

Traction of Retained Upper Central Incisors Because of Mesiodens, Orthosurgical Approach: A Case Report

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ABSTRACT

Tooth retention is defined as the inability of a tooth to reach the occlusal plane after the normal age of eruption or when the contralateral tooth has already erupted for at least 6 months with a completely formed root. The most common cause of retention of upper central incisors are supernumerary teeth (56-60%) and odontomas, which cause a direct obstruction of the eruption path. Within the surgical approach of the traction of retained upper central incisors there are different methods to reduce traction time. Orthodontists have developed strategies to accelerate orthodontic movements based on the concept of Regional Acceleratory Phenomenon or RAP. The following article presents a case where a 14-year-old patient has absence of 1.1 and 2.1 (FDI Nomenclature), presence of root remains of 5.1 and 6.1, and presence of a tooth with amorphous morphology erupting in keratinized gum. Having imaging studies can help us to give a proper diagnosis of retention of central upper incisors caused by two mesiodens, for which it is indicated an ortho-surgical approach. The use of orthodontics appliances and a surgical approach to correct the retention of upper central incisors can bring us benefits in terms of the time of traction of them. When using RAP, the traction chains need to be activated a few days postsurgical, this way the traction of the retained upper central incisors can take less time than with a conventional approach. The correct diagnosis and the multidisciplinary approach of retained upper central incisors is imperative to have a good prognostic. The use of orthodontic appliances in hand with the surgical approach to take advantage of the RAP stimuli is important to achieve a shorter treatment time and to return the function and esthetics of smile faster.

Keywords: Multidisciplinary, Mesiodens, Supernumerary Teeth, RAP

Introduction

Dental impaction is defined as the failure of a tooth to reach the occlusal plane after the normal age of eruption or when the contralateral tooth has already erupted with a fully developed root (Calil *et al.*, 2022). The most frequent cause of school-based bullying is the absence of anterior teeth (Calil *et al.*, 2022).

Tooth retention occurs most frequently in the maxillary arch, with an incidence of 69%, and 51.2% of cases involving the incisor region. Impacted central incisors are rare (0.06%–0.12%) and are more prevalent in males than in females (Mockutė G *et al.*, 2022).

Due to the location of the missing tooth, the retention of maxillary central incisors significantly impacts facial aesthetics, function, speech, and the patient's self-esteem (Mockutė *et al.*, 2022). According to Seehra, *et al.* (2023), the etiological factors for delayed eruption of maxillary incisors can be classified into two categories: hereditary factors and environmental factors. The three most common causes were root dilaceration (27.5%), supernumerary teeth (55.7%), and tuberculate teeth (19.7%). Yusa, *et al.* (2023) state that the etiology of supernumerary teeth is unknown; they may present as an isolated finding or as part of a syndrome, such as cleft lip and palate, cleidocranial dysostosis, or Gardner syndrome.

The objective of this case report is to describe the orthodontic-surgical management of impacted maxillary central incisors associated with mesiodens using the regional acceleratory phenomenon (RAP), with the aim of promoting their eruption, optimizing orthodontic traction time, and restoring dentofacial function and aesthetics.

Case Presentation

A 14-year-old male patient, ASA I (according to the American Society of Anesthesiologists risk classification, 2025), presented for consultation stating, "my front teeth aren't coming in." He initially visited the Dental Prevention Clinic for an orthodontic assessment; clinical examination revealed retained root fragments from teeth 5.1 and 6.1, the absence of teeth 1.1 and 2.1 (Fig. 1), and a bilateral Class III molar relationship. A tooth with abnormal morphology erupting through keratinized gingiva was also observed. To supplement the diagnostic process, the patient was asked to obtain imaging studies (orthopantomogram, lateral cephalometric radiograph, and cone-beam computed tomography) (Fig. 1). Radiographic analysis showed teeth 1.1 and 2.1 impacted due to the presence of two supernumerary teeth with irregular morphology; third molars at Nolla stage 6 were also observed.

Based on the imaging studies, intraoral photographs, and clinical examination, the following treatment plan was implemented:

- Surgery to extract the third molars (to allow for distalization and achieve a Class I molar relationship)
- Placement of orthodontic brackets (to align teeth and create space for teeth 1.1 and 2.1)

- Surgery to extract root fragments from teeth 5.1 and 6.1, remove the supernumerary teeth, and place traction buttons on teeth 1.1 and 2.1

Prior to the surgery to extract the supernumerary teeth and place traction buttons, a decision was made to surgically extract teeth 3.8 and 4.8 (Fig. 1) and to place the orthodontic appliances (Fig. 2).

