung et al.[22], Hatano et al.[19], Renton et al.[20], and Cilasun et al.[21], the percentage of IAN lesion did not exceed 0.6% of coronectomies, whereas in the cases of extraction it was placed between

2.2% and 5.1%. Therefore, the coronectomy procedure decreases the risk of IAN injury compared with extraction.

The presence of infection and dry socket is between 0% and 5.7%, with the study by Leung et al[22] having the greatest number of cases of infection, which may be related to the fact that no postoperative antibiotic was prescribed. In studies comparing extraction with coronectomy, a higher percentage of infection and dry socket was observed in patients undergoing extraction, except in the study by Renton et al.[20] where there was a higher percentage of infection and dry socket in cases of coronectomy.

Postoperative pain is low in patients where coronectomy is performed, with the study by Leung et al.[22] recording the most cases of pain. In studies comparing pain in patients undergoing tooth extraction and coronectomy[19-22], the results show that the incidence of pain is similar in both groups.

Wound dehiscence has been recorded in a few studies[17,18,24,27,28,29,30], with the highest percentage of cases occurring in the study by Kohara et al.[27]

Regarding the root migration, all of the studies evaluated it except O'Riordan et al.[8] and Cilasun et al.[21]

The percentage of migrated roots was high, reaching close to 100%. 19,24,25,27 The average number of millimeters of migration away from the IAN was approximately 1.5 to 3.09 mm, being greater in the first 6 months and decreasing after 12 months.[17,22,23,24,28,31] However, Monaco et al.[26,29] observed that the root migration after 12 months was maintained, not coinciding with the other authors, and especially with Leung et al.[31], who verified that migration decreased and after 24 months it stopped completely.

Some authors observed that migration occurred more frequently in females and in younger patients (≤30 years).[24-31] Regarding the shape of the roots, Goto et al.[24] observed that conical roots had greater migration potential, while Kohara et al.[27] and Leung et al.[22,31] did not find differences. Finally, regarding the depth of impaction, Kohara et al.[27] and Kouwenberg et al.[32] observed that the third molars in position A on the Pell and Gregory classification migrated a greater distance, contrary to the findings of Leung et al.[22,31] who obtained a similar migration.

Reintervention to extract the roots is quite infrequent and, in the event it is necessary, the possibility of damaging the IAN during the procedure decreases due to migration of the roots. The great majority of the cases were due to the exposure of the roots in the oral cavity, inadequate wound healing[19,24,27], or pulpitis.[24,27,29]

Some authors find that there is a relationship between failure of the coronectomy and the experience of the surgeon, observing that this was a key factor due to the longer time required to perform the procedure in novel surgeons compared to experts.[29,32] This factor should be included in future studies because it is considered a cause of subsequent complications.

CONCLUSIONS

Coronectomy as treatment for third molars in close relationship with the IAN is a safe and effective procedure if performed using the technique described by Pogrel et al. in 2004. Postoperative complications after coronectomy treatment (IAN lesion, infection and dry socket) are less frequent than after extraction, with pain being the only similar value in both procedures. In case of reintervention for extraction of the roots, the risk of injuring the NDI is lower, due to the migration of the roots away from the surgical bed.

References

1. Petersen LB, Vaeth M, Wenzel A. Neurosensoric disturbances after surgical removal of the mandibular third molar based on either panoramic imaging or cone beam CT scanning: A randomized controlled trial (RCT). Dentomaxillofac Radiol 2016; 45 (2): 2015-24.
2. Weir S, Lopes V, Malden N. Influence of SIGN guidelines on removal of third molars in The Lothians, Scotland, a clinical audit. Oral Surg 2010; 3: 57-60.
3. Leone SA, Edenfield MJ, Cohen ME. Correlation of acute pericoronitis and the position of the mandibular third molar. Oral Surg Oral Med Oral Pathol 1986; 62: 245-50.
4. Bataineh AB. Sensory nerve impairment following mandibular third molar surgery. J Oral Maxillofac Surg 2001; 59: 1012–17.
5. Carmichael FA, McGowan DA. Incidence of nerve damage following third molar removal: a West Scotland Oral Surgery Research Group Study. Br J Oral Maxillofac Surg 1992; 30: 78–82.
6. Jerjes W, Swinson B, Moles DR, El-Maytah M, Banu B, Upile T, y cols. Permanent sensory nerve impairment following third molar surgery: a prospective study. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006; 102 (4): 1–7.
7. Bhat P, Cariappa KM. Inferior alveolar nerve deficits and recovery following surgical removal of impacted mandibular third molars. J Maxillofac Oral Surg 2012; 11: 304–8.
8. Cheung LK, Leung YY, Chow LK, Wong MC, Chan EK, Fok YH. Incidence of neurosensory deficits and recovery after lower third molar surgery: a prospective clinical study of 4338 cases. Int J Oral Maxillofac Surg 2010; 39 (4): 320–6.
9. Sarikov R, Juodzbalys G. Inferior alveolar nerve injury after mandibular third molar extraction: a literature review. J Oral Maxillofac Res 2014; 5 (4): e1.
10. Sedaghatfar M, August MA, Dodson TB. Panoramic radiographic findings as predictors of inferior alveolar nerve exposure following third molar extraction. J Oral Maxillofac Surg 2005; 63 (1): 3-7.
11. Nakamori K, Tomihara K, Noguchi M. Clinical significance of computed tomography assessment for third molar surgery. World J Radiol 2014; 6: 417–23.
12. Ghaeminia H, Gerlach NL, Hoppenreijs TJ, Kicken M, Dings JP, Borstlap WA. Clinical relevance of cone beam computed tomography in mandibular third molar removal: A multicentre, randomised, controlled trial. J Craniomaxillofac Surg 2015; 43 (10): 2158 -67.
13. Susarla SM, Dodson TB. Preoperative computed tomography imaging in the management of impacted mandibular third molars. J Oral Maxillofac Surg 2007; 65 (1): 83-8.
14. Wang W-Q, Chen MYC, Huang H-L, Fuh L-J, Tsai M-T, Hsu J-T. New quantitative classification of the anatomical relationship between impacted third molars and the inferior alveolar nerve. BMC Med Imaging 2015; 15: 59.
15 Ecuyer J, Debien J. Surgical deductions. Actual Odonto stomatol 1984; 38 (148): 695-702.
16. Knutsson K, Lysell L, Rohlin M. Postoperative status after partial removal of the mandibular third molar. Swed Dent J 1989; 13: 15-22.
17. Pogrel MA, Lee JS, Muff DF. Coronectomy: a technique to protect the inferior alveolar nerve. J Oral Maxillofac Surg 2004; 62: 1447-52.
18 O'Riordan BC. Coronectomy (intentional partial odontectomy of lower third molars). Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2004; 98: 274-80.
19 Hatano Y, Kurita K, Kuroiwa Y, Yuasa H, Ariji E. Clinical evaluations of coronectomy (intentional partial odontectomy) for mandibular third molars using dental computed tomography: a case-control study. J Oral Maxillofac Surg 2009; 67: 1806-14.
20 Renton T, Hankins M, Sproate C, McGurk M. A randomised controlled clinical trial to compare the incidence of injury to the inferior alveolar nerve as a result of coronectomy and removal of mandibular third molars. Br J Oral Maxillofac Surg 2005; 43: 7-12.
21. Cilasun U, Yildirim T, Guzeldemir E, Pektas ZO. Coronectomy in patients with high risk of inferior alveolar nerve injury diagnosed by computed tomography. J Oral Maxillofac Surg 2011; 69: 1557-61.
22. Leung YY, Cheung LK. Safety of coronectomy versus excision of wisdom teeth: a randomized controlled trial. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2009; 108: 821-27.
23. Dolanmaz D, Yildirim G, Isik K, Kucuk K, Ozturk A. A preferable technique for protecting the inferior alveolar nerve: coronectomy. J Oral Maxillofac Surg 2009; 67: 1234-38.
24 Goto S, Kurita K, Kuroiwa Y, Hatano Y, Kohara K, Izumi M, y cols. Clinical and Dental Computed Tomographic Evaluation 1 Year After Coronectomy. J Oral Maxillofac Surg 2012; 70: 1023-29.
25. Leung YY, Cheung LK. Coronectomy of the Lower Third Molar Is Safe Within the First 3 Years. J Oral Maxillofac Surg 2012; 70: 1515-22.
26. Monaco G, de Santis G, Gatto MR, Corinaldesi G, Marchetti C. Coronectomy: a surgical option for impacted third molars in close proximity to the inferior alveolar nerve. J Am Dent Assoc 2012; 143: 363-69.
27. Kohara K, Kurita K, Kuroiwa Y, Goto S, Umemura E. Usefulness of mandibular third molar coronectomy assessed through clinical evaluation over three years of follow-up. Int J Oral Maxillofac Surg 2015; 44: 259-66.
28. Frenkel B, Givol N, Shoshani Y. Coronectomy of the mandibular third molar: a retrospective study of 185 procedures and the decisión to repeat the coronectomy in cases of failure. J Oral Maxillofac Surg 2015; 73: 587-94.
29. Monaco G, De Santis G, Pulpito G, Gatto MRA, Vignudelli E, Marchetti C. What Are the Types and Frequencies of Complications Associated With Mandibular Third Molar Coronectomy? A Follow-Up Study. J Oral Maxillofac Surg 2015; 73: 1246-53.
30. Agbaje JO, Heijsters G, Salem AS, Van Slycke S, Politis C, Vrielinck L. Coronectomy of Deeply Impacted Lower Third Molar:Incidence of Outcomes and Complications after One Year Follow-Up. J Oral Maxillofac Res 2015; 6 (2): e1.
31. Leung YY, Cheung LK. Long term morbidities of coronectomy on lower third molar. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2015; 121 (1): 5-11.
32. Kouwenberg AJ, Stroy LPP, Rijt EdV–vd, Mensink G, Gooris PJJ. Coronectomy for the mandibular third molar: Respect for the inferior alveolar nerve. J Craniomaxillofac Surg 2016; 44 (5): 616-21.
33. Mukherjee S, Vikraman B, Sankar D, Veerabahu M. Evaluation of Outcome Following Coronectomy for the Management of Mandibular Third Molars in Close Proximity to Inferior Alveolar Nerve. J Clin Diagn Res 2016; 10 (8): 57-62.

Anitua, E.
Licenced in dentistry,
Licensed in medicine,
Doctor of medicine.
Scientific researcher, Eduardo Anitua Foundation, Vitoria, Spain.
Scientific Director of BTI- Biotechnology Institute, Vitoria, Spain.

Indexed in:
- IME
- IBECS
- LATINDEX
- GOOGLE SCHOLAR

Correspondence address:
Dr. Eduardo Anitua

Eduardo Anitua Foundation
C / Jose Maria Cagigal 19,
01007 Vitoria, Spain
eduardoanitua@eduardoanitua.com
Phone: +34 945 160 653

Date received: 21 June 2017.
Date accepted for publication: 8 November 2017.

coem
Ilustre Colegio Oficial de Odontólogos y Estomatólogos de la Iª Región

Original article

Immediate post-extraction implants with immediate loading in alveoli with infection due to active periodontitis: a retrospective cohort study

Published in spanish Científica Dental Vol. 14. Nº 3. 2017
www.cientificadental.es

ABSTRACT

Objective: In this study, a follow-up of immediate implants with immediate loading is carried out in alveoli affected by active periodontitis in order to determine their survival, bone loss and other variables that may lead to treatment failure, both surgical and prosthetic.

