

## Surgical Treatment Options for Impacted Maxillary Incisors

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### Abstract

**Introduction:** A correct diagnosis is essential in order to obtain an excellent aesthetic and functional result in a case of impacted incisors. The correct pondering of the different clinical data, such as age, positioning of the tooth in the alveolus as well as the quality and health of the periodontum, are fundamental in order to guide the correct treatment in each case. There are different types of surgical approaches and the technique to be chosen (gingivectomy, apically positioned flap or closed eruption ) will depend on the buccolingual level, the distance to the occlusal plane and the quantity of attached gingiva around it.

**Aim of the Study:** The aim of this study was to present the different types of surgical techniques and orthodontic tractions on impacted incisors cases.

**Material and Methods:** In this article are presented three cases of maxillary impacted incisors treated with different surgical techniques and orthodontic tractions used for this dental eruption anomaly.

**Conclusions:** It is fundamental to make a correct and early diagnosis in cases of impacted incisors in order to choose the correct surgical technique and orthodontic traction to achieve good periodontal and aesthetic results in this cases.

**Keywords:** *Impacted Maxillary Incisors; Gingivectomy*

### Introduction

The treatment of the upper incisors is specially compromised in many cases. The difficulty resides in the final aesthetic result, due to its important position in the arch. The maxillary central incisor are the third most commonly impacted teeth in caucasians, following the third molars and the maxillary canines [1,2] its inclusion is produced in 1 to 2% of the orthodontic patients [1]. The impacted incisors are usually more frequent in the maxilla than in the mandible [1].

The most frequent cause of the impacted incisors is the presence of mesiodens or supernumerary teeth [2-4]. Another cause can be the presence of odontomas, infectious processes, as well as previous trauma in the deciduous teeth [3,4].

The professional has two principal therapeutic options in cases of impacted upper incisors. The formerly option was to extract the tooth and replace it with a prosthetic of some sort depending on the age of the patient and the possibilities in the case. The other option is to allow the affected tooth to reach its position in the arch spontaneously or forced eruption after the extraction of the mesiodens or supernumerary teeth [2].

The treatment technique and the soft tissues that covers the impacted tooth are major factors that influence the posttreatment periodontal health of the impacted tooth and their adjacent teeth [5].

In order to undertake this option, different methods can be used. The easiest procedure is to create space for the tooth and allow its physiologic eruption. This treatment option is the simplest and the one that will bear greater results both functionally and aesthetically. However, in most cases it should be processed by the orthodontic traction of the incisor [4].

In order to complete the incisor traction, the crown of the teeth must be surgically exposed. The type of surgery will depend where the incisor is located in the buccolingual level, the distance to the occlusal plane and the quantity of attached gingiva around it [4]. Different types of surgery can be used.

The gingivectomy is a simple procedure, in which an incision is made along the occlusal border of the impacted teeth. It is used in teeth that are in the alveolar crest with a great amount of attached gingiva and that do not require elimination of the bone. Once the gingivectomy has been done, the process of eruption is physiological and the tooth occupies its position on the occlusal plane [6].

The apically positioned flap (APF) is a flap of total thickness; it can be apical or lateral depending on the position of the impacted tooth. The procedure consist in the elimination of the bone and the tooth's follicle as well, leaving exposed at least half of the crown. The flap with attached gingiva is sutured at the level of the periosteum. Once the healing process has taken place the orthodontic traction of the tooth can be done. It is indicated on impacted teeth that are position on the buccal part, that are near the occlusal plane without enough quantity of attached gingival [6]. Some of the advantages that this technique gives are that in the event of bracket failure, you can repeat the bonding of the bracket with no need for repeating the surgery [7].

The closed eruption technique (CET) carries an incision with discharges from the alveolar crest towards apical zone. The bone that covers the incisor must be taken out. An orthodontic attachment united to a chain should be cemented to the tooth and the gingiva sutured over the crown of the tooth covering it completely. The chain should exit through the gingiva to make the orthodontic traction. This technique is indicated for impacted teeth that are far from the occlusal plane or form the attached gingival zone positioned buccally, lingually or in half of the alveolus. The activation of the incisor can begin two weeks after the surgery [1].

In this article are presented three typical cases of impacted incisors. The first case was solved with a simple gingivectomy, the second with closed eruption technique and the last with an apically positioned flap.

