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Case Report

Periodontal management during orthodontic-surgical treatment of maxillary impacted incisors: A case report

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ABSTRACT

The treatment of impacted teeth is a multidisciplinary process requiring close collaboration between periodontics and orthodontics. Impaction can have several causes, including physical obstructions in the eruption pathway, arch length discrepancies, or dental deformity. The management of these cases lies in the diagnosis established after an appropriate clinical and radiological examination. The age, position, etiology, and amount of space in the dental arch of an unerupted tooth determine how it should be treated. In several cases, orthodontic creating space, removing physical obstructions, and exposing the patient surgically with or without traction are general guidelines for treatment. In addition, ensuring adequate access to the tooth and the possibility of attaching an orthodontic anchor, the periodontal plastic surgery procedures associated with surgical clearance must preserve the integrity of the periodontium of the impacted tooth, as well as that of adjacent teeth, and above all promote the long-term maintenance of their periodontal health.

1. Introduction

A tooth is considered impacted when it fails to reach the occlusal plane after the physiological date, and its follicular sac is not connected to the oral cavity or when its contralateral tooth has already erupted for at least six months with a fully developed root. Impacted teeth may be located in a bone crypt at different levels of the maxilla or mandible. Clinically speaking, a tooth is considered impacted if it fails to erupt within 18 months of its expected eruption date. Upon identification of an impacted permanent incisor, an attempt is frequently made to reposition the impacted tooth within the dental arch. Surgical exposure of the tooth's crown followed by orthodontic alignment are common methods for managing impacted maxillary permanent incisors. Early interceptive interventions can also be used to help misplaced maxillary incisors erupt.[1] The periodontal approach to impacted and retained teeth, also known as surgical release, involves the management of bone, connective and epithelial tissues. It uses adapted periodontal plastic surgery techniques to reach these teeth while simultaneously adjusting the marginal periodontium.[2,3]

The causes of eruption failure are complex and varied. There are two primary groups of etiological variables that contribute to the delayed eruption of maxillary central incisors: systemic and local. Dilations, overcrowding, odontomas, dental trauma, ectopic tooth bud position, dentigerous cyst, insufficient arch space, early loss of deciduous teeth, cleft lip and palate, and tissue scarring from early tooth extraction are instances of local causes.[4,5]

The literature indicates that most impacted maxillary central incisors erupt spontaneously within 1-2 years of the

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impaction's cause being removed; this phenomenon is more common in younger patients.

Various factors influence spontaneous tooth eruption, such as:

1. The initial vertical position of the impacted tooth
2. The degree of angulation.
3. The shape of the obstacle and further orthodontic expansion of the dental arch.

Depending on these factors, the recorded spontaneous eruption rate varies between 30.3% and 89.4% of cases treated by surgical exposure of the impacted tooth, followed by orthodontic traction. Nonetheless, some affected incisors still do not erupt and need further care, such as orthodontic tension after surgical exposure.[6,7]

Dental inclusion, which occurs with varying frequency, affects all teeth, for instance 0.4% of maxillary incisors. The specific case of inclusion of anterior teeth requires a special therapeutic approach. The aim is not only to free the retained tooth, but also to ensure an optimal functional and aesthetic periodontal environment.[8]

This article will discuss a case of two impacted maxillary permanent central incisors that were managed conjointly with periodontal and orthodontic approach.

2. Case Presentation

A 13-year-old male patient in permanent dentition was reported with a chief complaint of missing upper front tooth in the department of orthodontics of the Dental Consultation and Care Center (DCCC) in Casablanca.

On endobuccal examination, the patient presents an average hygiene with a fine pardontal biotype. We note a Class I Canine and Right Molar and a Class II Canine and Class III Left Molar. (Figure 1)

Figure 1: Endobuccal examination with an insufficient eruption space for 11 and 21

The standard orthodontic radiological examination was performed with a panoramic and a lateral cephalometric radiography (Figure 2). We were able to identify the 2 permanent central incisors included with the necessary information in relation to position, orientation, possible presence of anatomical obstacle. The panoramic X-ray was completed with a retroalveolar radiography (Figure 2) to accurately examine the radicular morphology of both teeth.

Two-dimensional x-rays were considered sufficient for this clinical case, so the cone beam was not necessary for this young patient. We decided to start an initial orthodontic therapy without extraction in order to bring the necessary space to both teeth, followed by a surgical periodontal intervention to successively expose the 11 then the 21.