Material and Methods: Patients in whom immediate post-extraction implants with immediate loading were placed in areas affected by periodontitis over 9 years (from December 2006 to January 2015). Information was collected retrospectively on demographic data, data related to the implant and data related to the evolution of the implant over the course of of follow-up (stability of soft tissues, hard tissues and prostheses). Marginal bone loss due to the implant and survival of implants and prostheses were calculated. The distance between the implant studied and its adjacent implant or tooth and the repercussions that this distance had on the behavior of the soft periplantar tissue and papilla formation were calculated by implant.

Results: Finally 25 patients and 39 implants were included in the study. The mean follow-up time was 6 years (range 1 to 7 years). Only 3 of the implants included in the study did not meet the criteria for implant success and the survival of the implants and prosthesis was 100%. The mean marginal bone loss was 1.50 mm (range 0.61-5.01 mm). Errors were observed (loosening of screws and porcelain fractures) in 6% of the prostheses. A statistically significant correlation was found between the distance to the adjacent tooth-implant and the stability of the soft tissue after surgery (p=0.038). The average distance between the implant and the adjacent implant or tooth was tooth when the soft tissue remained stable after the treatment was 3.10 mm ± 1.67 and when not stable it was of 2.09 mm ± 1.95. The average tooth-to-implant distance when the papilla was present was 2.96 mm ± 1.95 mm.

Conclusions: Immediate loading of post-extraction implants affected by periodontitis (active at the time of insertion of the implant) is not a risk factor for the survival of the implants according to the data obtained by this study.

KEYWORDS

Post-extraction socket; Active infection; Periodontitis.

INTRODUCTION

The use of dental implants to replace missing pieces is currently routine practice, with a high level variety available for inserting the implant and for loading it (immediate, early, deferred insertion, immediate loading, deferred loading ...).[1] Since the first references on the immediate insertion of implants in post-extraction beds, the protocols have been modified in order to achieve preservation of the alveolus, reducing the treatment time and improving the aesthetic conditions for the procedure (with preservation of the gingival margin and avoidance of vestibular collapse).[1-5] The arrival of the immediate-load post-extraction implant has reduced treatment times even further and the survival rates reported by the different studies published in this regard are similar to those for conventional implants[6-10], provided that the surgical technique is carried out carefully with the alveolus and its ridges preserved and the recommended insertion torque ranges are respected to start immediate loading (30-45 Ncm for single implants and 20 Ncm for multiple splints).[1,6-9]

The latest systematic reviews published on immediate post-extraction implants with immediate loading indicate that there is a higher failure rate for these implants when they are located in posterior sectors (0.54% vs. 0.45% in the anterior sector).[11] This fact must therefore be taken into consideration when selecting the location of our immediate implants with immediate loading. As for works that study the evolution of immediate post-extraction implants, with immediate loading in alveoli with infection, the publications are considerably scant, finding one systematic review that indicates that the implants integrate correctly when placed in areas with secondary infection derived from an endodontic or periodontal problem.[12] Other studies also fail to show differences between the survival of this type of immediate implant with immediate loading when they are inserted in areas with infection compared with others inserted in areas without infection.[13-14] These data seem to indicate that these implants do not behave worse than immediate post-extraction implants with conventional immediate loading, but most published studies do not collect long-term data.

The objective of this study is to show a series of cases of immediate post-extraction implants with immediate loading in areas affected by active periodontal infection and to carry out a long-term follow-up to assess the survival of the implant, with marginal bone loss, prosthetic complications and survival of the prosthesis as secondary variables.

MATERIALS AND METHODS

All the patients included in the study were recruited from the Anitua dental clinic in Vitoria, Spain. The data were reviewed retrospectively, selecting the patients who met the following inclusion criteria:

- Immediate post-extraction implant in the alveolus in an area affected by active periodontitis.

- Implant inserted from December 2006 to January 2015.

- Immediate loading of the implant.

A database with the selected patients was set up in which demographic data (sex, age), social habits (alcohol, tobacco), medical conditions of interest and data related to their periodontal history were collected. To this database were added the data related to the implants (length, diameter and insertion torque), data related to the prosthesis (screwed/cemented) and data regarding the peri-implant soft tissue (biotype and stability during the follow-up period). Data collection was carried out by two independent examiners.

Measurement of marginal bone loss was performed using the last follow-up panoramic radiograph. For the panoramic radiographs, all patients were placed in the same position identified by marks on the ground for the position of the feet, facial arc to fix the position of the head, laser caliber to establish the correct bipupilar plane and the facial midline, as well as a crossbite and a support for the chin. Once the radiograph is obtained in digital format, it is calibrated by using specific software (Sidexis measure) using a known length in the radiograph such as the dental implant. Once we introduce the calibration measure, the computer program performs a calculation based on this measure to eliminate magnification, being able to perform linear measurements that are exempt from this error. Crestal bone loss was measured at two points: mesial and distal of each implant. Finally, a

comparison was made of the means of both measures, which did not show statistically significant differences.

Diagnostic, surgical and prosthetic protocol

All patients were subjected to a diagnostic protocol consisting of a dental CT (cone-beam), models and diagnostic waxing. From these, a surgical guide was fashioned which was used in the insertion of the implants.

All surgeries were carried out by two experienced surgeons. Before tooth extraction and subsequent insertion of the implants, an antibiotic premedication consisting of amoxicillin 2 g orally one hour before the intervention and 1 gram oral paracetamol (as analgesic) was used. Subsequently, the patients continued with a treatment of amoxicillin 500-750 mg orally every 8 hours (depending on weight) for 5 days.

Anesthesia was local infiltration (articaine with 1:100,000 epinephrine).

The tooth extractions were performed in the most atraumatic manner possible and all inflammatory tissue was subsequently removed from the alveolus. The bed for the insertion of the implant was subsequently prepared by reaming at low revolutions without irrigation (biological reaming).[15,16] This procedure consists of two phases during reaming: an initial phase in which reaming is carried out at high revolutions with the initial reaming (between 800 and 1000 revolutions per minute) with abundant irrigation. The second reaming phase comprises the use of reaming cutters of increasing diameter at low revolutions (50-150 revolutions per minute) without irrigation. At the beginning of the reaming at low revolutions, all the bone that is retained in the burr is collected from and kept during surgery in PRGF-Endoret (unactivated fraction 2) to keep it immersed in the patient's proteins and maintain viability of the cells contained therein. Subsequently, it can be used to fill the resulting gap between the bone ridges and the implant in cases where filling is required.

The implants were inserted with the surgical motor calibrated to 25 Ncm and insertion was completed with the torque wrench, with the final torque recorded in each patient's record. In cases in which there was a gap of less than 0.5 mm between the implant and the vestibular ridge, it was filled with PRGF-Endoret® activated fraction 1 and retracted and when this gap was greater with autologous bone obtained from reaming + PRGF-Endoret® fraction 2 activated.

After the surgery, patients were instructed to use careful hygiene and a soft diet without chewing in the intervened area during the first 6 months. The provisional prosthesis was inserted 24 hours after the surgery and after the first 6 months, the measurements for the definitive prosthesis were taken.

To determine the success of the implants, the criteria proposed by Buser et al.[18] and modified by Albrektsson et al.[19] were followed, consisting of: (1) absence of persistent pain, dysesthesia or paresthesia in the area, (2) absence of peri-implant infection or suppuration, (3) absence of implant mobility, (4) absence of bone resorption greater than 1.5 mm during the first year of loading and 0.2 mm per year in subsequent years. The implant treatment was considered successful when the previously described criteria were met. Survival of the implant was considered positive when the implant was present at the end of the follow-up period.

The incidences related to the prostheses recorded during the follow-up visits were assessed, such as: loosening of the retaining screws, fracture of the retaining screws, removal of the prosthesis, fracture of the porcelain or the structure of the prosthesis. Survival of the prostheses and the success of the treatment was considered according to the criteria proposed by Lang et al.[11]: (1) absence of fracture of the porcelain or the structure, (2) absence of loss of retention (3) absence of fracture of retention elements.

Statistical analysis

The patient was taken as the unit for the statistical analysis of demographic data, social habits, medical history and periodontal history.

The implant was taken as the statistical unit for the description of the implant-dependent variables: insertion torque, marginal bone loss, soft tissue behavior and survival of the implant or prosthesis.

Survival of the implants and prostheses was performed by means of the Kaplan-Meier test. To analyze the relationship between the distance to the implant or the

adjacent tooth and the implant studied with the soft tissue variables, a Pearson correlation was performed. Among the associated variables, binary logistic regression was subsequently carried out. For the rest of determinations descriptive statistics were presented. (SPSS Inc., Chicago, IL, USA).

RESULTS

Twenty-five patients were enrolled in which 39 immediate post-extraction implants with immediate loading were implanted in areas infected with periodontitis. Twenty of the patients were women and the mean age at the time of surgery was 55 years (range 43 to 79).

The implants were inserted at the position of central incisors in 9 of the cases, in the lateral incisors in 20 of the cases and in the cuspids in 10 cases. Bone type III was the most frequent finding in 67% of the cases. Bone type II was found in 20% of cases and bone type IV in 3% of the remaining cases. The average insertion torque was 45 Ncm (range 40-50 Ncm).

The mean follow-up time was 6 years (range 1 to 7 years). Most of the cases had a follow-up time of more than 5 years (65%) and during the entire follow-up time there was no failure of the implants studied.

Only 3 of the implants included in the study did not meet the established criteria for implant success because they had a bone loss greater than 1.5 mm during the first year of loading (although this fact did not correlate with problems such as mobility of the implant, pain or infection or failure of the implant). Therefore, we can consider that the success of the implant treatment stood at 93%.

The mean marginal bone loss was 1.50 mm (range 0.61-5.01 mm). Implants with a marginal bone loss greater than 2 mm (25.6% of the implants) were subsequently analyzed separately by a survival function and we were able to observe how these bone losses are less frequent in the first 40 months (18.2 %) going on to be much more frequent after 40 months (81.8%) (Figure 1).

As for the prosthesis, 81.4% of the restorations were part of bridges, with only 18.4% being single restorations and only 0.2% of the implants were part of complete

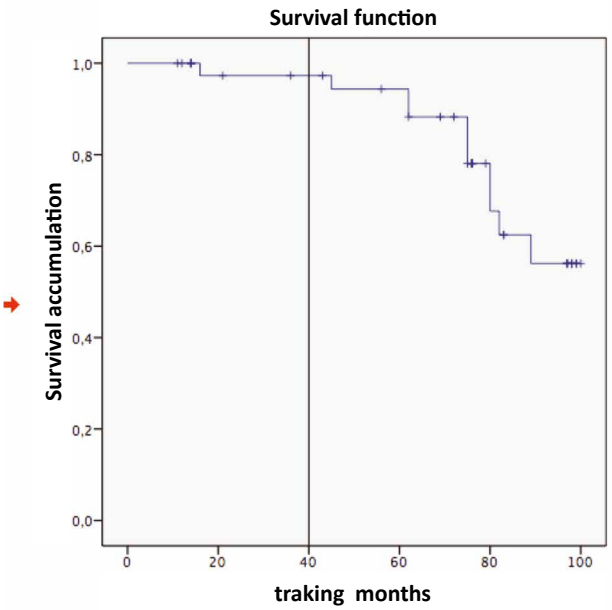


Figure 1. Implants with bone loss greater than 2 mm depending on the time of follow-up. In it we can observe the trend of accumulation of cases in which this loss occurs by increasing the monitoring time over 40 months.

prostheses. No prosthesis failure was recorded in the cases studied, although 6% of prosthetic complications were recorded, consisting of 4.8% loosening of screws and 1.2% porcelain fracture.

