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USE OF BIODENTINE

AS AN ALTERNATIVE TREATMENT IN HORIZONTAL RADICULAR FRACTURES: CLINICAL CASE REPORT

USO DE BIODENTINA COMO TRATAMIENTO ALTERNATIVO EN FRACTURAS RADICULARES HORIZONTALES: REPORTE DE CASO CLÍNICO

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ABSTRACT

Nowadays, horizontal type root fractures, considered with a poor prognosis, have treatment options, such as the use of bioceramic cement since it contains an adequate capacity to regenerate dental tissues, in turn, allowing the affected tooth to remain in the mouth. The objective of this research is to theoretically support the efficacy of biodentine cement in horizontal root fractures by reviewing a clinical case and scientific articles that support the treatment to preserve the dental organ in the oral cavity and avoid radical treatments such as tooth extraction. A bibliographic review of books and scientific articles related to horizontal fractures was carried out. The research is contributed by a review of a clinical case and surveys that allow supporting the therapy carried out resulting in the reduction of the fracture line thanks to splinting and the conservative process, from the moment the biodentine cement was placed. In addition to this, the therapy chosen by the respondents was extraction, concluding that biodentine is a material that avoids extractions since it has high compatibility with the dental structure, although its benefits are not widely known.

Keywords: Horizontal root fractures, biodentine cement, dental organ.

RESUMEN

Hoy en día, las fracturas radiculares de tipo horizontal, consideradas con mal pronóstico, tienen opciones de tratamiento, como el uso de cemento biocerámico ya que contiene una capacidad adecuada para regenerar los tejidos dentales, permitiendo a su vez que el diente afectado permanezca en la boca. El objetivo de esta investigación es respaldar teóricamente la eficacia del cemento biodentina en fracturas radiculares horizontales mediante la revisión de un caso clínico y artículos científicos que apoyan el tratamiento para preservar el órgano dentario en la cavidad bucal y evitar tratamientos radicales como la extracción dentaria. Se realizó una revisión bibliográfica de libros y artículos científicos relacionados con las fracturas horizontales. La investigación es aportada por la revisión de un caso clínico y encuestas que permiten apoyar la terapia realizada dando como resultado la reducción de la línea de fractura gracias a la ferulización y al proceso conservador, desde el momento en que se colocó el cemento biodentina. Además de esto, la terapia elegida por los encuestados fue la extracción, concluyendo que la biodentina es un material que evita las extracciones ya que tiene una alta compatibilidad con la estructura dental, aunque sus beneficios no son ampliamente conocidos.

Palabras clave: Fracturas radiculares horizontales, cemento biodentino, órgano dentario.

INTRODUCTION

Traumatic accidents have been described in many ways and classified based on established criteria. Several studies indicate that the prevalence of fractures occupies 5%, taking into account that the most common in presenting injuries are young people (González et al., 2009) since they are involved in risky activities, especially the male gender, however, the tooth structure of the female gender is more fragile or susceptible to a more intense affectation (Delgado Morales et al., 2013).

Root fractures are part of the classification of trauma, although they are a type of dislocation according to the direction of displacement of the coronal fragment (Herbel et al., 2013). Coronary or crown-root fractures occupy 38% of the permanent dentition (Mier et al., 2013).

Generally, the most affected are the upper incisors since these are in an anatomical region that is in direct contact with the external environment and this contributes to making it visible as such and having an aesthetic, functional and, compromise of social character. The person who suffers from it and has symptoms is usually associated with severe pain, so it should be treated as quickly as possible (Sánchez Montero & Rodríguez Cruz, 2010).

The most frequent root fracture in a study carried out over several years occurred in the middle third (57%), followed by the apical third (34%). 59% maintained pulp vitality, and 62% of them underwent partial obliteration of the root canal without causing problems (Canalda and Brau 2014). Total or partial necrosis affected 37% of the teeth, through surgical extrusion, in a study of 10 years of evolution (Laura et al., 2012), (Jarrín et al., 2021).

These traumatic complications are treated in many cases by exodontia of the disarticulated fragment. If the fracture is in the radicular cervical third and it is accessible, the possibility of a gingivectomy or alveolectomy is evaluated. Once the surgery is finished, an endodontic procedure would be performed, in addition to a post and crown, completing the rehabilitative process. If the articulated fragment is not accessible, there are two treatment options: total extraction with a fixed rehabilitation, with implantology, or a more conservative treatment through root canal treatment and later orthodontic extrusion and conclude with endodontics, post, and crown. But what happens when the fracture is in the middle or apical third?