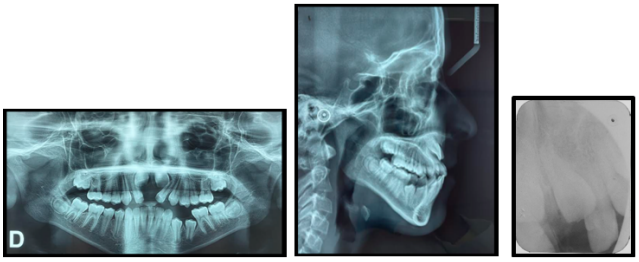

Figure 2: Radiological examination

The vestibular hump at the bottom of the oral vestibule as well as radiological data allowed us to locate with precision the 2 incisors. In the light of clinical and radiological examinations we were able to identify the cause of the inclusion related to the lack of space on the arch.

The orthodontic therapy consisted in a bonding with uninformed Tweed brackets, the sequence of wires followed was 014 NiTi, 016 NiTi, 16.22 NiTi, 17.25 NiTi and a 17.25 stainless steel (SS) wire. The opening of space was obtained using an open NiTi spring activated during the sessions. From the stainless-steel wire with a closed space holding spring (Figure 3), the patient was referred to the periodontology department of de DCCC so that he could be treated in collaboration with the orthodontic department.

Periodontal clinical diagnosis includes a visual inspection and palpation of any cupping, which in our case is vestibular. Next, the periodontal clinical examination focuses on the type of periodontium, the dimensions of the keratinized tissue opposite the impacted tooth and edentulous ridge, the level of the muco-gingival line, and its distance from the emergence situation (emergence location). The two incisors were in a vestibular position under the mucosa, which guided us towards a targeted clearance approach using an apically displaced mucosal flap.

2.1. Surgical intervention

Surgical release was achieved using an apically displaced flap with the aim of preserving pre-existing keratinized tissue by moving it to a more apical position, then securing

Figure 3: Orthodontic treatment paves the way for traction of the 11 and 21.

it with suture at the periosteum held in place. Access to the tooth after piercing its follicular sac was obtained by a full-thickness flap, and since the tooth was submucosal, there was no need to touch the bone. (Fig 4a). This technique has allowed good access to the clinical crown and the possibility of bonding an orthodontic attachment (Fig 4b). After healing, a bracket was bonded on the vestibular side of 11. A 012 NiTi wire was ligated on the bracket to ensure traction of the 11. The orthodontic traction by light forces in compliance with physiological displacement allow the placement of incisors on the arch with a healthy periodontium.

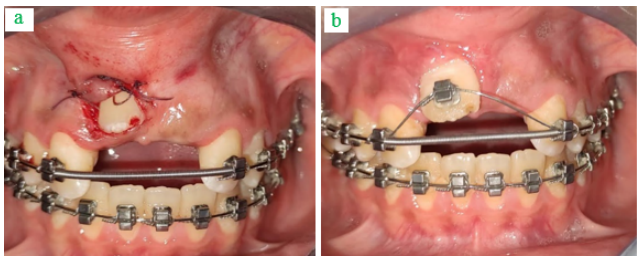

Figure 4: Clinical view after surgical release of the 11 with an apically displaced flap; b: The "overlay technique" used with a super-elastic 012 NiTi wire ligated on the 17.25 SS wire serving as anchor;

Once the 11 was on the arcade, we began the traction of the 21. We decided to carry out the two deferred operations using the same surgical protocol. (Fig 5 a,b)

The 21 was put in place orthodontically following the same process. The apically displaced flap technique has enabled us to gain a good band of keratinized gingiva for the two teeth being pulled, as illustrated in the following photos (Figure 6), which will guarantee periodontal health by maintaining rigorous periodontal control.

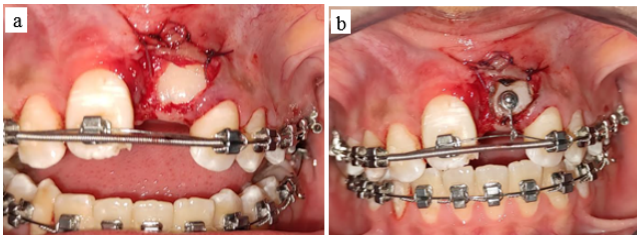

Figure 5: a: Clinical view after surgical release of the 21 with an apically displaced flap, also showing the 11 growing into a suitable position on the arch with good periodontal support; **b:** Attachment of an orthodontic button for tooth traction 21

Figure 6: After 3 months of orthodontic traction: both centrals are on the arch with good periodontal integration.

