

Orthodontic Treatment in Impacted Maxillary Canines. A Review Literatura

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Abstract

The prevalence of impacted maxillary canines is 1 to 3%, approximately 50% of impacted canines cause root resorption of adjacent teeth. On the other hand, if the permanent canine has not begun to find its correct position, the evaluation of an orthodontist should be considered as the first option, who will provide various treatments. Orthodontic surgery and treatment are used to treat impacted canines in the maxilla affected in the permanent dentition. Depending on the position of the canine, the best treatment can be selected to achieve the correct position of the canine tooth. These article summaries all these difference techniques, knowing its advantages, and cost-benefits considerations.

The objective of this literature review is to update the information on orthodontic treatments in impacted maxillary canines, describe the etiology of impacted maxillary canines as well as describe orthodontic traction and treatments for impacted maxillary canines.

Keywords: *Impacted Tooth; Orthodontic Traction; Permanent Dentition; Orthodontic Treatment*

Introduction

Orthodontists frequently present many complications when treating impacted maxillary canines; this condition has a prevalence of approximately 1% to 3% [1], with women having the highest prevalence of canine impaction, that is, 2 to 3 times more assiduously than in men [2]. Impacted maxillary canines can trigger problems in the oral cavity if they are not treated in time, a clear example of this will be a root resorption of the incisors that surround it or are close to this place of eruption. In this way, an adequate early and timely intervention by the orthodontist will be of great importance, so that in this way the tooth at its disposal can be traction and thus avoid adverse side effects for the patient to be treated [3]. The cause of maxillary canine impact is still up for debate. Some researchers point out that this genetic theory has the highest certainty because it can be inherited by genes, however, there is another theory that is also widely accepted, which is the eruption guide theory which is related to the moment a lateral incisor manifests small root or bilateral root [4]. When there is absence of the lateral incisor, the canine will go long and as a consequence it will be impacted causing the incisors to pull [5]. An impact of the maxillary canine can be determined in different points of view or different approaches, the one that predominates the most in the research is the one proposed by Erikson and Kuroi, where the measurement of the impact angle of the longitudinal axis of the canine was evaluated, in terms of the center line of the tooth, or by panoramic radiographic images. Regarding the premolars, lateral incisors and central incisors, it would be located at the tips of the canines in their shadow areas for measurement, so that when obtaining impaction

areas that vary from 1 to 5. Sector 1 is close of the premolars and when sector 5 is close to the midline of the tooth, the collision height can also be measured, which will indicate how far the tip of the canine tooth is from the occlusal plane [6]. Therefore, the present study on canine impaction in the maxilla will allow the orthodontist to find new solutions for an effective treatment. Orthodontic require research that summarizes the cause and treatment, which is proposed by other studies in the scientific literature and also by health institutions. Likewise, they require a new update in the information base to provide an efficient diagnosis, which will be key to carry out modern treatments. Therefore, this literature review aims to determine the etiology and implement the use of appropriate treatments to effectively treat the involvement of impacted canines in the maxilla.

Material and Methods

Extensive research has been done in the existing literature on this topic. From the beginning of this information until October 9, 2020, the bibliographic search carried out includes articles published in the Medline database through PubMed, SCOPUS, SCIENCE DIRECT, WILEY and SCIELO, and there is no language restriction. The keywords used are: impact, maxillary canine, orthodontic treatment, MIC and retained canine. Including observational, descriptive, longitudinal research, systematic reviews, books, and editorials. Finally, 39 articles were included in this review.