The extraction of the dental organ has been the therapy most chosen by the dental professional (Velasco Ortega et al., 2015). This is what was known in the old days as a treatment, but today, it is no longer something that can be endorsed.

As an alternative, you have the option of extracting the necrotic pulp from the fragmented third and placing sealant cement in the fracture line, since there is currently a wide variety of these on the market that have in their composition: alumina, zirconium, bioactive glass, ceramic glasses, hydroxyapatite and resorbable calcium phosphates (Jaramillo et al., 2009) which makes them more biocompatible with tissues, especially with those of the periapice, among the most outstanding for their handling and availability, we have bioceramic cement.

Biodentine, which is part of this group, is a bioactive substitute for dentin, which has been used since the beginning of the 21st century but which has been on the rising 10 years ago due to its noble action on dental tissues and the bioactivity it exerts as such, promoting the early formation of reparative dentin and favoring healing. Added to this, due to its calcium component, it creates an unfavorable environment for the development of bacteria. (Terán & Sarria, 2015). This ensures the absence of postoperative sensitivity and the durability of tooth restorations in the vital pulp (Hernández et al., 2021), (Smarandache & Broumi, 2020).

Its properties include fast setting time, good resistance to compression, high density, and low porosity compared to other materials such as (Mineral Trioxide Aggregate) MTA (Kaur et al., 2017). Biodentine has been used since its creation in pulp therapy, for temporary restorations in enamel and permanent dentin, large or deep caries lesions, ensuring the absence of post-operative sensitivity and the durability of an upcoming restoration, deep cervical or root lesions, enamel coating, pulpotomies, in patients where a furcation perforation has occurred, in internal and external resorption, apexification and for root fractures as described in this review (Camilleri, 2013), (Wyssenbach-Kanpandegia et al., 2020), (Carralero et al., 2020).

The objective of this research is to theoretically support the efficacy of biodentine cement (tricalcium silicate) in horizontal root fractures by reviewing a clinical case and articles of scientific interest that support the treatment to preserve the dental organ in the cavity. mouth and avoid radical treatments such as extraction, reinforced by the knowledge of the biomaterial in relation to the treatment of root fracture.

DEVELOPMENT

A bibliographic review of books and scientific articles related to horizontal fractures was conducted. The search has been carried out through the digital platforms of Google scholar, PubMed, DialNet, Scielo, Elsevier, and information from the Journal of Endodontics for articles,

bibliographic fragments, essays, and monographs published by different national and international professionals. These being current studies, no more than five years ago, using the keywords of the present bibliographic review, the search and obtaining of information in articles. In addition, a survey of 126 internship students at UAO Uniandes has been carried out, virtually through the Microsoft Forms platform to obtain data that can contribute to the research.

The aforementioned content has taken into account the risk-benefit ratio of the treatment presented, based on scientific arguments. However, we have the obligation to mention the adverse effects of the treatment to guarantee the integrity of the patient, in addition, we have the consent of the legal representative.

The present work aims to analyze, through the presentation of a clinical case, the diagnosis, treatment, and possible complications of a horizontal root fracture, demonstrate the efficacy of a conservative procedure, express the properties of bioceramic cement such as Biodentine and comply with the premise of minimally invasive dentistry, using the deductive method(Mohd Zainal Abidin Ab Kadir 2021), (Smarandache et al., 2020), (Fernández et al., 2020).

A 30-year-old male patient attends the Puyo Social Security "IESS" by Od. Santiago Jordan. Esp, four weeks after having suffered a trauma to the upper left hemiarcade, he refers pain in the anterior sector of the upper jaw, which originates in dental organ 2.1. On clinical examination, he presents mobility of grade II according to the Miller scale, there is no bleeding, without the presence of carious lesions, absence of trauma in dental organs adjacent to the 2.1. Radiographic examination revealed a radiolucent shadow running from distal to mesial of the root of the upper left central incisor compatible with a fracture, absence of periapical pathology, complete periodontal ligament, intact cortical bone, without radiographic alteration of the adjacent teeth. In the vitality tests, he gave positive percussion and thermal tests. The general condition of the patient presents stable vital signs.

