Minimally invasive surgical management of impacted maxillary canines

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AIM: *Combined surgical-orthodontic treatment of impacted maxillary canines has developed significantly in the last few years, regarding management of both hard and soft tissues and forces of traction. The aim of this report is to describe a combined surgical-orthodontic approach used to treat an impacted maxillary canine and to value the functional and esthetic results after 5 years of followup.*
MATERIALS AND METHODS: *A 13-year-old boy had been seen by surgeons in the Operative Unit of Orthodontics of Policlinico Tor Vergata in Rome. Radiographic images showed intraosseous impaction of teeth 1.3 and 2.3 in a late mixed dentition, and the patient was scheduled for the combined surgical-orthodontic treatment.*
RESULTS: *After the five-year follow-up, the patient had a good occlusal stability. The maxillary canine that had been orthodontically repositioned showed an adequate width of attached gingiva, which was well keratinized, and the margin of free gingiva that followed the course of the cement-enamel junction. Bleeding was absent on probing, the periodontal pocket depth was < 4 mm, and there was no radiographically evident bone loss.*
CONCLUSIONS: *The combined surgical-orthodontic technique used in this case (closed eruption towards the center of the alveolar ridge associated with conservative periodontal surgery, the adhesive technique, and controlled orthodontic traction) simulates physiological tooth eruption and results in proper alignment with good periodontal results. It should be considered as the treatment of choice for impacted teeth whose eruption is not precluded by the position of the tooth and/or the presence of ankyloses.*

KEY WORDS: Mucoperiosteal flap, Surgical tecnique

Introduction

In anterior region of the mouth the maxillary canines are the teeth that mostly are impacted, with a percentage ranging from 0.8% to 2.9%.
These teeth have an important role not only in maintaining the shape of the arch and the function, but also esthetically (from aesthetic point of view) [1].

In fact, if those impacted teeth are not recovered, there might be a lot of problems like bone resorption, resorption of adjacent dental roots [2], loss of the natural height of the dental arch, measured through facebow in centric relation, perforation of the mucosa under the dentition (natural or prosthetic dentition), local infections, dental cysts [3]. So, it is important to recover and maintain these teeth in the oral cavity, avoiding, where it is possible, to extract them [4].
Two most commonly used methods for exposing impacted canine are (1) surgical exposure, allowing natural eruption, and (2) surgical exposure with placement of an auxiliary attachment [5].
Orthodontic forces are subsequently applied to the attachment to move the impacted tooth. Combined surgical-orthodontic treatment has developed significantly in

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the last few years, regarding management of both hard [6,7] (bone, enamel, dentin) and soft tissues (gum) and forces of traction [8,9].
Regarding the soft tissue, there has been a switch from the technique which removes gingival tissue above impacted tooth (window technique), to the technique which maintains attached gum and alveolar mucosa with their reposition on initial position (closed technique), or on apical position (apically repositioned flap) [10].
The direction of the traction has moved the tooth away from the near teeth roots, avoiding to create injury on anchoring teeth, but especially has allowed the eruption of the impacted canine at the center of the alveolar process, reproducing the physiological eruption and, at the same time, the migration of the periodontal tissues [11].
The aim of the present report is to describe a combined surgical-orthodontic approach, analyzing step by step surgical phases used to treat an impacted maxillary canine and to value the functional and esthetic results after 5 years of follow-up.

Clinical Case

A 13-year-old boy had been seen by surgeons in the Operative Unit of Orthodontics of Policlinico Tor Vergata in Rome. During clinical examination, the child showed excellent general and oral health status, right and left molar class I malocclusion, an adequate width of attached gingiva, which was well keratinized, absence of permanent canines and presence of deciduous canines. Radiographic images showed intraosseous impaction of teeth 1.3 and 2.3 in a late mixed dentition (Fig. 1). The TC and rendering 3D demonstrated that the teeth were impacted on palatal side (Fig. 2). The patient was scheduled for the combined surgical-orthodontic treatment.
The treatment was divided in three phases.