Results and Discussion

Etiology of impacted maxillary canines

Among the causes of impacted canines, there are the most common causes that are endocrine disorders, such as growth hormone or thyroid hormone deficiency, vitamin A and D deficiency, congenital syphilis, TMJ ankylosis and heredity. Local causes are lack of space, dislocation of adjacent teeth, early detachment of deciduous teeth, abnormal curvature of the root caused by trauma in childhood, the development of diseases such as tooth germ and periodontitis [7-11]. The cases of affected canines cause Lappin to observe this affectation, either by a blockage caused by an excess of tooth or dentinoma, a recent trauma, or eruptive changes in the canines on the same side [12]. It determined that the cause of this anomaly is due to the lack of reabsorption of the temporal canine, but this research was not of much relevance since a controlled study was not carried out, although its was not important, their explanation makes a lot of sense because over time various investigations have explained that the removal of temporary canines in a suitable time seems to be very useful for the eruption of permanent canines [12-15]. A current study showed that in cases where the lateral incisor is impacted, it causes are the obstruction of supernumerary teeth, odontomas or recent trauma, and as a consequence there will be a high frequency of eruptive alteration of the canine on the same side [16]. This research showed a significant increase in the prevalence and severity of displaced canines by 41.3%, buccal displacement was observed in 30.2%, palatal displacement occurred in 9.5%, and canine-lateral transposition of incisors in 1.6% of patients [17]. There are various investigations that associate canine impaction in the maxilla with the absence of permanent lateral incisors, since the presence of those teeth, in this case the atypical lateral incisors are the cause of the deviation of the maxillary canines around their correct position [18]. The displacement of the maxillary canines has two possible processes, the first is developmental, which is related to the lack of orientation of the lateral incisors, which leads to the origin of a new path for the descending trajectory of the anterior side, and the second is related to the late stage of the tooth entering the narrow part of the alveolar process [19]. The extraction of the temporal canine is the appropriate treatment to correct maxillary canines in palatal eruption in individuals aged 10 to 13 years, as long as the space condition is present correctly, since it was determined that 91% of the canine teeth, they overlap the adjacent lateral incisor root, while 64% of the canine teeth overlap the lateral incisor relative to the middle of the root initially [20].

Orthodontic traction and treatments for impacted maxillary canines

This procedure is more appropriate for cases with a better diagnosis, such is the case of infants, since they are in their growth stage. The treatment method consists of surgically exposing the affected tooth, and then performing orthodontic traction to guide the tooth

and align it with the dental arch. Loss of bone around tooth extraction, root resorption, and recession of the gums are the most common complications of this type of surgery [21]. If a surgical exposure that causes tooth displacement is to be performed, good communication between the orthodontist and the doctor is essential to adopt the most appropriate technique. To choose the type of surgically exposed elements, whether open or closed, such as the depth of action, the anatomy of the edentulous area and the type of orthodontic force to be used, which are factors to consider [22]. When the tooth is impacted in the middle third of the socket, a closed treatment is strongly recommended. In this case, it is necessary to remove the bone tissue as little as possible by exposing the crown of the tooth to hold the traction accessory. To avoid placing it in a very high gingival position, lateral traction is usually necessary, and special care must be taken in the direction of traction [23]. The most common traction method for canines with the affected jaw involves surgical exposure and then placement of orthodontic accessories so that a slow, light force can be applied to move the teeth into the correct position [24]. Another treatment alternative is to use a heavy anchorage using a transpalatal arch to give reinforcement in a variety of applications ranging from orthodontic applications as well as in common dental treatments. This transpalatal arch is made of stainless steel that is known as an anchoring device that will be attached to molars and premolars, attempting to orthodontically position through a palatal [25].

Treatment with tie wires in crossbow

It is composed of round wires; this will accumulate force when bent on its longitudinal axis and will have a horizontal cross section that will enter the double tube placed in the system. The arc force will be found relative to the length of the wire in the vertical and horizontal directions. Once the affected tooth is identified clinically and radiologically, a surgical procedure is performed to expose part of the enamel surface of the affected tooth. Convenient soft tissue contact is made to expose the bone covering the crown. It should be considered not to touch the roots of the adjacent teeth, since, if the cement is affected, the possibility of hardening will increase, so the root development is still incomplete [26]. Canine teeth are generally fixed or in a variable position, so an orthodontic button with self-curing resin can be placed, but taking into account the protection of the adhered gums produced by the impact of the buccal dentin fragments, In the event that the tooth is affected by bone, it should be kept away from fibrous adhesions around the tooth [27]. This treatment will control the germination of the teeth by applying a certain force in the vestibular direction, so that the crown of the canines can move away from the root, thus avoiding resorption. This will also allow us to exert controlled and easily modifiable forces. This system can overcome the limitations of mobile systems, such as traction of the upper jaw hitting the teeth. In a certain way, it will reduce the root resorption of the adjacent teeth because they bring the teeth towards the buccal side for later repositioning [28].

