



Multidisciplinary guidelines for diagnosis and conservative treatment of impacted maxillary canines

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ABSTRACT: The retention of the upper canines in the jaws is a very frequent problem in dental practice; these are the teeth with the greatest tendency to retention, preceded only by the lower and upper third molars. In this bibliographic review, all the information related to the subject was analyzed and summarized, with the arguments of books and digital articles referring to the topic of diagnosis and conservative treatment of impacted upper canines. Similarly, the guidelines for the rational use of auxiliary diagnostic means in combination with the clinical method were described, during the diagnosis that is made by combining the clinical method and the rational use of auxiliary or complementary diagnostic tools. On the other hand, several treatment options can be interceptive treatment, conservative treatment, and radical treatment, where it was confirmed by the literature that the timely treatment of maxillary canine retention allows its conservation in the arch and the great importance of multidisciplinary work on the treatment plan.

KEYWORDS: Impacted canines, Retained canines, Orthodontic, Oral surgery, Retained canines and Retained canine surgery.

I. INTRODUCTION

The maxillary canines are the third most frequently impacted group of teeth, preceded by the mandibular third molars and the maxillary third molars. It can be said that an upper canine has been retained when it does not occupy its corresponding place in the hemiarch, once the budding age has passed.^{1,2}

The retention of the maxillary canines implies a malocclusion between the upper teeth, in addition to representing a problem for the patient's aesthetics, it is linked to other difficulties such as root resorption of adjacent teeth, cyst formation, and other possible complications.³

For this reason, it is of great importance to conceptualize guidelines for timely diagnosis and multidisciplinary treatment. To understand the anomalies of dental eruption, it is necessary to identify the normal eruptive age standards, in addition to knowing the migration path of the upper canine, which begins its displacement below the orbit until it appears in the oral cavity.^{1,3,4}

Retained maxillary canines are very frequent in clinical practice, according to all authors, these are the teeth with the highest incidence of retention only after the third molars. Both the general dentist and the specialist need to know how to identify them in the tools of diagnosis of eruptive anomalies, to offer the patient early treatment and avoid future complications.^{4,6}

The key point of this literature review was to provide information on multidisciplinary dental management for the diagnosis and conservative treatment of impacted maxillary canines.

II. MATERIAL AND METHOD

A bibliographic review was carried out with the use of primary sources and was specified in the reading and argumentation of books and digital articles referring to the topic of diagnosis and conservative treatment of retained upper canines. The references were written in Spanish and English, and are included from the years 2011 to 2021, in addition to accessing the Pubmed, Google Scholar, and Ebsco databases.

The following keywords were used: impacted canines, retained canines, orthodontic surgery, retained canines, and retained canine surgery. 23 articles were found, of which only 13 were included with the necessary information to be able to carry out the documentary research and another 5 books that provided relevant information for the subject.

III. DEVELOPMENT

Identification of normal eruption pattern of



maxillary canines

To know what makes a canine an included tooth, we must first know the normal dental eruption.³

The maxillary canines present a typical eruption pattern. At 3 years of age, his crown is located high up in the maxilla, moving toward the occlusal plane, in a direction related to the root of the lateral incisors. This tooth presents an accentuated mesial inclination.⁴

It is with this inclination that this tooth usually bursts into the arch at approximately 11, 12, or 13 years of age on average and also is responsible for closing any interdental spaces between the incisors. When the canine has finished erupting, it is still slightly tilted.⁴

In the first instance, the pediatric dentist examines patients aged 8, 9, and 10 years old for whom must have a clinical history with the necessary auxiliary means, most frequently X-rays, and from that moment it is determined if any abnormality is found concerning the permanent canines.

When the canine does not erupt approximately between 11, 12, 13 years old, we can predict that the cuspid is retained for some reason. The causes that can delay its eruption can be classified as generalized and localized. Localized causes include discrepancies in arch length and tooth size, prolonged retention or an early loss of the primary canine, abnormal position of the tooth bud, the presence of palatal clefts, ankylosis, formation of cysts or tumors, dilaceration of the root, tooth malformation, presence of supernumerary teeth, fibrous gums, iatrogenic or idiopathic conditions according to Lara et al.⁵

Some other conditions that can cause impacted canines are migration of the adjacent tooth, loss of arch length, internal root resorption, formation of dentigerous cysts, external resorption of impacted canines, as well as adjacent teeth, and infections, particularly in partial eruption. and painful inflammatory processes. Root resorption of permanent lateral incisors is one of the most important complications that require orthodontic

intervention to treat impacted canines. Reports are indicating that 50% of the adjacent incisors present root resorption and, that in two-thirds of these cases, the extension of the damage reaches the dentin, sometimes involving the pulpar cavity.⁵

According to Davila et al, there is the theory of transmigration, which is defined as physiological transportation of the canine through the maxillary midline, without the influence of any pathological entity (supernumerary teeth, odontomas, trauma, cysts, or tumors).⁶