Phase 1. Initial Orthodontic Treatment

The first phase of the treatment has predicted orthodontic therapy to prepare anchoring teeth, through alignment and leveling phases of arches. A complete banding of superior arch has been made and a palatal bar has been insert as anchorage.

Phase 2. Surgical Exposition And Traction Of Impacted Teeth

Surgical technique (palatal approach):
After local anesthetic with mepivacaine 1:100.000, a palatal cut has been made from the mesial angular line

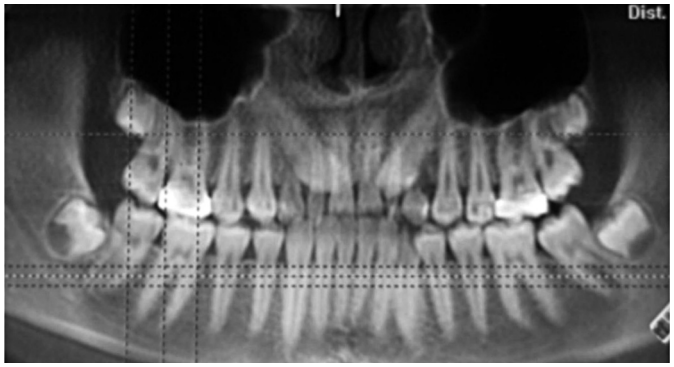

Fig. 1: Panoramic image of tc cone beam which show the inclusion of 13 and 23.

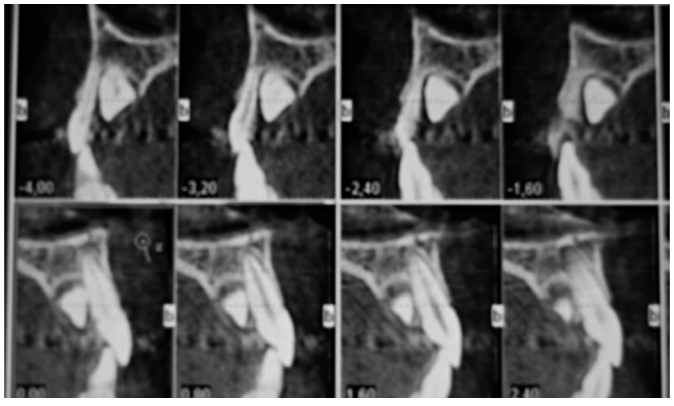

Fig. 2: Section which show palatal inclusion.

Fig. 3: Elevated flap.

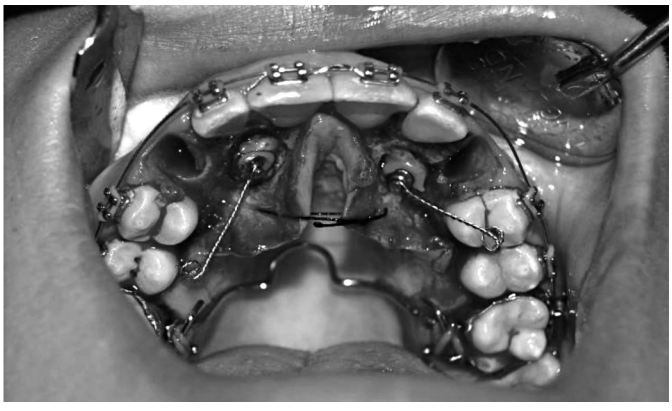

Fig. 4: The impacted teeth are exposed and the orthodontic buttons are attached.

Fig. 5: The flap is repositioned (closed technique).

of the upper second premolar to distal angular line of the homolateral central incisor. The cut has been intrasulcular without vertical release, this has guaranteed a better closing of the flap at the end of surgery. A total thickness flap has been elevated with a controlled movement of the periosteal elevator (Fig. 3) without disconnecting the interincisal area because in this area there is nasopalatine nerve. After the flap has been elevated it has been anchored with stitches and the matching deciduous teeth have been extracted (Fig. 4).

The enamel surface of the impacted teeth has been washed and dried and then an orthodontic button with a chain has been positioned at crown level (Fig. 4). After the surgical field has been carefully washed, the mucoperiosteal flap has been repositioned and sutured (Fig. 5).