Regarding the behavior of the soft tissues of the patients studied, 40% of them presented a thin biotype and 60% a thick biotype. A statistically significant correlation was found between the distance to the implant-adjacent tooth and the stability of the soft tissue after surgery. This correlation was analyzed using a Pearson correlation ($p=0.038$), which is negative, which indicates that when the distance between the implant studied and the implant or adjacent tooth increases, the possibility that the tissue does not remain stable increases. Subsequently, binary logistic regression between these two variables was performed, showing a statistically significant association ($p=0.016$). In this regression we could confirm that for each millimeter that the distance between the implant studied and the implant or adjacent tooth increased, the probability that the tissue remained stable decreased by 0.43 ($p=0.04$).

The mean distance between the implant studied and the implant or adjacent tooth was 3.10 mm ± 1.67 in cases in which the soft tissue remained stable after treatment.

41.6% of the cases in which the tissue remained stable were in between 2 and 3.8 mm of distance. The mean distance between the implant studied and the implant or adjacent tooth was 2.09 mm ± 1.95 in the cases in which the soft tissue did not remain stable after treatment. In 85% of these cases, the distance remained between 1.8 and 2.3 mm (Figure 2).

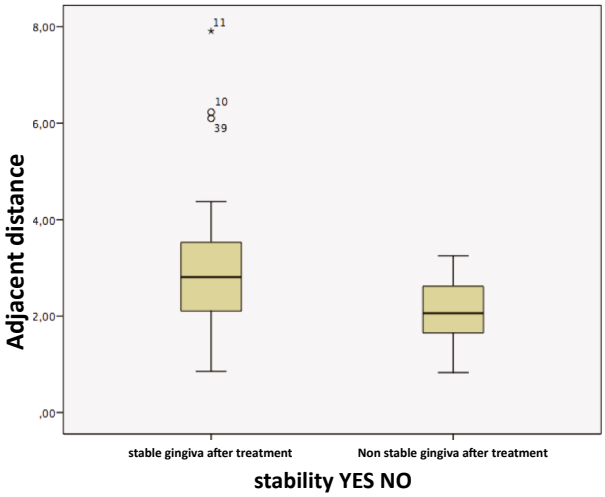


Figure 2. Distribution of cases according to the stability of the gingiva after treatment and the distance between the implant and the adjacent piece.

When we analyzed the distance to the adjacent tooth-implant and papilla formation, we found that the mean distance in the group in which papilla was formed was 2.96 mm ± 1.95 and in the group in which it was not formed it was 2.52 mm ± 0.79.

The evolution of one of the clinical cases included in the study is shown in Figures 3-6.

DISCUSSION

The results of this study demonstrate the veracity of the null hypothesis: the immediate loading of immediate post-extraction implants in alveoli with active infection by periodontitis is not a risk factor for the failure of implants. The average survival of the implants inserted immediately after immediate extraction with immediate loading is 98.4% (after 2 years) and drops to 97.5% (range

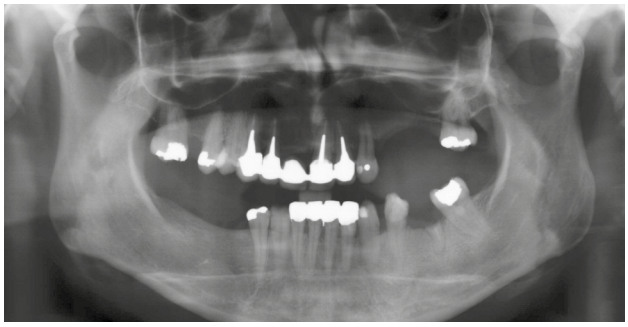


Figure 3. Panoramic radiograph showing bone destruction produced by active periodontal disease, more pronounced in the upper central zone (incisors and canines).

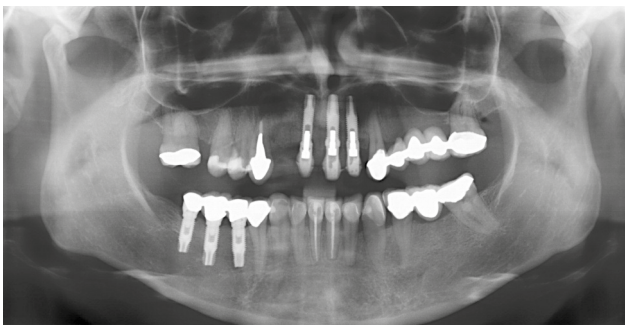


Figure 4. Panoramic radiography after extraction of the anterior superior front and insertion of three immediate post-extraction implants with immediate loading in areas with active periodontal infection.

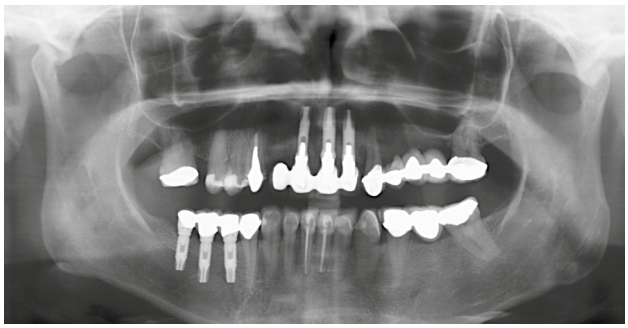


Figure 5. Radiography after placement of the definitive prosthesis.

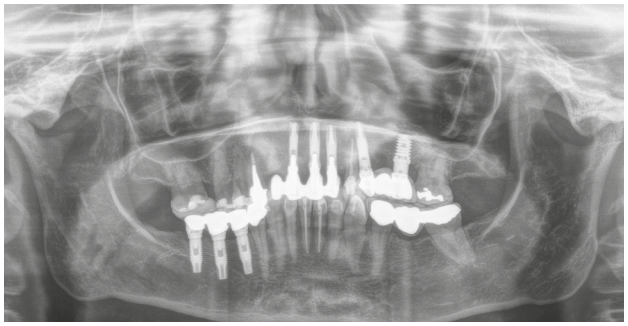


Figure 6. X-ray after 7 years of follow-up. We can see how the implants are stable without bone loss.

95.2-98.8% after 3 years of follow-up).[11] In our study, the survival rate of the implants is higher (100%), and the implant follow-up is longer (2-6 years).

In our study, the success rate of the implant treatment according to the criteria established by Buser et al.[18] and subsequently modified by Albrektsson et al.[19] was 93%. These data are comparable to those provided by Covani et al.[20] in which, after four years of follow-up, 7 out of 163 implants (4.2%) showed high bone loss, which made them unsuccessful implant treatments despite not being failed implants.

When we analyzed cases with bone loss of more than 2 mm in the follow-up period in our study, it was found in 25.6% of the cases, being more frequent for more than 40 months of follow-up (81.8% of cases positive for bone loss of more than 2 mm). This rate is lower than other published studies (Zitzmann and Berglundh 2008)[21] where bone loss is found in 28% of patients greater than 2 mm and in 43% of implants, reaching up to 50% of the cases in patients with active periodontal disease who are not treated before insertion of the implants.[21,22] Therefore, compared to this figure, our study shows 50% less bone loss greater than 2 mm, all of our implants being in active periodontal disease In this study we have also found a significant correlation between the distance between the implant studied and the implant or adjacent tooth. This distance compromises soft tissue stability and papilla formation according to the data we have obtained. Other studies published in the international literature find that when the distance is greater than 3-4 mm papilla formation is compromised[23,24], and when the distance is greater than 4.5 mm, the papilla is only obtained in 48% of cases.[23] In our data, the soft tissue remained stable when the mean between the implant studied and the implant or adjacent tooth was 3.10 mm ± 1.67, which is consistent with the 3-4 mm range described above, as in the cases in which we recorded the presence of papilla, the average distance was 2.96 mm ± 1.95.

Regarding the technical complications in the studies that collect data on immediate post-extraction implants with immediate loading, there is a large amount of data, all of which are very heterogeneous.[11] In our study, the survival rate of the prostheses was 100%, with prosthetic incidents recorded in 6% of the cases. Covani et al.[20] report in their study a complication rate of 9.8% for implants in a situation similar to ours, the complications consisting of loosening of prosthetic screws. Two other studies published in similar situations do not include prosthetic complications, so they have a rate equal to ours (Prosper et al., Lang et al.)[25,26]

CONCLUSIONS

With the limitations of this study (volume of patients, retrospective nature), we can affirm that implants inserted immediately post-extraction with immediate loading in central incisors with active periodontal infection do not present a higher failure rate than conventional placed in the same position or implants placed after immediate extraction in alveoli free of infection.

We can therefore affirm that the presence of active infection at the implant insertion site in the cases studied does not represent a risk factor for the survival of the implant nor for the behavior of the bony tissues and gingival tissues in the long term.

ACKNOWLEDGMENTS

To Javier Flores and Mohammad Hamdan, for their participation in the data collection for this study.

References

1. Esposito M, Grusovin MG, Willings M, Coulthard P, Worthington HV. The effectiveness of immediate, early, and conventional loading of dental implants: a Cochrane systematic review of randomized controlled clinical trials. Int J Oral Maxillofac Implants 2007; 22: 893-904.
2. Lazzara RJ. Immediate implant placement into extraction sites: surgical and restorative advantages Int J Periodontics Restorative Dent 1989; 9: 332-43.
3. Cabello G, Rioboo M, Fabrega JG. Immediate placement and restoration of implants in the aesthetic zone with a trimodal approach: soft tissue alterations and its relation to gingival biotype. Clin Oral Implants Res 2013; 24: 1094-1100.
4. Chen ST, Buser D. Esthetic outcomes following immediate and early implant placement in the anterior maxilla--a systematic review. Int J Oral Maxillofac Implants 2014; 29 Suppl: 186-215.
5. Evans CD, Chen ST. Esthetic outcomes of immediate implant placements. Clin Oral Implants Res 2008; 19: 73-80.
6. Benic GI, Mir-Mari J, Hammerle CH. Loading protocols for single-implant crowns: a systematic review and meta-analysis. Int J Oral Maxillofac Implants 2014; 29 Suppl: 222-238.
7. Esposito M, Grusovin MG, Maghaireh H, Worthington HV. Interventions for replacing missing teeth: different times for loading dental implants. Cochrane Database Syst Rev 2013; 3: CD003878.
8. Norton MR. The influence of insertion torque on the survival of immediately placed and restored single-tooth implants. Int J Oral Maxillofac Implants 2011; 26: 1333-1343.
9. Su M, Shi B, Zhu Y, Guo Y, Zhang Y, Xia H, et al. Comparison of implant success rates with different loading protocols: a meta-analysis. Int J Oral Maxillofac Implants 2014; 29: 344-352.
10. Chrcanovic BR, Albrektsson T, Wennerberg A. Immediate nonfunctional versus immediate functional loading and dental implant failure rates: a systematic review and meta-analysis. J Dent 2014; 42: 1052-1059.
11. Lang NP, Pun L, Lau KY, Li KY, Wong MC. A systematic review on survival and success rates of implants placed immediately into fresh extraction sockets after at least 1 year. Clin Oral Implants Res 2012 ; Suppl 5: 39-66.
12. Machtei EE, Horwitz J, Mahler D, Grossmann Y, Levin L. Third attempt to place implants in sites where previous surgeries have failed. J Clin Periodontol 2011; 38: 195-198.
13. Chrcanovic BR, Martins MD, Wennerberg A. Immediate placement of implants into infected sites: a systematic review. Clin Implant Dent Relat Res 2015; 17 Suppl 1: e1-e16.
14. Montoya-Salazar V, Castillo-Oyague R, Torres-Sanchez C, Lynch CD, Gutierrez-Perez JL, Torres-Lagares D. Outcome of single immediate implants placed in post-extraction infected and non-infected sites, restored with cemented crowns: a 3-year prospective study. J Dent 2014; 42: 645-652.
15. Anitua E, Alkhraisat MH, Pinas L, Orive G. Efficacy of biologically guided implant site preparation to obtain adequate primary implant stability. Ann Anat 2015; 199: 9-15.
16. Anitua E, Carda C, Andia I. A novel drilling procedure and subsequent bone autograft preparation: a technical note. Int J Oral Maxillofac Implants 2007; 22: 138-145.
17. Anitua E, Orive G, Aguirre JJ, Ardanza B, Andia I. 5-year clinical experience with BTI dental implants: risk factors for implant failure. J Clin Periodontol 2008; 35: 724-732.
18. Buser D, Weber HP, Bragger U, Balsiger C. Tissue integration of one-stage implants: three-year results of a prospective longitudinal study with hollow cylinder and hollow screw implants. Quintessence Int 1994;25:679-686.
19. Albrektsson T, Zarb GA. Determinants of correct clinical reporting. Int J Prosthodont 1998; 11: 517-521.
20. Covani U, Crespi R, Cornelini R, Barone A. Immediate implants supporting single crown restoration: a 4-year prospective study. J Periodontol 2004; 75: 982-988.
21. Zitzmann NU, Berglundh T. Definition and prevalence of peri-implant diseases. J Clin Periodontol 2008; 35: 286–291.
22. Deng FL, Zhang H, Zhang Q. Clinical observation of implant immediate loading in periodontitis patines. Zhonghua Kou Qiang Yi Xue Za Zhi 2011; 46: 646-649.
23. Gastaldo JF, Cury PR, Sendyk WR. Effect of the vertical and horizontal distances between adjacent implants and between a Tooth and implant on the incidente of interproximal papilla. J Periodontol 2004; 75: 1242-1246.
24. Cosyn J, Eghbali A, De Bruyn H, Collys K, Cleymaet R, De Rouck T. Immediate single-tooth implants in the anterior maxilla: 3-year results of a case series on hard and soft tissue response and aesthetics. J Clin Periodontol 2011; 38: 746-753.
25. Prosper L, Crespi R, Valenti E, Cappare P, Gherlone E. Five-year follow-up of wide-diameter implants placed in fresh molar extraction sockets in the mandible: immediate versus delayed loading. Int J Oral Maxillofac Implants 2010: 25: 607-612.
26 Lang NP, Brägger U, Hämmerle CH, Sutter F. Immediate transmucosal implants using the principie of guided tissue regeneration. I. Rationale, clinical proedures and 30-month results. Clin Oral Implants Res1994; 5: 154-163.