The definitive diagnosis of horizontal root fracture was confirmed as it was corroborated with the periapical radiography. Given these findings, the tooth was splinted with interproximal resin points for three months since the patient lives in remote areas, which makes it difficult for him to constantly leave to its periodic control. The time used coincides with the protocol imposed for root fractures of two to three months (Sáez-Alcaide et al., 2017). Since it is common for mobility to cease once the triggers have been eliminated. Once the splinting period is over, the dentist must schedule follow-up visits at three, six, and twelve months, subsequently at annual intervals (Camejo et al., 2018), (Mar Cornelio et al., 2021).

The initial diagnosis of the fracture was corroborated by a complementary imaging exam, periapical radiography, a Computerized Axial Tomography may be suggested since this study allows to observe with greater precision the density, size, and texture, in turn, the extension and exact location of the problem (radiology info) and other important details such as cracks, the vestibular, lingual, palatal and interdental cortices, and the integrity of the neighboring teeth in greater detail and rule out other associated pathology (Gibbon et al., 2018).

During the treatment, the patient had normal development, we proceeded to anesthetize with a supraperiosteal infiltrative technique, using a 2% lidocaine solution, then the respective absolute isolation at a distance with the use of dental floss, continuing with the cameral opening by palatine.

Once the opening was made, the pulp was removed up to the fracture line with wide files to limit its use to clean the canal. This process does not have filing as an objective. It is important to carry out an irrigation protocol gradually with 5% sodium hypochlorite. After cleaning the canal, it was filled with Biodentine from the fracture line until its closure. The reason why only the coronal segment is removed is based on the vitality of the pulp since the apical third remains alive and will help in the healing of the fracture line with the formation of the calcium callus. Another reason why the lower segment was not instrumented is to avoid the separation of the two fragments and avoid adequate healing by inducing another unfavorable regeneration time.

It is important that, at the time of the end of the procedure, the patient does not report having contact points on the affected tooth to avoid occlusal stress and that this interferes with the recovery or healing of the fracture. If, through radiographic and clinical controls, the pulp of the lower segment evolves to necrosis, proceed with periapical surgery through apicoectomy, preserving the dental organ (Hidalgo Ordoñez et al., 2021), (Cornelio et al., 2019).

When the root canal was finished washing, it was filled with SEPTODONT brand biodentine, in the same way, up to the middle third, which is where the fracture line is located.

The reduction of the fracture line is observed thanks to the splinting and the conservative process. From the moment the biodentine cement was placed, there was an improvement in terms of the symptoms for the patient. The dental organ regained its stability, losing the degree of mobility. The tooth no longer needed to resort to extraction, since in

each control, from the first one that was done five months after treatment until December 2019, demonstrating healing, joining the two fragments with the calcium callus formation that the cement contributed, showing that this tooth could be kept in the mouth despite having an unfavorable diagnosis.

In the bibliographic review, 120 articles were analyzed. Out of which thirty contributed to the research. And out of these 30, seventeen demonstrated the efficacy of biodentine in fractures and one of them supports the treatment with a period of 10 years of evolution. The remaining thirteen did not have relevant information.

Figure 1. Initial radiography

Source: Clinical case of Od. Jordan Santiago. Esp; 2018 - 2019

Figure 2. Control X-ray: 5 months and 15 days

Source: Clinical case of Od. Jordan Santiago. Esp; 2018 - 2019

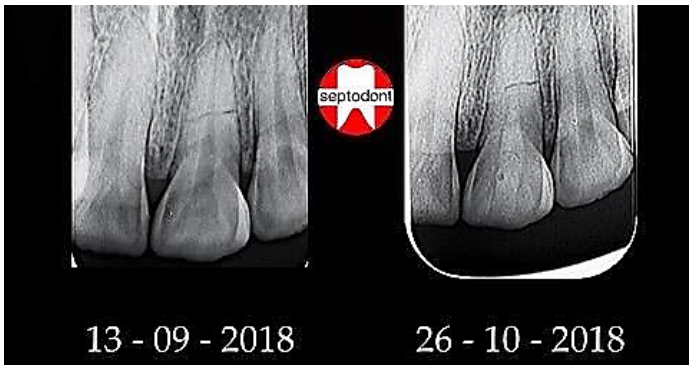

Figure 3. Control X-ray: 1 year and 1 month

Source: Od clinical case: Jordán Santiago. Esp; 2018 - 2019

Figure 4. Control X-ray: 1 year and 3 months

Source: Clinical case of Od. Jordan Santiago. Esp; 2018 - 2019

A survey was carried out to the students of the Dental Care Unit of the Autonomous Regional University of the Andes in July 2020 with a total of 126 respondents, in order to determine how well they know the biodentine as well as the treatment that They considered more appropriate in the case that is presented to them, obtaining the following results:

To question 1 of the survey, which suggests the treatment to be carried out, 59 students (corresponding to 47% of the total respondents) answered that they would carry out the extraction of the dental organ with horizontal root fracture.

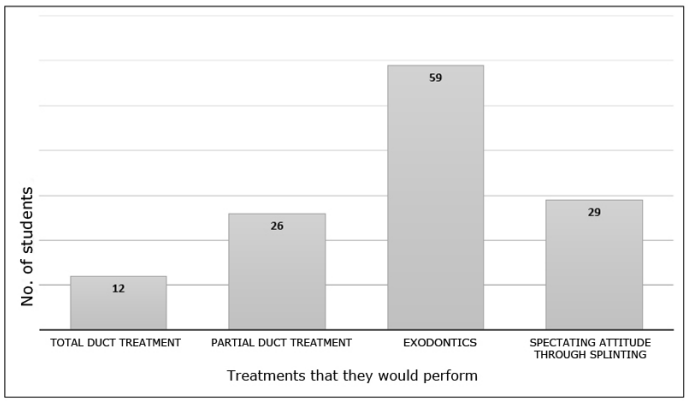

Figure 5. Survey results for question 1.

Source Martínez; Quinonez; 2020

To the question, what sealant material do you consider to have a better healing effect on root fractures? 76 students corresponding to 61% of the total respondents answered biodentine, and 90% of these would recommend this material for horizontal root fractures.

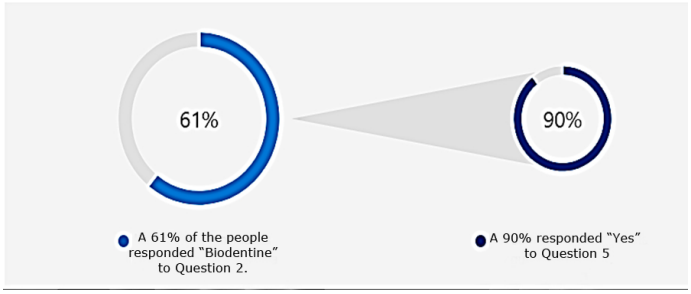

Figure 6. Survey results for questions 2 and 5.

Source: Martínez & Quinonez, 2020.

In root fractures, as a treatment, immobilization of the traumatized teeth is proposed. The time will depend on the location of the fracture (middle third 4 weeks) (coronal third 4 months).

In some cases, the same therapy is usually applied, but it is proposed to eliminate the coronal segment, this depending on the vitality of the pulp since the apical third remains alive and will help in healing and the posterior coronal segment can become necrotic. Once finished, we proceed to use bioceramic cement that acts at the level of the fracture line, promoting its closure.

Among these types of cement, biodentine, which as described by the Septodont house, stands out for being a bioactive dentin substitute. It is used in restorative treatments in temporary and permanent dentition, and as it can be complemented with the inorganic dentin matrix, causing healing in root fractures. Then, as it is biocompatible and due to its low cost, it is considered optimal for this type of problem, and applying it, coincides with studies carried out in this research. However, it should be emphasized that biodentine being a new product in this type of problem, the use of MTA is the one that most high-impact books and articles endorse.

CONCLUSIONS

Biodentine proved to be a noble cement with the tissues, it caused healing, the reduction of the fracture line, and the induction of the dentin tissue, which is evident from the fifth month of radiographic control and continues after 1 year and 6 months of evolution, up to the current date, thus preventing the patient from losing his tooth and complying with the premise of conservative dentistry. However, the survey carried out among the UAO Uniandes students showed that only 10% of those surveyed would carry out a partial filling of the canal even though 69% of them know the properties of biodentine, noting the lack of information on the treatment technique

Several studies endorse and support this treatment in teeth that report sensitivity, coinciding with the results demonstrated in the case, and denoting that the applied therapy was adequate in this type of case.

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