When reviewing the distribution according to the position of the canines and gender, Santoyo-Deddens et al.⁷ reported that the most affected gender is female, and that retained canines are most observed in the maxilla with a semi-vertical position of more than 70% in both genders. This supports what Graber and collaborators mentioned in their book.⁸

Diagnostic methods for the identification of impacted maxillary canines

The diagnosis of retained upper canines is carried out by combining the clinical method and the rational use of diagnostic aids. The proper diagnosis is made when the eruption is delayed beyond 12 years old in girls and 13 years old in boys.^{7,9}

From the first moment that the patient arrives at the clinic, we perform an interrogation to find out if there is any dental absence if the patient knows there is a missing tooth or if we, based on the clinical examination, observe that there is a persistence of the temporary dentition. This physical procedure is carried out thoroughly, inspecting and palpating the area where the canine should be, either vestibular or palatal and visualizing whether it is or not a bulge.^{1, 10}

A panoramic radiograph is the most common tool to confirm the clinical diagnosis of an impacted canine. In addition, intraoral and occlusal radiographs are used. Radiography can also help assess the position of the impacted canine about the maxilla or mandibular base.²



Source: UABC's Clinical files

Another tool used to identify a retained canine is tomography. This specialized technique helps us to obtain 3D images and also allows us to cut off a specific section to be analyzed. Obtaining each conventional tomographic slice requires a controlled and precise movement of the head of the x-ray tube and the film during exposure; this has been surpassed by cone-beam computed tomography (CBCT).

The conservative treatment plan for maxillary impacted canines.

The conservative treatment plan for impacted maxillary canines will depend on several factors, such as the patient's age, severity, location, and retention position⁹. In addition, a treatment plan will have to be multidisciplinary to be successful, in which pediatric dentistry, orthodontics, maxillofacial surgery, and periodontics must intervene.⁵

Multidisciplinary management of these cases is essential due to the complications of a delayed diagnosis, such as mucogingival and esthetic problems. Success in the treatment should be defined as long term desirable esthetics and stable periodontal conditions.

Periodontal clinical diagnosis should be performed, in order to decide the adequate surgical treatment and preserve keratinized gingival tissue around the erupted permanent tooth. A lack of attached gingiva raises the risk of gingival recession. It is crucial a good understanding between the orthodontist and periodontist to prevent complications.

Once the position of the retained maxillary canine has been located with the help of dental imaging, it should be observed if there is any pathological circumstance that is preventing the eruption of the canine, such as a supernumerary tooth or an odontoma. Once any pathology that is obstructing its trajectory has been ruled out and taking into account its position and orientation, the orthodontist must be able to create a strategy that allows the positioning and leveling of the canine in

the arch.⁸

To have a broader view of the treatment indications, we must know about the classification of impacted maxillary canines. Ugalde proposes a simple classification in which a posteroanterior and lateral radiograph of the skull is used as diagnostic aids; this classification for impacted canines helps us to identify the location of the retention is given unilaterally or bilaterally, the angulation of the canine, depth of retention, presentation, root state and damage to adjacent teeth.⁴ This will help specialists to plan the most appropriate treatment for the patient, taking into account all the aforementioned aspects.

Valverde and Parrales⁹ suggest that permanent maxillary canines with a tendency to retention begin to show abnormal changes in their transmigration after 5 years of age; however, their retention can be predicted by the position of the cusp and the angle formed by the axial axis of the canine with the midline from the age of 9 years old.

Multidisciplinary treatment for impacted maxillary canines can be divided into three: interceptive treatment, conservative treatment, and the radical treatment.¹⁰ For study reasons, no articles on radical treatment of impacted maxillary canines were consulted.

The interceptive treatment described by authors such as Stabryla J et al¹⁰ suggests the extraction of deciduous maxillary canines in patients between 10 and 13 years of age with a tendency to retention, as well as carrying out radiographic controls every 6 months, with the aim of spontaneous correction, this having a percentage of 78% effectiveness in the total number of cases evaluated in a study consulted by Valverde and Parrales⁹; however, Graber⁸ mentions that these measures have provided limited results.

To achieve success in a conservative treatment in which the objective is the correction of the impacted upper canines must include the participation of all dental areas, adapting to the specific needs of each patient.

Boj¹ mentions that there are factors that



can mean a good prognosis for treatment, these can be, the vertical position of the tooth with an angle less than 45 degrees, palatal dystopias, age in young patients, and an arch with sufficient space for placement of the missing canine. It is also mentioned that we can find factors that can lead to a poor prognosis, such as the location of the canine above the roots of the lateral incisor, buccal dystopias, the formation of a greater angle of 60° constituted by the axial axis of the canine with the midline and age in adult patients.