Phase 3. Final Orthodontic Treatment

After the teeth have been recovered, the orthodontic therapy continues with finishing phases for the finalization of the case.

Follow-Up

After the five-year follow-up, the patient had a good occlusal stability. The maxillary canine that had been orthodontically repositioned showed an adequate width of attached gingiva, which was well keratinized, and the margin of free gingiva that followed the course of the cement-enamel junction. Bleeding was absent on probing, the periodontal pocket depth was < 4 mm, and there was no radiographically evident bone loss (Fig. 6).

Fig. 6: Complete Treatment.

Discussion

The treatment of impacted teeth needs a multidisciplinary approach. As the spontaneous eruption, which occurs in a harmonious way, brings to a dental alignment when there are healthy periodontal tissues, in the same way the combined surgical orthodontic technique of an impacted tooth has to reproduce the physiological eruption [12,13]. Therefore the aim of the orthodontic therapy is to guide the tooth eruption towards the center of the bone ridge, while the surgical treatment has to ensure the respect of the periodontal and dental structures to avoid damage at the end of the therapy. The aim of the presentation of this clinical case is to describe the surgical technique of the exposition of two impacted teeth (maxillary palatal canines), which will be repositioned in the dental arch through a combined surgical orthodontic treatment. The teeth will be submitted to a "closed" eruption towards the center of the alveolar ridge with the application of the conservative surgical technique, the adhesive technique and the controlled orthodontic traction.
In this clinical case a mucoperiosteal flap has been set up with the papilla preservation technique. In the interincisal area a full thickness flap has been elevated, because in this area there is the nasopalatine nerve, so that impacted teeth can be exposed and the orthodontic buttons can be attached. At the and the flap has been repositioned (closed technique) so the keratinized tissue can be maintained and the discomfort can be reduced during healing. Figs. 1-8 show the full treatment after seven-year follow-up.

Conclusions

The combined surgical-orthodontic technique used in this case (closed eruption towards the center of the alveolar ridge associated with conservative periodontal surgery, the adhesive technique, and controlled orthodontic traction) simulates physiological tooth eruption and results in proper alignment with good periodontal results. It should be considered as treatment of choice for impacted teeth whose eruption is not precluded by the position of the tooth and/or the presence of ankyloses.

Riassunto

OBIETTIVI: Il trattamento combinato chirurgico-ortodontico per il recupero dei canini mascellari inclusi si è sviluppato notevolmente negli ultimi anni, considerando non solo il management dei tessuti duri e molli, ma anche delle forze di trazione.
Lo scopo del presente lavoro è descrivere una tecnica combinata chirurgico-ortodontica per il trattamento di un canino incluso mascellare, con una tecnica chirurgica minimamente invasiva, valutandone i risultati funzionali ed estetici nel follow-up a medio termine (5 anni).
MATERIALI E METODI: P.B., di 13 anni, alle indagini radiografi che si evidenzia la malposizione intraossea degli elementi 13 e 2.3 in una dentizione mista tardiva e si è deciso pertanto.
Per il suo recupero in arcata attraverso un approccio combinato ortodontico-chirurgico.
RISULTATI: Nel follow-up a 5 anni il paziente si è presentato con una buona stabilità occlusale. Gli elementi riposizionati ortodonticamente in arcata presentano adeguata banda di gengiva aderente ben cheratinizzata porzione che da un ottimo spessore ed il margine della gengiva libera che segue l'andamento della giunzione amelo-cementizia, assenza di sanguinamento al sondaggio, una profondità di tasca < 4 mm e assenza di perdita ossea visibile radiografi camente.
CONCLUSIONI: Il trattamento combinato chirurgico ortodontico (eruzione "chiusa" verso il centro della cresta alveolare con l'applicazione dei principi di una chirurgia conservativa, della tecnica adesiva e della trazione ortodontica controllata) simula l'eruzione fisiologica dentale, ottenendo un corretto allineamento in arcata associato a condizioni di salute parodontale.
Dovrebbe quindi essere considerato come trattamento di scelta per i denti inclusi, almeno quando la loro posizione e l'assenza di anchilosi permetta la loro eruzione.

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