Clinical case

Treatment of multiple recessions in the aesthetic sector through the use of the bilaminar technique: Description of the surgical technique and results

Quispe López, Norberto
Doctor in Dentistry Alfonso X El Sabio University (UAX). Associate professor at the UAX university clinic.

García-Faria García, Carmen
Bachelor of Dentistry, UAX. European Specialist Master in Orthodontics UAX. Master in Damon system.

Mena Álvarez, Jesús
Bachelor of Dentistry, Complutense University of Madrid (UCM). Director of the Master's Program at UAX Endodontics. Doctor Dentistry, UAX.

Morales Sánchez, Araceli
Stomatologist. Doctor of Medicine, University of Granada.

Galán Ledesma, Enrique
Bachelor of Dentistry, UAX. Master's Degree in Oral Implantology and Implanted Prostheses, UAX.

Gensana Talarm, Miquel
Bachelor of Dentistry, UAX. Specialist in Surgery and Oral Rehabilitation.

Aranda Vegas, Eloy
Bachelor of Dentistry, UAX. Master's Degree in Oral Surgery, Implantology and Periodontics, University of Málaga.

Pérez González, Juan Francisco
Bachelor of Dentistry, UAX. Master's Degree in Endodontics.

Indexed in:
- IME
- IBECS
- LATINDEX
- GOOGLE SCHOLAR

Correspondence address:
Norberto Quispe López

Calle Torres Villarroel number 18, 6th
37005 Salamanca.
norbert_1404@hotmail.com
Tel.: 686 490 313

Date received: 26 December 2017.
Date accepted for publication: 23 March 2018.

Published in spanish Científica Dental Vol. 15. Nº 1. 2018
www.cientificadental.es

ABSTRACT

Gingival recession, defined as partial radicular denudation by apical displacement of the gingival margin, involves the vestibular alveolar bone and the free gingiva located above it. Gingival recessions were classified by Miller according to the prognosis for root coverage. Different surgical procedures and flap designs have been proposed for the treatment of multiple recessions in the aesthetic area.

This paper presents and describes the treatment of multiple adjacent gingival recession affecting the aesthetic zone, which were treated using the bilaminar technique, connective tissue graft and enamel matrix derivatives in combination with a coronally advanced flap.

Use of the bilaminar technique resulted in successful root coverage for treatment of multiple gingival recession.

KEYWORDS

Gingival recession; Connective tissue graft; Mucogingival surgery; Emdogain.

INTRODUCTION

Gingival recessions are a pathological manifestation encountered quite frequently in our daily practice. Their most typical location is the oral face of the teeth.[1] Different classifications systems for gingival recession have been described throughout history, however, the Miller classification system (1985) one of the most cited in the scientific literature.[2]

In recent decades, the need to solve the problems generated by root exposure, such as dentine hypersensitivity and root caries, have led to the proposal of numerous therapeutic modalities for coating exposed roots, especially at the level of the incisors and bicuspids.

We currently have two fundamental techniques to address the treatment of multiple recessions, such as the modified combined thickness coronally advanced flap[3] and the supraperiosteal tunnel technique.[4,5]

Selection of one surgical technique over another depends on the local anatomical conditions of the area to be treated and the patient's requirements.[3] The local anatomical conditions are related to the tooth and adjacent soft tissues. Regarding the tooth, it is necessary to consider the dimension of the radicular exposure (width and depth), the number of recessions and the loss of cervical hard tissue associated with radicular exposure. Regarding soft tissues, it is important to analyze the quality and quantity of keratinized tissue apical and lateral to the radicular exposure, as well as the depth of the vestibule and the presence of the frenulum next to the muscular tension surrounding the margins of the soft tissues.

Different systematic reviews and meta-analyses show that connective tissue grafts (CTJ) offer superior results in obtaining keratinized gingiva and root plaque versus pedicled flaps without the use of soft tissue grafts or substitutes.[6-8]

Gingival recessions do not always of inflammatory or traumatic origin. They may be due to dental malocclusions, orthodontic treatment[9] or the presence of frenula and muscle insertions.[10] The treatment of multiple gingival recessions is indicated both for improvement of the periodontal prognosis, due to better control of bacterial plaque, and to improve the aesthetic appearance.

Figure 1. Initial clinical situation.

Figure 2. Before treatment, multiple localized recessions from 21 to 26.

The objective of this work is to present treatment that consisted of a bilaminar surgical technique with a connective tissue graft and enamel matrix derivatives to correct gingival recessions in the aesthetic sector.

CLINICAL CASE

A 22-year-old woman who comes to our clinic due to the presence of multiple gingival recessions from teeth 21 to 26. The patient states that her longest teeth have an unsightly appearance. No medical history of interest or drug allergies and does not smoke.

Periodontal clinical examination revealed multiple vestibular gingival recessions (Miller class I) that affected teeth 21, 22, 23, 24, and 26 (Figures 1 and 2). No clinical or radiographic signs of periodontitis were observed.

Therefore, the treatment objectives were: A) Achieve complete root coating. B) Improve the aesthetics by ensuring that the resulting tissue that covers the

Figure 3. Flap design.

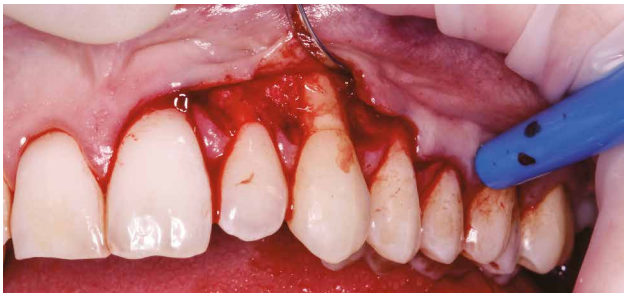


Figure 4. Design of the partial-total-partial flap.

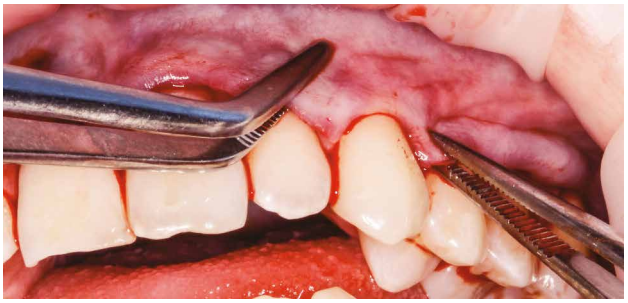


Figure 5. Observe the elasticity of the flap.

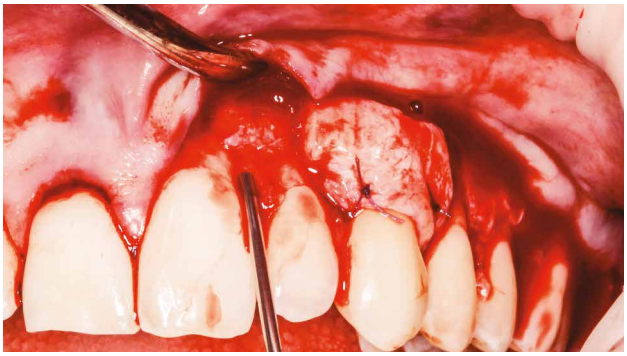


Figure 6. ITC placed at the level of tooth 23 and application of Emdogain® gel.

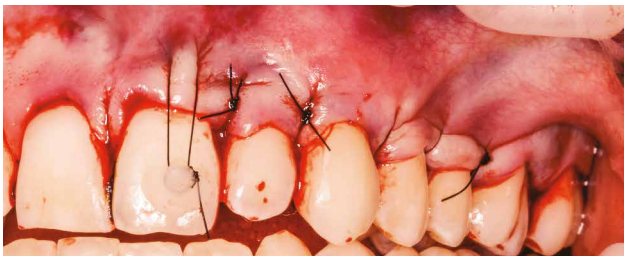


Figure 7. Suspensory sutures.

Figure 8. Follow-up at one week.

recessions naturally imitates the neighboring tissues in color, shape and consistency.

The surgical technique chosen to approach the treatment was by means of a coronal reposition flap (CRF) combined with a connective tissue graft (CTG) plus the use of enamel matrix proteins (Emdogain®).

Surgical procedure

Prior to the intervention, the patient was rinsed for one minute with a chlorhexidine mouthwash. The surgical technique began with the preparation of the recipient bed, making oblique sub-segmental incisions in the interdental areas, which were continued with an intrasulcular incision in the recession defect (Figure 3). A flap was raised using the partial-total-partial flap technique in a corono-apical direction (Figure 4). The most apical portion of the flap was raised to partial thickness to facilitate its coronal displacement, this incision cuts the superficial muscular attachments included in the thickness of the flap. Mobilization of the flap was considered adequate when the marginal portion of the flap passively exceeded the cementoenamel junction of the treated teeth and when the surgical papillae covered the anatomical papillae (Figure 5). The tanatomical interdental papilla tissue was de-epithelialized to receive the surgical papilla.

Mechanical and chemical decontamination of the root surfaces was then carried out. For this, the exposed root areas were carefully smoothed with ultrafine Perioset

Figure 9. Follow-up after 2 weeks.

Figure 10. Follow-up at one month.

Figure 11. Follow-up at 6 months.

Figure 12. Follow-up at 9 months; Complete root coating in all treated areas.

burrs. After thorough debridement and softening of the root surface, the exposed root was chemically treated with 24% ethylenediaminetetraacetic acid (Prefgel) for two minutes, followed by an abundant saline lavage. After profuse rinsing with sterile saline solution, Emdogain® gel was placed on the exposed root surfaces.