According to Graber⁸, there are two fundamental indications for the surgical treatment of impacted maxillary canines. One of these is the elimination of physical obstacles that restrict their normal eruption, such as highly resistant superficial soft tissue, supernumerary teeth, or odontomas. Another of the reasons consists of working together with the orthodontic area, in which the surgical crown is exposed and its traction is carried out using a bonded button or a conventional bracket attached to the enamel.

In the case of having ruled out pathologies that have prevented the eruption of the canine and once its position in the arch has been located employing diagnostic tools, the most appropriate thing to do will be to proceed with its surgical exposure.

For canines that are in a vestibular location, the use of the infraorbital, nasopalatine and submucosal anesthesia technique is suggested. Subsequently, the use of a closed traction technique is recommended, which consists of making a flap that must include attached gum, then a little of the bone that covers the tooth must be removed to expose the follicle.¹ The follicle should then be slightly opened to expose a small part of the crown.⁸

Once the above process is completed, the situation must be controlled to maintain homeostasis⁸, to make possible the adhesion of a button or bracket, which will be necessary to perform the traction of the canine through the use of steel ligature or a prefabricated chain. Subsequently, the entire flap is sutured again, leaving the steel ligature or chain attached to the main archwire.¹¹

In the case of retained canines with palatal location, an infraorbital trunk anesthesia technique and the nasopalatine and anterior palatine nerves should be performed. As with the vestibular canines, the surgical technique most recommended by authors such as Graber⁸ and Boj¹ is the closed exposure technique, therefore, using this technique as a reference for the approach, a flap of the palatal mucosa should be raised, with an amplitude which

allows the correct approach of the retained canine, then the crown of the tooth must be exposed for the placement of a button for its subsequent traction using steel ligature or preformed chain.¹²⁻¹⁴

In palatal dystopia, it is preferable to leave a window over the crown of the canine before suturing, unless it is very close to the marginal gingiva. This is also of great help in the event of detachment since a second intervention will not be required.¹

There is another surgical technique which is called the open exposure technique of the eruption, this consists of removing the bone and soft tissues around the crown, and leaving the area exposed with the oral cavity. To prevent scarring of the removed tissues on the crown of the tooth, a large amount of these is removed until reaching the cement-enamel junction and a dressing is placed, which should remain for 2 to 3 weeks to allow the tissues to heal around the intervened area.^{1,3-5}

However, it has been shown that the most favorable surgical technique for the treatment of impacted maxillary canines is the closed surgical technique since it has shown superior periodontal results compared to the open surgical technique,¹ this is of great relevance considering account that the upper canines have great importance in the aesthetics of the patient's smile.

Another topic of great importance that must be taken into account in this bibliographic review is the anchoring method used. Before advances in bonding materials, a metal ligature was placed through a hole created in the crown of the tooth utilizing a needle; this technique is still used in special circumstances.¹¹⁻¹⁶

Currently, the use of a button or a conventional bracket as an anchorage method is widely accepted, the decision of this will depend largely on the size of the exposed crown and the position of the canine in the maxilla.¹¹

According to Proffit¹¹, the least recommended way to achieve anchorage is the placement of a metal ligature around the crown of the canine, because this leads to loss of periodontal attachment due to the existence of bone that is destroyed when passing through the wire around the canine. tooth, it fails to regenerate even after removal of the latter.

Some complications can derive from orthodontic-surgical treatment, these can be the absence of keratinized tissue, gingival recession, gingivitis, ankylosis, loss of pulp vitality, root resorption, marginal bone loss, tooth damage and neighboring periodontium and can even lead to the extraction of the included tooth.¹²⁻¹⁸



IV. CONCLUSION

- Interceptive treatment is always the best option for patients with impacted upper canines, this consists of predicting with the help of dental imaging the cuspids that have a tendency to retention, detect this is possible in patients from 9 years old. Every case can be different, but it will be convenient to carry out a treatment such as serial extractions, or an eruption guide.
- To make a good diagnosis of canines retained in the maxilla the necessary guidelines must be managed, which in turn achieve a multidisciplinary union between the various specialties to achieve the functionality of occlusion, and aesthetics in most young patients.
- Periodontal management of impacted maxillary canines would avoid esthetic and mucogingival problems.
- It's necessary to perform minimally invasive surgical procedures to obtain healthy periodontal conditions after orthodontic treatment.
- Multidisciplinary approach between the orthodontist and periodontist would benefit the patient maintaining a healthy periodontium.
- The options of conservative multidisciplinary surgical treatment involve the participation of all dental specialties, as well as pediatric dentistry as a first instance, going through orthodontics for the most part, also maxillofacial surgery and, if necessary, endodontics, periodontics and prosthodontics.
- Future research is suggested on multidisciplinary guidelines for the diagnosis and conservative treatment of retained canines in the maxillae, as well as identifying how many patients suffer from this anomaly and how effective conservative treatment is in the future.

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