### Clinical Cases

**Case 1:** A 7 year old patient presented a posterior crossbite and lack of eruption of the upper right central incisor; the tooth presented enough space for the eruption, radiologically there was no mechanical blockage and could be perfectly palpated (Figure 1).



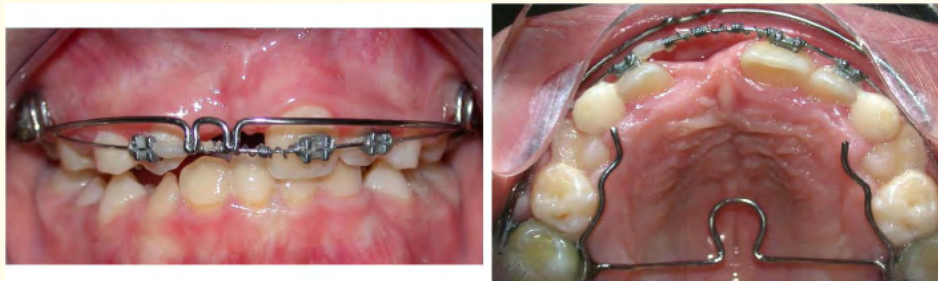
The treatment plan was to allow the correct eruption of the impacted tooth and solve the transversal malocclusion. A gingivectomy was done at the alveolar crest level of the impacted incisor and time was permitted for physiological eruption of the tooth. A rapid palatal expander was used and finally orthodontic fixed appliances in the upper incisors were placed to align them. Total treatment time was 12 months and the impacted incisor kept the appearance and periodontal health similar to its homologous (Figure 2).



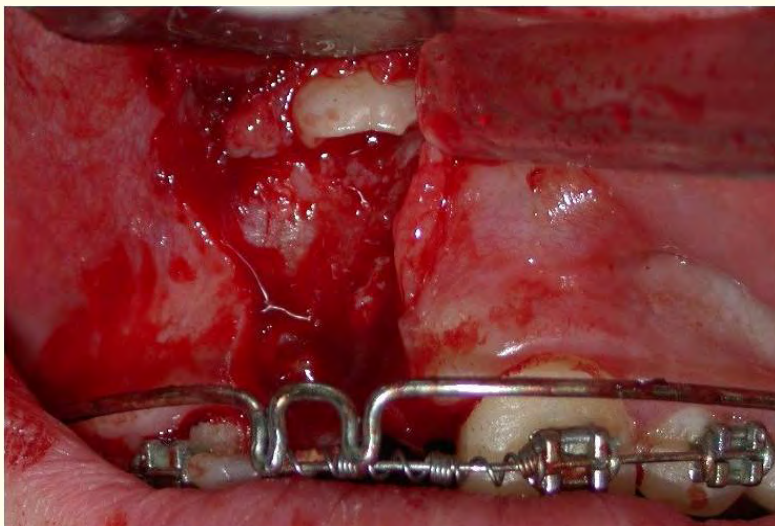
**Case 2:** A 9 year old patient presented an absence of the upper right central incisor. One year before, the patient had had an extraction of a mesiodens and waited a year for spontaneous eruption with no success be seen that the mesiodens has interrupted the correct eruption of the incisor (Figure 3). On the intraoral exploration, the impacted incisor was palpated at the height of the apex of the contiguous central incisor.



The treatment plan was to provide space for the impacted tooth and afterwards proceed to make the orthodontic traction. First of all, a RME was done; later on, brackets were placed in the upper anterior teeth to provide adequate space to the impacted incisor. Once the space was obtained, a 0,9 mm stainless steel arch was placed soldered to the headgear tubes of the superior bands (Figure 4). In the anterior part, hook bends were done in order to traction with an elastic chain or thread from the arch to the impacted tooth. At the height of the temporary molars an omega loop was made to move the anterior hooks upward or downwards according to convenience, as well as to increase or reduce the length of the arch to prevent damage the adjacent soft tissues. In the palatal side a transpalatal bar was soldered with anterior extensions to maintain the transversal dimensions.