Once the recipient bed was created, we proceeded to obtain a CTG from the palatal masticatory mucosa and the said graft was positioned at tooth 23 through simple sutures in the connective tissue of the de-epithelialized papillae (Figure 6).

Subsequently, the vestibular flap was advanced coronally, completely covering the cementoenamel junction. Suspension sutures were performed with 5/0 non-absorbable sutures to allow adaptation and stabilization of each surgical papilla on the interdental connective tissue bed and a dental suspension suture at the level of tooth 21 (Figure 7).

We performed follow-up a week after the intervention (Figure 8) and after 15 days we removed the suture, observing a good healing (Figure 9). Photographic follow-up after 1, 6 and 9 months showed a complete root coating and a favorable aesthetic outcome (Figures 10, 11 and 12).

DISCUSSION

Periodontal plastic surgery is carried out for aesthetic and physiological reasons, such as root sensitivity, root caries, cervical abrasion and to facilitate plaque control in the affected areas.[11] Therefore, the objectives include achieving successful coverage of the exposed root surfaces, as well as good aesthetics and functionality.

Numerous studies have shown the effectiveness of the use of a CTG for root coating.[12-14] In addition, the bilaminar techniques[15-17] have greater predictability in terms of the root coating obtained, provide a better blood supply, graft protection, ease of fixation and decrease in the graft contraction compared to other non-laminar models. We see in the literature that we can expect complete root coating in Miller classes I and II. However, in recent years, it has been shown that we can also achieve complete coating in class III gingival recesses.[18]

Enamel matrix derivative is a resorbable material consisting of hydrophobic proteins extracted from embryonic enamel of developing porcine origin.[19] In this case, proteins derived from enamel were used. It is important to state that there is scientific evidence that supports the use of regenerative techniques through the

use of these proteins to improve stability and long-term coating results through the induction of the formation of new periodontal fibers on new cement.[20,21]

In our clinical case, the graft dimension was adequate to cover only the root surface of tooth 23. Our decision-making process included clinical considerations regarding patient morbidity and the possible side effects of obtaining another graft from the palate. Therefore, the availability of substitutes (Emdogain®) is very useful for the treatment of multiple gingival defects to reduce patient morbidity and, at the same time, obtain a favorable aesthetic outcome and root coating.

CONCLUSIONS

The coronally advanced flap in combination with connective tissue and Emdogain® are predictable and showed effective aesthetic results after 9 months.

The choice of surgical technique for the treatment of gingival recessions should be the one that, contrasted in the literature, obtains the best therapeutic result with the lowest patient morbidity.

References

1. Löe H, Arenud A, Boysen H. The natural history of periodontal disease in man: prevalence, severity, extent of gingival recession. J Periodontol 1992; 63: 489-495.
2. Miller PD. A classification of marginal tissue recession. Int J Periodontics Restorative Dent 1985; 5(2): 8-13.
3. Zucchelli G, De Sanctis M. Treatment of multiple recession type defects in patients with aesthetic demands. J Periodontol 2000; 71:1506-1514.
4. Allen AL. Use of the supraperiosteal envelope in soft tissue grafting for root coverage. I. Rationale and technique. Int J Periodontics Restorative Dent 1994; 14(3): 216-227.
5. Zabalegui I, Sicilia A, Cambra J, Gil J, Sanz M. Treatment of multiple adjacent gingival recessions with the tunnel subepithelial connective tissue graft: a clinical report. Int J Periodontics Restorative Dent. 1999; 19(2): 199-206.
6. Roccuzzo M, Bunino M, Needleman I, Sanz M. Periodontal plastic surgery for treatment of localized gingival recessions: a systematic review. J Clin Periodontol 2002; 29(3): 178-194.
7. Chambrone L, Sukekava F, Araújo MG, Pustiglioni FE, Chambrone LA, Lima LA. Root-coverage procedures for the treatment of localized recession-type defects: a Cochrane systematic review. J Periodontol 2010; 81(4): 452-478.
8. Chambrone L, Pannuti CM, Tu YK, Chambrone LA. Evidence-based periodontal plastic surgery. II. An individual data meta-analysis for evaluating factors in achieving complete root coverage. J Periodontol 2012; 83(4): 477-490.
9. Pini-Prato GP, Cozzani G, Magnani C, Baccetti T. Healing of gingival recession following orthodontic treatment: a 30-year case report. Int J Periodontics Restorative Dent. 2012; 32(1): 23-27.
10. Fowler EB1, Breault LG. Early creeping attachment after frenectomy: a case report. Gen Dent. 2000; 48(5): 591-593.
11. Leong DJ, Wang HL. A decision tree for soft tissue grafting. Int J Periodontics Restorative Dent 2011; 31(3): 307-313.
12. Chambrone L, Faggion CM Jr, Pannuti CM, Chambrone LA. Evidence-based periodontal plastic surgery: an assessment of quality of systematic reviews in the treatment of recession-type defects. J Clin Periodontol 2010; 37(12): 1110-1118.
13. Cairo F, Nieri M, Pagliaro U. Efficacy of periodontal plastic surgery procedures in the treatment of localized facial gingival recessions. A systematic review. J Clin Periodontol 2014; 41(15): S44-62.
14. Quispe López N, García-Faria C, Garrido P, Mena J, Morales A, García-Faria A. Cirugía plástica periodontal: injerto de tejido conectivo e injerto gingival libre para el tratamiento de recesiones clase II y III de Miller en incisivos mandibulares. a propósito de tres casos. Cient Dent 2015; 12 (2): 141-148.
15. Harris RJ. Root coverage with connective tissue grafts: an evaluation of short- and long-term results. J Periodontol 2002; 73(9): 1054-1059.
16. Cairo F, Pagliaro U, Nieri M. Treatment of gingival recession with coronally advanced flap procedures: a systematic review. J Clin Periodontol 2008; 35(8): 136-162.
17. Cochran DL, Cobb CM, Bashutski JD, Chun YH, Lin Z, Mandelaris GA, McAllister BS, Murakami S, Rios HF. Emerging regenerative approaches for periodontal reconstruction: a consensus report from the AAP Regeneration Workshop. J Periodontol 2015; 86(2): S153-6.
18. Aroca S, Keglevich T, Nikolidakis D, Gera I, Nagy K, Azzi R, Etienne D. Treatment of class III multiple gingival recessions: a randomized-clinical trial. J Clin Periodontol 2010; 37(1): 88-97.
19. Gestrelius S, Andersson C, Johansson AC, Persson E, Brodin A, Rydhag L, Hammarström L. Formulation of enamel matrix derivative for surface coating. Kinetics and cell colonization. J Clin Periodontol 1997; 24: 678-684.
20. McGuire MK, Cochran DL. Evaluation of human recession defects treated with coronally advanced flaps and either enamel matrix derivative or connective tissue. Part 2: Histological evaluation. J Periodontol 2003;74(8): 1126-1135.
21. McGuire MK, Scheyer ET, Schupbach P. A Prospective, Case-Controlled Study Evaluating the Use of Enamel Matrix Derivative on Human Buccal Recession Defects: A Human Histologic Examination. J Periodontol 2016; 87(6): 645-653.

Clinical case

Influence of the type of dentist practice on the management of the palatally impacted canine

Varela, M.
Chief of Unit and Director of the Postgraduate Program. Orthodontics Unit of the Jiménez Díaz Foundation University Hospital.

García-Camba, P.
Attending and Chief of Studies of the Postgraduate Program. Orthodontic unit of the Jiménez Díaz Foundation University Hospital.

Marcianes, M.
Contracted orthodontist. Orthodontics Unit of the Fundación Jiménez Díaz University Hospital.

Published in spanish Científica Dental Vol. 14. Nº 3. 2017
www.cientificadental.es

ABSTRACT

Palatally impacted maxillary cuspids are a common eruption disorder whose management in our clinics is based on the previous experience of the involved professional. As a result, the outcome of the treatment is not uniform.

We present seven cases of palatally impacted maxillary cuspids managed with different approaches by several dentists with a different professional background (general dentist, oral surgeon, expert in dental esthetics, prosthodontist and orthodontist). The discussion of these cases reveals the criteria that justified the corresponding treatment approaches.

KEYWORDS

Maxillary cuspids; Palatal deviation; Treatment.

Indexed in:
- IME
- IBECS
- LATINDEX
- GOOGLE SCHOLAR

Correspondence address:
Dr. Margarita Varela Morales

Orthodontics Unit
Fundación Jiménez Díaz
Avda. Reyes Católicos 2
28040 Madrid
mvarela@fjd.es
Tel: 91 549 93 95

Date received: 28 March 2017.
Date accepted for publication: 4 July 2017.

coem
Ilustre Colegio Oficial de Odontólogos y Estomatólogos de la Iª Región

INTRODUCTION

Tooth eruption disorders are a significant problem in dental practice. Dentists with varying professional profiles often select the therapeutic approach that is most in line with their own training and with the experiences over the course of their clinical practice as it relates to this pathology. As a consequence, the same disorder can be handled differently depending on whether the clinician in charge of the case is more expert in oral surgery, prosthesis, conservative dentistry, orthodontics, etc.

Take for example a relatively frequent problem such as palatally impacted maxillary cuspids (PIMC), a genetically conditioned eruptive disorder, independent of available space.

Therefore, from a pathophysiological standpoint, it is totally different from vestibular impaction, which is usually due to mechanical factors derived from lack of space.[1]

The prevalence of PIMC in the general population ranges from 0.9 and 2%, with significant interethnic variations and with a certain predominance in women.[2,3] It is not surprising, then, that this pathology is a common finding in many practices.

We will schematically present several cases of PIMC in young adults or adolescents in the context of B-B moderate conditions that have been treated differently by clinicians with different professional profiles.

CASE 1

Summary description of the case

27-year-old female patient who presents a Class I malocclusion, with crossed occlusion of 17/47 and interincisal diastema. Absence of 26 due to extraction. Crown on 16 and 14 endodontically. 13 is not present and never erupted. The previously restored 53 with composite remains in the arch (Figures 1a and b). No periodontal or functional problems. The radiographic study by cone beam tomography (Cone Beam Computed Tomography, CBCT) reveals the palatal inclusion of 13 without complications such as reabsorption of adjacent teeth, dentigerous cyst or apparent ankylosis of the cuspid (Figure 1c).