3. Discussion

The placement of an impacted or retained tooth represents a major challenge for the professional tandem of orthodontist and dental surgeon.[9,10]

Complete information in the clinical record is of paramount importance before any decision is taken on orthodontic traction. It must contain exhaustive details of the inclusion in order to optimally apply the tooth placement protocol. Thus, it should include data on the depth, orientation, vestibular or palatal position, root shape, apex curvature of the impacted tooth, and its relationship to adjacent teeth. The diagnostic synthesis, resulting from the joint analysis of clinical and radiological data, enables the orthodontist to formulate a precise diagnosis and establish a rigorous treatment plan.[11,12]

Clinical experience has shown that the quality of the periodontal marginal tissue surrounding the freed tooth, reconstituted by periodontal plastic surgery techniques, resists probing and remains stable over time. According to Korbendau and Guyomard (1983), the attached gingiva accompanies the tooth as it moves. It remains at the same level as the neighboring teeth, shows no change in height, and retains comparable thickness and quality.[12,13]

The surgical phase of the procedure is designed to accomplish two distinct objectives: firstly, the installation of an anchorage device enabling traction of the impacted crown, and secondly, the preparation of the periodontal environment.[13,14] The location of the impacted crown determines the surgical trajectory and direction of traction. However, the apex of the tooth guides the mechanical process of orthodontic treatment.

According to several studies, apically or both apically and laterally displaced flaps have the advantage of maintaining or creating a reserve of keratinized tissue around the erupting tooth. It can be applied to vestibular impacted teeth, characterized by a near-normal axis, lack of contact with adjacent teeth and a high risk of alveolar mucosal effraction.[15–17] This type of flap brings keratinized gingiva to the neck of the impacted tooth by mobilizing keratinized tissue located downstream of the tooth.[13] It can be performed using either a vestibular or palatal approach. The advantage of a palatal approach lies primarily in aesthetic considerations, with the absence of periodontal problems on the vestibular side and the avoidance of gingival scarring.

The surgical protocol involves a horizontal incision of the edentulous ridge and two incisions at the level of the bone contact, either vertical or slightly trapezoidal, with a width slightly greater than the mesio-distal diameter of the tooth. Full-thickness flap detachment enables the crown to be freed, followed by partial-thickness dissection at the back of the vestibule to free the flap. The procedure also includes removal of the follicular sac and residual cortex around the crown.[9]

What's more, the bonding process takes place after healing, under favorable conditions and without bleeding. In the event of anchor detachment, it is always possible to re-establish it without difficulty.[13,18] Vestibular inclusion is less common than palatal inclusion. It is mainly the result of a lack of space in the dental arch, underlining the importance of creating space in the first place.[14,16]

Orthodontic treatment should allow the tooth to erupt without altering the occlusal plane and without marginal tissue recession. In certain situations, the tooth may remain immobile due to a lack of bone clearance, inadequate orthodontic traction or ankylosis.[19] It is recommended to use a fixed device since this enables more control over the direction of traction and parasitic effects. The traction device needs to be elastic so it can deliver light forces, constant traction is necessary to minimize parasitic motions on the anchoring teeth and to protect the periodontium. Chambas et al, stated that two therapeutic approaches are taken: Either the main wire also acts as a force generator by its elastic deformation, using various loops or materials with a high modulus of elasticity (nickel-titanium wires). Either the anchor teeth are connected by a rigid arc of strong cross-section, on which is placed an auxiliary system (elastic, elastomeric chain, spring).[20] The traction direction is an essential parameter that must be monitored, and possibly adapted, throughout the orthodontic phase. The tooth must be guided to its normal position taking into account the adjacent teeth and the periodontium.[21] If unwanted movements appear (egression, version, rotation of adjacent teeth), they must be corrected and the anchorage must be reinforced before the resumption of orthodontic traction. If this type of movement persists or if their amplitude is significant despite anchoring, it may mean the presence of an ankylosis of the tooth included.[21]

Great care must be taken to avoid errors and achieve satisfactory results, both for the patient and the practitioner. According to Pignoly M. and coll.; an accurate diagnosis of the tooth's location, made possible by the use of modern imaging techniques, is essential to perform a surgical procedure that respects the tooth concerned and the surrounding anatomical structures. Axes and traction forces are carefully planned to move the tooth to its final position on the arch under optimal conditions. Throughout the process, the periodontal context is optimized and monitored at every stage to prevent the development of periodontal defects, considering the complexity of their subsequent repair.[22,23]

4. Conclusion

Treating a dental inclusion is a major challenge. A variety of therapeutic approaches are available, integrated into a multidisciplinary approach involving close collaboration between periodontists and orthodontists. The choice of treatment must constantly weigh up the benefits and risks of therapeutic intervention. Early detection and accurate diagnosis are essential to optimize the management of dental inclusions.

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6. Conflict of Interest

Authors have no conflict of interest to declare.

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