Microimplant treatments

Due to the advantages of micro screws over osseous integrating implants, they are becoming increasingly popular as a source of bone anchorage in modern orthodontics [29]. In many clinical situations, the strength and stabilities of micro screw implants are sufficient to move teeth without losing mutual anchorage. This article shows the potential of micro implant anchoring in the germination of canine orthodontic teeth [30].

X-rays taken at different angles should be used to assess the location of the canine. This technique is not intended to produce root movement, so it is not suitable for canine teeth that impact horizontally or canine teeth that have a straighter root at the Crown [31]. Due to the lack of alveolar bone in the canine area, small implants should be used, especially after the original canine tooth is extracted. Since the force required to tighten the tooth is less than 50g, a mini screw is ideal. The crown and root of the tooth can be drawn on the processed mold to determine the direction of force required to insert the tooth into the dental arch [32]. The micro implants should be placed in the alveolar bone of the labial cortex with this line of force, at an angle of 10 - 20° with respect to the bone surface and as parallel as possible to the longitudinal axis of the tooth. This keeps the tip of the micro-screw on the buccal side and reduces the possibility of the micro-screw coming into contact with the root of the tooth [33]. Although the head of the micro implant should be placed as tangen-

tially as possible to maximize the vertical component of force, implants placed too high can become unstable due to the accompanying increased torque. The attachment is attached to the labial surface of the affected canine to allow the teeth to rotate without an excessive rotation. After the canine enters the arch, tongue support can be added for more precise control [34].

Treatments with reinforced anchorage

The reinforced anchorage is another method of treatment of the maxillary canines, whose objective is to prevent secondary effects after orthodontic traction. This treatment requires a heavy buccal arch with a bracket slot and a palatal anchorage in the maxillary arch [35]. Therefore, to obtain traction on affected maxillary canines, it is often necessary to use heavy anchors and tensioned arch wires in the maxillary arch to anticipate the adverse effects of traction. Also, to resolve the effects of the canines, an ideal force will be required to move them through the bones [36]. After orthodontic traction with reinforced anchors, the use of copper titanium wire arches for the alignment and correction of the segments in the areas of incisors, premolars and molars, metal supports will be used for the durability of the deciduous canine (if present). This space is equipped with an open helical spring between the lateral incisor and the Nickel-titanium arch wire, essential requirements before surgery [37]. A temporary rigid anchor is then installed over the bands of the first permanent molars and it will be accompanied by a rigid palatal acrylic button and arch wire on all palatal surfaces of all maxillary teeth or a stainless-steel wire with multiple palatal and occlusal buccal hooks can also be placed. This anchor is cemented at least 4 weeks before surgery. The buccal hooks and anchor extensions will allow the buckles of the closed coil nickel-titanium springs to be attached, and a trans alveolar intraosseous traction will be performed, thus preventing the springs from immersing themselves in the attached gingiva and mucoperiosteum, so that its activation is limited. The stainless-steel dental arch in the bracket placed on the tooth is aligned and level, and the dental arch is suitable for the final molar involved in anchoring [38]. The buccal side of each fixed canine will be secured with a closed coil nickel-titanium spring and activated every 4 to 8 weeks as required by orthodontists. After traction of the canine is achieved, the bone anchor is removed because the incisors and premolars will have been stabilized and protected. From there, the steps of intercuspation and completion of the orthodontic treatment will be carried out so that the orthodontic treatment is completed [39].

Conclusion

Surgery and orthodontic treatment are used to treat impacted canines in the maxilla affected in the permanent dentition. When starting orthodontic treatment, it is advisable to first extract the canines from the root of the incisor, and then bring the dental arch inwards. Depending on the position of the canine, the best treatment can be selected to achieve the correct position of the canine tooth. Treatments of the impacted canine will have a very limited effect on periodontal disease.

Contribution of Authors

Aquino Valverde Alexandra Jacqueline and Barrientos Sánchez Dafne Milagros designed the study, collected, analyzed, and interpreted the data, wrote the manuscript, Atoche Socola Katherine Joselyn and Arriola Guillén Luis Ernesto interpreted the data and revised the manuscript. All authors read and approved the final manuscript.

Conflict of Interests

The authors declare that there is no conflict of interest in relation to the publication of this article.

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