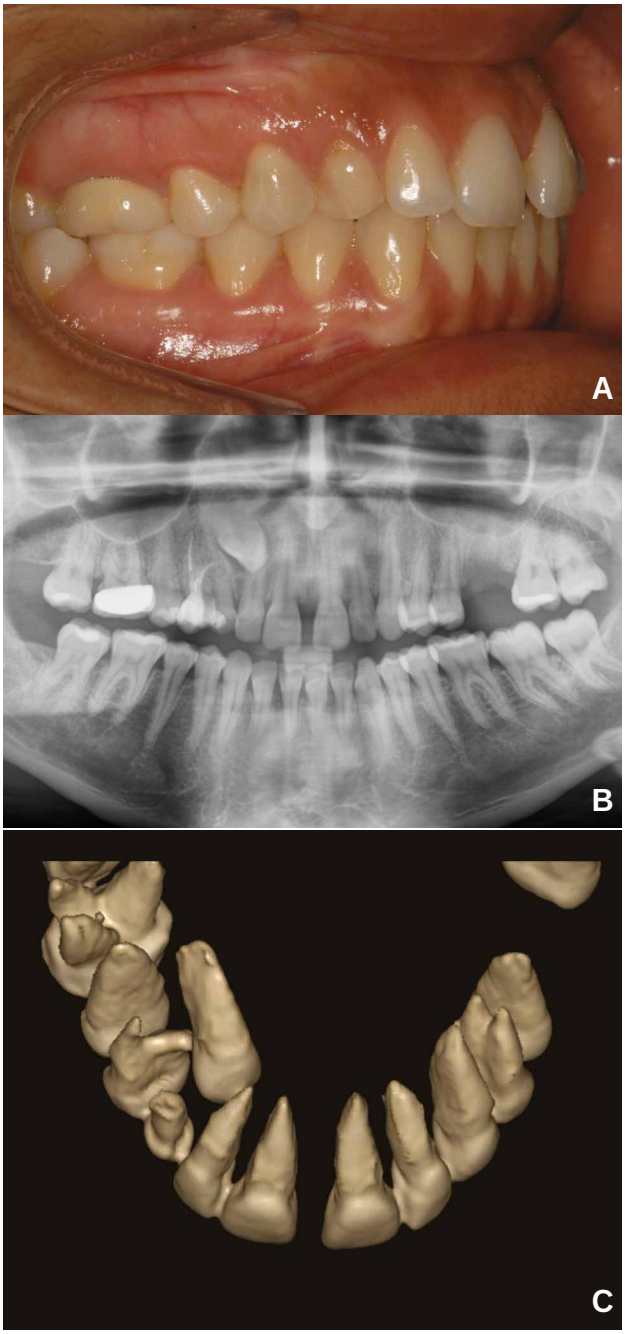


Figure 1. clinical case 1; a, intra-oral photography. 53 restored with composite is observed; b, the OPG reveals, among other findings, the 13 is impacted; c, the CBCT demonstrates the palatal position of 13 and rules out complications of impaction.

Treatment and discussion of the case

Withhold treatment

This patient's dentist, a general dentist who is usually not very interventionist, has advised the patient not to remove

the included canine. He believes that it is best to "leave things as they are" as long as the crown of the temporary canine is not exfoliated or degraded; This one has a caries restoration, the morphology of which has been remodeled favorably and maintains a very acceptable root length.

To opt to withhold treatment, the doctor has taken into account the patient's biopsychosocial conditions, which she knows well because she has been her family's dentist for several years. On the other hand, the malocclusion associated with the eruptive disorder is only moderate, without great aesthetic or functional affectation. The diastema is a familiar trait that does not displease the patient. For all these reasons, the doctor considers that orthodontic treatment is not justified at this time since the result with respect to the re-introduction of the PDMC can never be guaranteed and that, if it fails, it could lead to the need for prosthetic rehabilitation.[4,5]

This very rigorous professional has previously verified through CBCT that at the time of diagnosis the inclusion of the cuspid is not associated with any other pathology related to the eruptive disorder, in particular with reabsorption of the upper incisors.[6] They are aware that when only orthopantomography (OPG) is used as a diagnostic record, the proportion of incisal resorptions is less than 10% of cases of PDMC, but that three-dimensional imaging techniques, such as CBCT, facilitate more precise detection, increasing the proportion to as much as 48% of cases, according to some authors.[7,8] This professional has also weighed the risk of possible complications in the future if the cuspid is left in place, such as the development of large dentigerous cysts, external resorption with ankylosis of the cuspid itself, or delayed root resorption of any of the teeth that have been shown to be undamaged on the diagnostic study.[9,10] In addition, they have also weighed the fact that even though none of these changes are seen at a given moment does not mean that they will not develop in the future

For this reason, the doctor has recommended that their patient perform periodic radiographic monitoring as long as the cuspid remains included. In the end, the professional's determination, backed by their own experience, is firm: they will continue to recommend withholding treatment as long as the follow-up controls are normal and the temporal cuspid does not exfoliate,

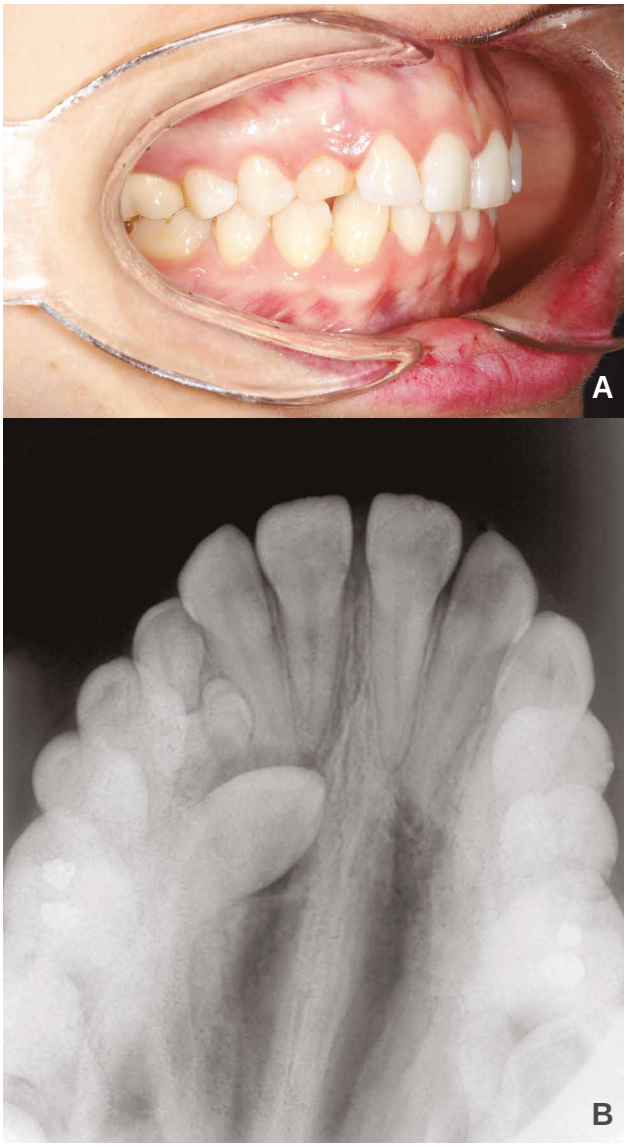


Figure 2. clinical case 2; a, lateral intra-oral photography shows tooth 53 that has not been exfoliated; b, occlusal radiography reveals the presence of a supernumerary odontoma or a tooth that is probably responsible for the inclusion of 13.

an acceptable aesthetic appearance is maintained and the patient continues to cope with the biological and psychosocial circumstances.

CASE 2

Summary description of the case

An 18-year-old woman with an insignificant malocclusion that does not pose functional problems. Inclusion of 13

with the presence of an odontoma (or supernumerary tooth) that could have interfered with its eruption path. The antecedent temporary cuspid has not been exfoliated (Figure 2).

Treatment and discussion. Extraction of the included canine and the odontoma/supernumerary as the only treatment

In most palatal impactions of a maxillary cuspid, there is no obstacle that affects the eruptive disorder, but in this patient it has been possible to detect an odontoma -perhaps a supernumerary tooth- interfering with the PIMC eruptive route.[11]

The professional in this case, a surgeon, decides to extract the impacted tooth that is causing the obstruction in the same surgical act, basing the decision on preventative criteria. In fact, this professional is almost always in favor of extracting the PIMCs in any circumstance, unless the patient has been referred by an orthodontist. Throughout their professional life, this professional has treated several patients who had developed significant complications related to impacted teeth and feels it is not worth taking unnecessary risks in any case.

As for the available space in the arch, the space now occupied by the temporary canine is insufficient for the substitution by an implant, for which reason the professional recommends maintaining the temporary canine for the time being and not carrying out any rehabilitation procedure.

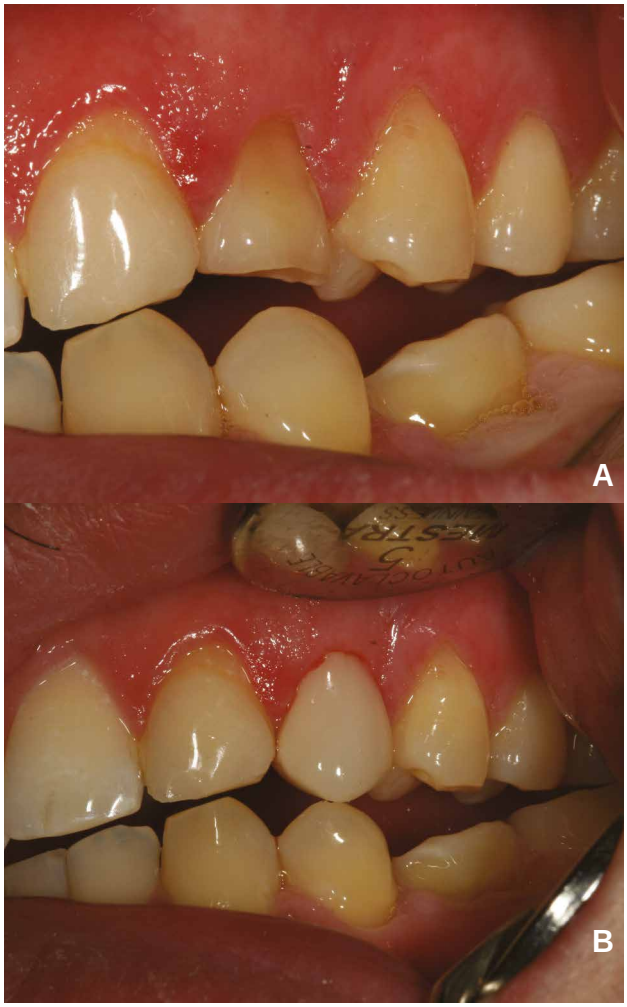


Figure 3. clinical case 3; a, the crown of the temporary cuspid is very damaged and there is no guide; b, remodeling with composite of the temporary cuspid with retrieval of the guide.

CASE 3

Summary description of the case

A 40-year-old male patient with a highly inclined and high PIMC in the setting of a malocclusion that the patient does not want to be treated by orthodontics. The corresponding temporal cuspid remains in the arch, which is very deteriorated but still retains acceptable root length. Good periodontal situation although with recessions in adjacent teeth (Figure 3a).

Treatment and discussion. Aesthetic remodeling of the temporary cuspid without extracting the PIMC as the only treatment

The dentist who will be in charge of this case, an expert in restorative dentistry and aesthetics, has been sent a 40-year-old patient from with a PIMC associated with a moderate malocclusion that the patient does not want to treat. The antecedent temporary canine is still present and, although its crown has suffered significant abrasion and does not act as a guide, retains its root relatively well, for which the dentist is inclined to rebuild it.