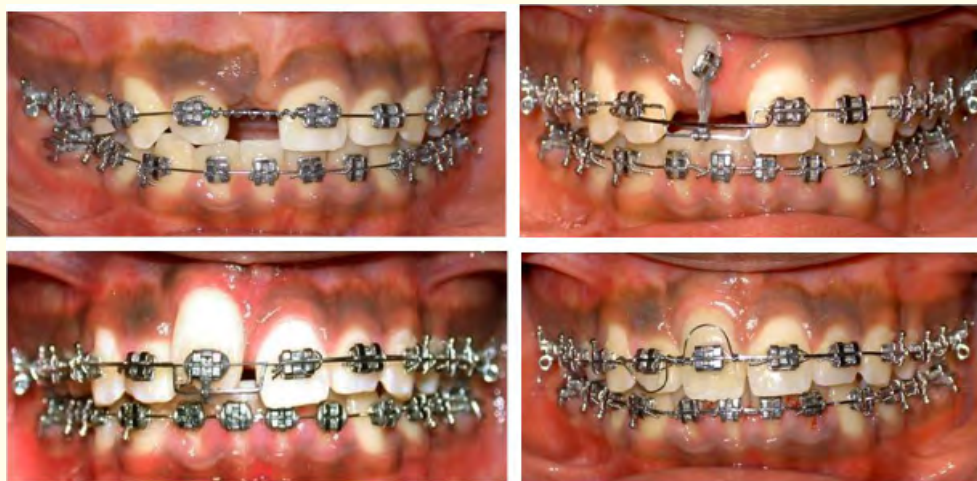
The bracket was cemented on the buccal part of the crown of the impacted tooth and a metallic chain was added to allow the orthodontic traction afterwards. Since the crown of the impacted incisor was above the mucogingival line (Figure 5), a CET was used. After 10 days of the surgical exposure, the orthodontic traction was begun with elastic thread from the hook bends positioned in the anterior part to the impacted incisor and it was activated every 4 - 5 weeks. Eight weeks after the periodontal surgery, the presence of the impacted incisor border was observed. Once the impacted incisor was at the height of the contiguous incisors the stainless steel buccal arch was cut and cemented the bracket in its correct position using a continuous nitinol arch to align the teeth. Negative torque was observed on the impacted incisor; so it was proceeded to use rectangular stainless steel arches with an auxiliary torque (Figure 6).



**Case 3:** A 13 year old patient showed that the upper right central incisor had not erupted. Dental history highlights include history of intrusive luxation of the 51, with posterior ankylosis and presence of mesiodens. The pre-treatment registers show a severe superior crowding, with no space for eruption of the impacted incisor, and a moderated inferior crowding with a bilateral class I (Figure 7). In the panoramic x-ray the presence of the incisor can be observed.



The treatment plan was to align and level the arch and seek space for the correct placement of the incisor with multi-bracket fixed appliances. The brackets were placed and the necessary space obtained for the traction of the incisor. Once the arch was stabilized with rigid wire and with the necessary space, the surgical-periodontal phase was undertaken. An APF was proposed due to the proximity of the tooth to the alveolar crest and the quantity of attached gingival (Figure 8), as a result, the incision was made at the level of the crest with the discharges in apical direction. The elimination of the bone and the tooth's follicle was done through the buccal part, a bracket was cemented in place and 2/3 of the crown was exposed. The traction was initiated from day 12 with an elastic element. The activation rhythm was monthly. Once the tooth was placed in the occlusal plane, the torques were worked on to improve the gingival margins, in the upper right central and lateral incisors (Figure 8).



Once the case was finished, the selective grinding of the incisor borders and occlusal adjustments were done. Fixed retention was used in both arches as well as a removable retainer (Figure 9).



## Discussion

The impaction of the upper incisors usually surfaces between the age of 8 and 10 and is more evident when the tooth is compared to the homologous. If it is a mesiodens or a previous traumatism, the patient is sent to the periodontist or oral surgeon with the objective of eliminating the mechanical blockage that does not permit the eruption of the tooth, and solve the problem [8]. When an incisor is backed up more than 6 months in its normal eruption process, it must be subject to a radiologic exam to ponder the possible cause of the eruption delay [9].

The following factors should be used to determine whether successful alignment of the impacted teeth can be achieved: (1) Direction and position of the impacted teeth, (2) Degree of root resorption, (3) degree of dilacerations and (4) Space available for the impacted teeth [10].