Accustomed to expertly handling composites to reconstruct teeth that are subjected to significant occlusal forces, he thinks that he will be able to obtain excellent aesthetics and recover an acceptable cuspid guide (Figure 3b). This professional has also carried out an appropriate radiographic study to rule out complications, and for

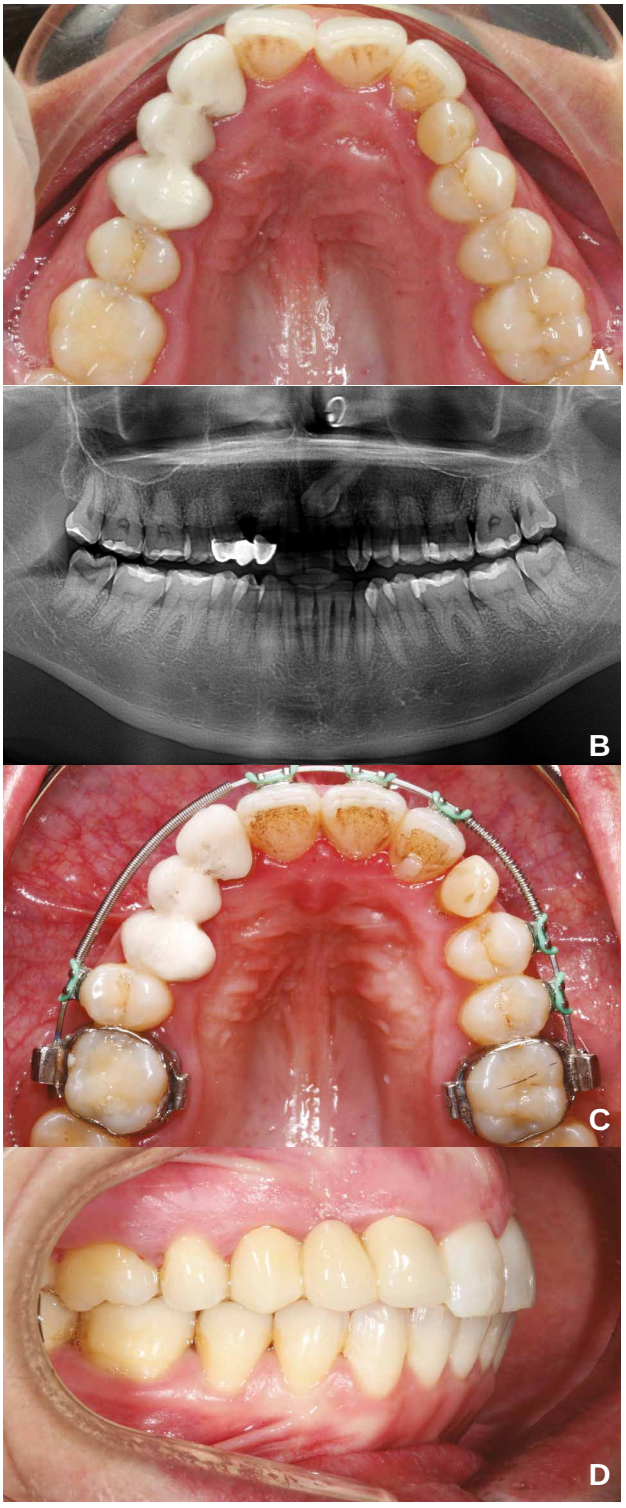


Figure 4. clinical case 4; a, intra-oral occlusal photography before treatment. The bridge is seen in the first t teeth, and the contralateral temporary cuspid; b, OPG shows the impacted 23; c, with orthodontics, space is being obtained for implant placement at 23. 63 persists in the arch; d, final result with the new bridge in the first quadrant.

the moment does not consider it necessary to remove the cuspid surgically, which could be re-introduced by orthodontics in the future should the temporary cuspid be lost or if a complication arises. In addition, a patient who is not currently very motivated towards orthodontic repositioning of the cuspid can change their mind later.

The doctor also advises the patient to carry out periodic radiographic monitoring in case it is necessary to modify the treatment plan at some point.

CASE 4

Case description

35-year-old female patient who had a conventional bridge placed 10 years ago to replace tooth 13, which was palatally included and was extracted. This bridge remains functional, though its color is not homogeneous with that of the adjacent teeth and the gum of the pillars has suffered a certain amount of recession (Figure 4a). Tooth 23 was also included, but it was not treated then. At this time, the patient, who has a Class I malocclusion with maxillary compression and skeletal discrepancy, still retains tooth 63, (Figure 4b and c) that is in crossed occlusion. She agrees to orthodontics to improve the occlusion and make room to replace the temporary cuspid, but not for traction the included 23, and prefers a short treatment and without uncertainties, another reason why this cuspid is also extracted. As for its replacement, the patient would prefer to have an implant placed at 23 instead of a bridge.

Treatment and discussion. Orthodontics, change of the conventional bridge of the old 13 and preparation for single prosthesis over implant of 23

The dentist who will be in charge of this case, one with much experience in conventional prostheses, sees a patient whom he treated when he was 25. This patient presented then the two palatally impacted maxillary cuspids, but for some reason that does not appear in the history, it was decided to initially treat only tooth 13. The treatment plan consisted of extracting the temporary tooth that was present, sculpting the adjacent teeth and making a porcelain bridge. His long experience with this type of fixed prosthesis led him to consider this option as

the best, given that the space for placement of an implant seemed insufficient and the alveolar bone was poor. The PIMC did not seem to interfere with the rehabilitation, but the dentist preferred to extract it. The patient did not return for follow-up even though the doctor had recommended it.

At the present time -10 years after that first incomplete rehabilitation- he requests treatment of his malocclusion by means of orthodontics. With respect to the impacted 23, he refuses orthodontic repositioning, and prefers the tooth be extracted and the space for rehabilitation prepared. The doctor refers the patient to an orthodontist who treats the malocclusion and prepares the space for the prosthetic cuspid while maintaining the temporary cuspid to preserve the alveolar bone (Figure 4d). His preference is to change the bridge at 13 to improve aesthetics and when he finishes his orthodontics, to place an implant at 23. This dentist, although he has been and remains a defender of conventional prostheses, accepts that single implants offer great advantages in cases like this.

CASE 5

Case description

45-year-old female patient with a class II-2 malocclusion, subdivision with deep overbite and retroinclination of the upper incisors that has caused abrasions of the incisal edges (Figure 5a). 13 is palatally impacted and the imaging study appears to show an idiopathic reabsorption of the crown that could be associated with ankylotic behavior before an eventual traction (Figure 5b). 53 is present and at the time was rebuilt with composite. Absence by extraction of 46. Moderate periodontal involvement.

Treatment and discussion. Substitution by single implant as the only treatment

This patient's dentist, an enthusiast of the advantages that immediate impact single implants offer over conventional prosthesis, leans towards that option in this case. The associated malocclusion is significant, but the patient is not very inclinced to undergo orthodontic treatment with cuspid traction of doubtful prognosis given the morphological characteristics of her crown.

The doctor recommends surgical extraction of the PIMC along with the temporary cuspid that is still present, as it could interfere with the placement of the implant. Of course she has carried out a careful radiographic workup using CBCT to rule out possible complications. The space available for rehabilitation is scarce, but the professional, a very skilled implantologist, and is able to place implants in almost critical spaces. However, the patient must assume that the prosthesis will be somewhat asymmetric with respect to the contralateral cuspid, a fact that was previously reported: without pre-prosthetic orthodontic treatment, it is not possible to obtain more space. The patient's, which is reasonable for the dentist, is that if orthodontics has been prescribed in an attempt to try to bring the cuspid back, it is an inevitably long, tedious, annoying and doubtful procedure in a patient of her characteristics, that treatment will not be recommended for the sole purpose of increasing the space available for the prosthesis. With a somewhat smaller crown than on the contralateral side, and maintaining her malocclusion, the patient is satisfied with the result of her treatment (Figure 5c) and, like the doctor, assesses the practically immediate nature of the rehabilitation that also includes an implant at 46.

CASE 6

Summary description of the case

16-year-old male patient, brachifacial, with palatal compression without crossed occlusion and a Class I malocclusion with deep overbite, microdontia of 22 and palatal inclusion of 23 (Figures 6 a and b). No complications are detected on CBCT. Good periodontal health.

Treatment and discussion. Orthodontic restructuring of the impacted canine and remodeling of the microdontic 22

This patient's dentist, an orthodontist, considers that interdisciplinary treatment aimed at redirecting the canine to its ideal position in the arch is worth it in this young man, although he has to assume the disadvantages of an interdisciplinary therapeutic approach in the hands of different specialists -surgeon, orthodontist and expert in aesthetic dentistry- with a prognosis that is not entirely

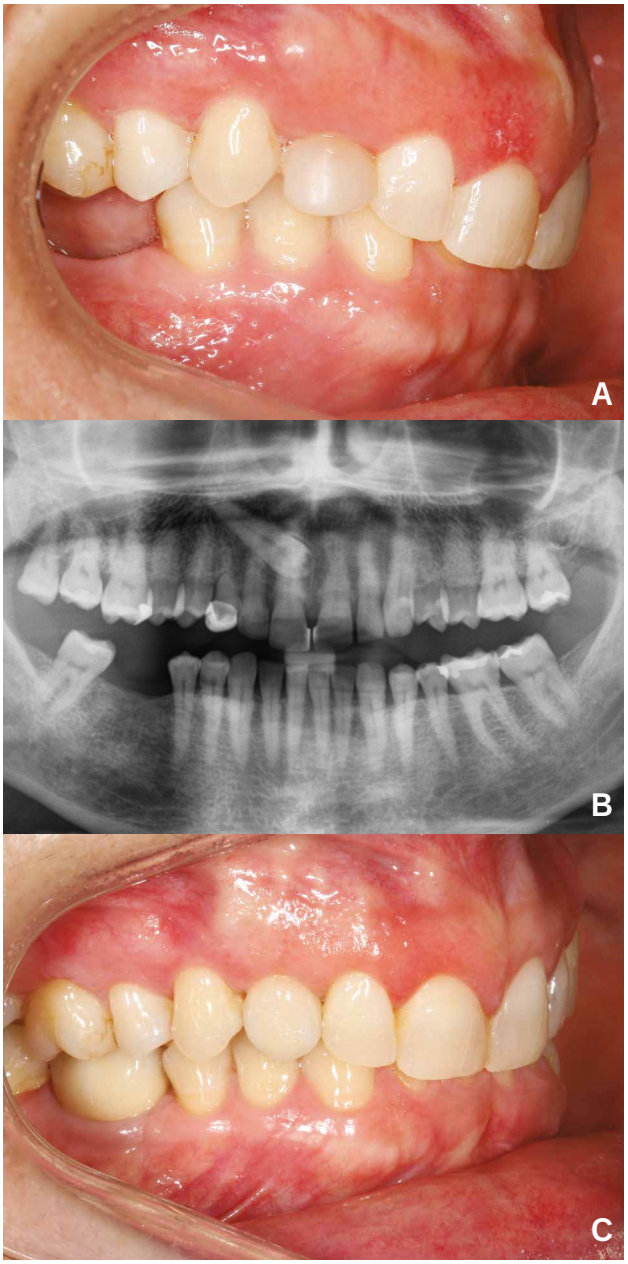


Figure 5. clinical case 5; a, intra-oral photography before treatment shows the significant deep bite and tooth 53 restored with composite; b, OPG reveals the impacted cuspid with an image compatible with reabsorption of its crown. c, after rehabilitative treatment, with implants at 13 and 46. The overbite persists due to the lack of orthodontic treatment.

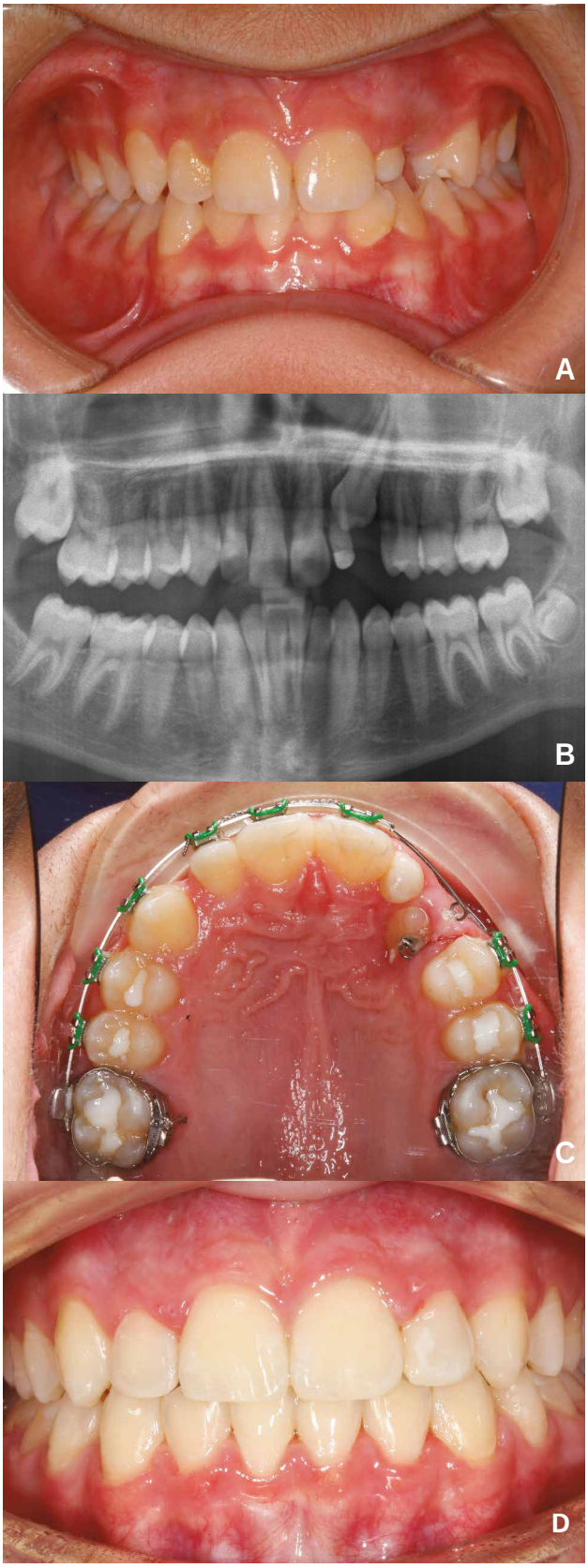


Figure 6. clinical case 6; a, intra-oral photography before treatment where the absence of 23 and microdontic 22 restored with composite is seen; b, OPG shows the impacted 23; c, 23 is being re-introduced through orthodontics; d, after treatment, 23 in its position in the arch and 22 restored with composite.

assured. This orthodontic approach will allow for good occlusion and improve the aesthetics and functionality of the dentition, as well as serve as a basis for traction of the canine and its proper location in the arch (Figure 6c). However, the professional is aware of the negative aspects of the choice and carefully explains them to the patient and his parents so that they make a well informed decision:

a) Cuspid exposure surgery performed by an oral or maxillofacial surgeon will be necessary. It is very important that this surgeon has experience in this type of intervention, since the future periodontal health of the displaced cuspid will depend to a great extent on it.[12]

b) Orthodontic treatment, prior to or simultaneous with the traction, will involve discomfort and expense and will inevitably be long.

c) Around 20% of the palatally impacted cuspids, depending on age, position of the tooth and other factors that are not always predictable, do not respond to orthodontic traction procedures.

In return, the orthodontist argues that, in the unfortunate even the tooth cannot be retracted, the necessary space for rehabilitation will have been prepared by means of a single implant prosthesis, with the appropriate size.

This patient's case ended happily with the proper location and function of both cuspids and adequate remodeling of 22 by an expert in aesthetic dentistry (Figure 6d).

CASE 7

Summary description of the case

28-year-old male patient. Dolichofacial pattern; moderate mandibular hyperplasia; maxillary compression. Class II molar. Absence of 16 and 26 by extraction. Migration and mesial inclination of 17 and 27 with inocclusion of both. Palatally impacted 23. Inferior crowding. Moderate periodontal disease with more intense gingivitis at 21 (Figure 7).

Treatment and discussion. Extraction of the impacted 23 included and 14. Closure of spaces by orthodontics

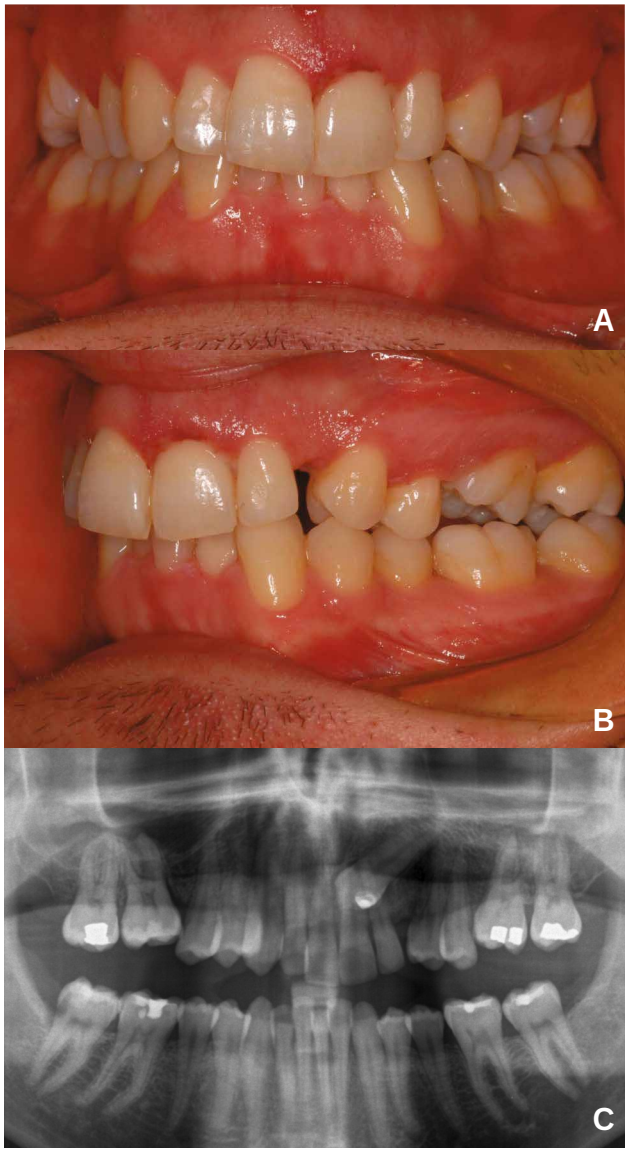


Figure 7. clinical case 7; a, front view, b, left side view, c, OPG with the upper left cuspid (23) included.

The professional who studies this problem, an orthodontist, assessing the patient's malocclusion globally, has decided that he would need an extraction in each of the upper quadrants. In most cases, the teeth that are extracted are premolars. However, in this case the professional chooses to extract the included cuspid and the first contralateral premolar.

He bases his decision on the following arguments:

- The included cuspid may not respond to traction and in that case, after the first adjacent premolar was removed, it would have to be replaced by an implant.

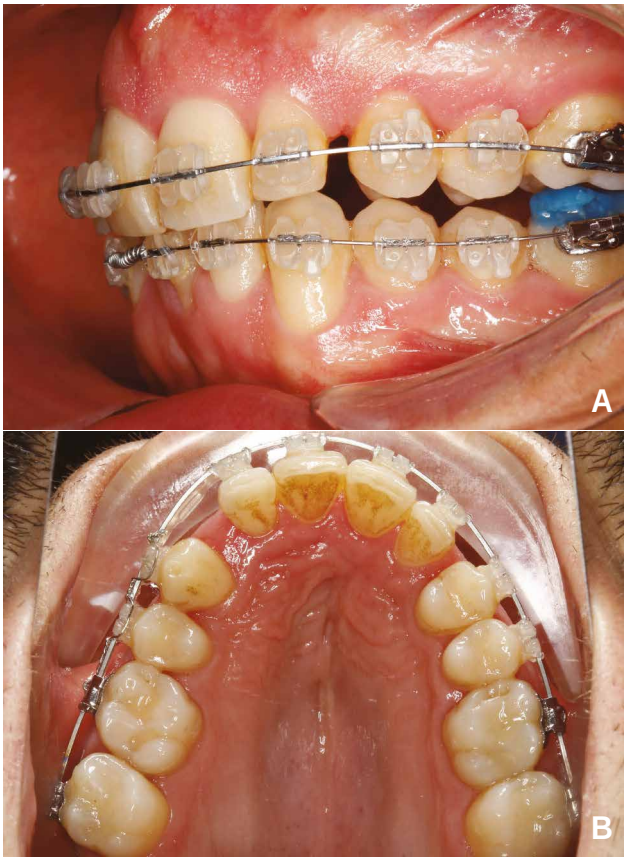


Figure 8. Clinical case 7, orthodontic treatment; a, side view, b, occlusal view.

Figure 9. clinical case 7, final result; a, front view, b, side view.

- Even counting on the cuspid responding favorably, the treatment would be much longer, something that the patient rejects from the start.

Undoubtedly, extraction of an upper cuspid by placing the premolar in its place and in occlusion with the lower canine and first premolar involves certain occlusal limitations that can be minimized if necessary by creating a "pseudo cuspid guide" with the premolar, transforming its morphology and/or providing an adequate occlusal fit. Figure 8 shows intermediate steps of the orthodontic treatment and Figure 9 the frontal and occlusal images of the final outcome.

CONCLUSIONS

- The different PIMC management options presented can be defensible as long as they are based on an adequate diagnosis, taking into account the patient's biopsychosocial conditions.

- Every clinician, regardless of the scope of their practice and specialization, should know the pros and cons of all options. This way they can explain them to the patient objectively, arguing the reasons why they is inclined towards a certain form of management.

- It is essential to include the basic aspects of the chosen procedure that have led them to propose this therapeutic option, including its limitations, on the informed consent document.

References

1. Peck S, Peck L, Kataja M. The palatally displaced canine as a dental anomaly of genetic origin. Angle Orthod 1994; 64: 249-56.
2. Dachi SF, Howell FV. A survey of 3874 routine full-mouth radiographs. II. A study of impacted teeth. Oral Surg Oral Med Oral Pathol 1961; 14: 1165-1169.
3. Ericson S, Kurol J. Radiographic examination of ectopically erupting maxillary canines. Am J Orthod Dentofacial Orthop 1987; 91: 483-492.
4. Becker A, Chaushu S. Success rate and duration of orthodontic treatment for adult patients with palatally impacted maxillary canines. Am J Orthod Dentofacial Orthop 2003; 124: 509–514.
5. Becker A, Chaushu G, Chaushu S. Analysis of failure in the treatment of impacted maxillary canines. Am J Orthod Dentofacial Orthop 2010; 137: 743–754.
6. Chaushu S, Kaczor-Urbanowicz K, Zadurska M, Becker A. Predisposing factors for severe incisor root resorption associated with impacted maxillary canines. Am J Orthod Dentofacial Orthop 2015; 147 :52-60.
7. Alqerban A, Jacobs R, Fieuws S, Willems G. Comparison of two cone beam computed tomographic systems versus panoramic imaging for localisation of impacted maxillary canines and detection of root resorption. Eur J Orthod 2011; 33: 93–102.
8. Ericson S, Kurol J. Resorption of incisors after ectopic eruption of maxillary canines: a CT study. Angle Orthod 2000; 70: 415-423.
9. Ericson S, Kurol J. Resorption of maxillary lateral incisors caused by ectopic eruption of the canines: A clinical and radiographic analysis of predisposing factors. Am J Orthod Dentofacial Orthop 1988; 94: 503–513.
10. Liu D G, Zhang W L, Zhang Z Y, Wu Y T, Ma X C. Localization of impacted maxillary canines and observation of adjacent incisor resorption with cone-beam com-puted tomography. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2008; 105: 91–98.
11. Morning P. Impacted teeth in relation to odontomas. Int J Oral Surg 1980; 9: 81-91.
12. Parkin NA, Milner RS, Deery C, Tinsley D, Smith AM, Germain P, Freeman JV, Bell SJ, Benson PE. Periodontal health of palatally displaced canines treated with open or closed surgical technique: a multicenter, randomized controlled trial. Am J Orthod Dentofacial Orthop 2013; 144 :176-84.

Ilustre Colegio Oficial de Odontólogos y
Estomatólogos de la Iª Región

Mauricio Legendre, 38. 28046 Madrid
Tel.: 91 561 29 05 / Fax: 91 563 28 30
www.coem.org.es @dentistasCOEM