When the impacted incisor is to be orthodontically pulled, we must always consider the fact that the tooth is surrounded by attached gingiva, given that when it is surrounded by alveolar mucosa, the gingival tissue will generally be inflamed [11] and when the tooth is tractioned, loss of the alveolar bone and/or gingival recession around the tooth could happen as a consequence. Despite of a correct decision on the type of surgery to be done and an opportune orthodontic traction, the post-treatment periodontal parameters studied on impacted incisors indicate a minor loss of insertion [8]. The post-treatment socket measurements show a major periodontal pocket statistically, but not clinically significant [8]. These results differ with those of Vernet and cols1 in which no differences were observed in the orthodontically treated impacted incisors with those of the control group. In any case, none of the studies [1,8] clinically valuable defects were observed but findings on impacted canines indicate a greater risk of recession and uneven gingival margins compared to the control groups [1,7]. Several investigations have shown that an adequate amount of attached gingiva may prevent gingival recession, and in a narrow zone of attached gingiva, inflammation may lead to recession instead of pocketing [7].

One of the undesirable effects of orthodontic treatment is excessive root resorption. Given that maxillary incisors are especially susceptible to this, it must be taken into account when performing treatment on impacted incisors [2].

From an aesthetic point of view, the teeth treated with the CET show more satisfactory results than those treated with APF [1,7]. The length of the crown of the incisor at the end of the treatment was similar in cases treated with the CET and in cases treated with the APF. One third of the cases showed gingival recessions or irregularities in the gingival surroundings at the conclusion of the treatment [1]. In the study made by Chaushu., *et al.* they reported a poor gingival contour seen in 8 out of 11 cases while using an APF. It should be taken into account that because of the high prevalence of gingival defects present with this type of surgery, adjunctive post-orthodontic periodontal surgery may be required in a lot of cases [7]. Impacted central incisors treated with CET can achieve a better aesthetic and periodontal health [8].

These sub-ideal results in the gingival surroundings could be due to various factors [1,6]. Initially, it could be to an incorrect choice in the surgical procedure, given that if an APF is done when the tooth is too high above the mucogingival line exist great probability that the treatment can conclude with periodontal and gingival defects. Additionally it can be due to defects in the surgical technique; for example, if the APF is not wide enough, when we make the traction afterwards a gingival defect appears. A final factor is that an incorrect orthodontic traction, done with an excessive use of force or with an excessively fast activation rhythm [1,6].

The traction of the impacted tooth must begin once the surgical exposure begins to heal. In case of the CET, the orthodontic activation is recommended after 2 weeks and in the APF should be waited 1 to 2 weeks [11]. The force must be of 50 g and can be applied from the arch with elastic elements that produce intermittent forces [6,12].

There are few articles [14,15] that study the prognosis of the impacted incisors pulp. In a sample of 21 impacted teeth with CET, after the treatment, coloration differences appeared in four of them, but none of the cases presented a periapical lesion, additionally these results were not statistically significant [8]. The pulpar response of an impacted tooth that requires orthodontic extrusion partly depends on the age of the patient, the radicular development of the tooth and the magnitude of the force. The extrusive force, produce a greater pulpar degeneration in the crown than on the root. Teeth with open apices have a greater capacity to adapt than those with closed apices [13] in regards to extrusive forces; and additionally possess a greater pulpar survival rate [14]. After the orthodontic traction, shortening of the root usually takes place in most cases and will depend on the distance that the tooth will have to travel through the bone [13]. Root shortening can be due to known genetic factors or systemic factors, although the age of the patient, the density of the bone in which the movement takes place, the type of movement, the applied orthodontic force and the duration of the treatment [15,16] can also cause it.

In relation to the retention after the orthodontic traction a fixed retention on the contiguous teeth must be done to avoid the intrusion after treatment [1,3]. In teeth treated with the APF, the band of the attached gingiva is sutured together with a band of mucosa. When the tooth is tractioned, the gingiva joins it and the mucosa is stretched. The vertical relapse is produced by the tendency that the mucosa has to recover its initial length [1]. However, teeth treated with CET presented a smaller vertical relapse given that they erupt in an attached gingiva without stretching the oral mucosa [1].

## Conclusion

It is fundamental to make a correct diagnosis in cases of impacted incisors in order to choose the correct surgical technique. The height and the position of the incisor in the alveolus and its relation to the attached gingiva will be fundamental indicators in this process. If all these factors are taken into account the results will be excellent and the aesthetics will not be compromised.

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