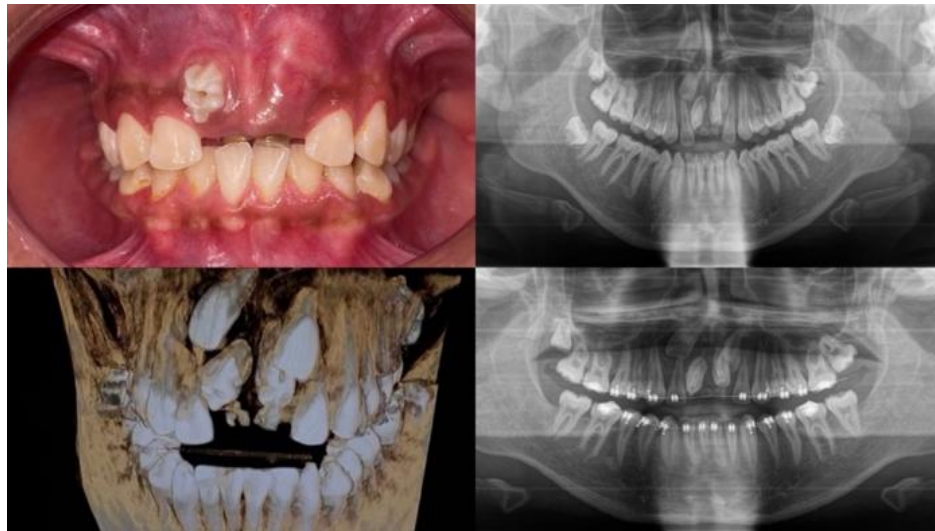


Figure 1: Initial photograph, initial Orthopantomogram X-Ray and CBCT screen are taken. Orthopantomogram X-Ray post extraction of 3.8 and 4.8 is taken.



Figure 2: Orthodontic treatment is initiated. Root fragments of teeth 5.1 and 6.1 are luxated with straight 3mm elevator and supernumerary tooth is luxated with a straight 4 mm elevator. Osteotomy of crown of tooth 1.1 is made.

Orthodontic Treatment

Orthodontic treatment began six months prior to the surgical phase to reach a heavy-gauge wire—thereby leveraging the release of pro-inflammatory cytokines—and thus achieve faster traction of the maxillary central incisors.

During the first month, a light-gauge 0.014 NiTi archwire was used; follow-up appointments were scheduled at 15-day intervals, during which 0.016 NiTi, 0.016 stainless steel, and 0.016x0.022 NiTi archwires were placed in subsequent visits.

Once the patient was on a heavy 0.016x0.022 NiTi archwire, the decision was made to proceed with the surgical phase.

Surgical Technique

The procedure began with anesthesia of the infraorbital and nasopalatine nerves using 4% articaine with 1:100,000 epinephrine. A 3 mm straight elevator was used to luxate the retained root fragments of teeth 5.1 and 6.1 (Fig. 2), while a 4 mm elevator was used to luxate the amorphous supernumerary tooth that had erupted through the keratinized gingiva (Fig. 2). A modified Neumann incision was made and a mucoperiosteal flap was reflected; the crown of tooth 1.1 was exposed using a 701 bur at low speed (Fig. 2), and the second supernumerary tooth was luxated using the same elevator. Since the crown of 2.1 was exposed upon raising the flap, no osteotomy was required. Micro-osteoperforations were performed to promote the activation of pro-inflammatory cytokines.

37% orthophosphoric acid was applied and left to act for 20 seconds, followed by rinsing and drying; adhesive was then applied and light-cured for 20 seconds. Exact Clear orthodontic resin (TP Orthodontics) was used to bond the traction button (Fig. 3); this procedure was performed on both impacted teeth (Fig. 4).

Simple sutures using 4-0 catgut are placed, and the chains are ligated to the bracket on tooth 2.2 to prevent patient discomfort (Fig. 4).

The traction chains were activated one day post-surgery, with the placement of a 0.016 x 0.022 archwire. Follow-up appointments were conducted at one-month intervals, during which the traction chains were activated. At 1 month follow up we can see 1/3 of the crown 2.1 erupting in keratinized gum, whereas at the one-year mark, we can see that tooth 2.1 has reached the occlusal plane.

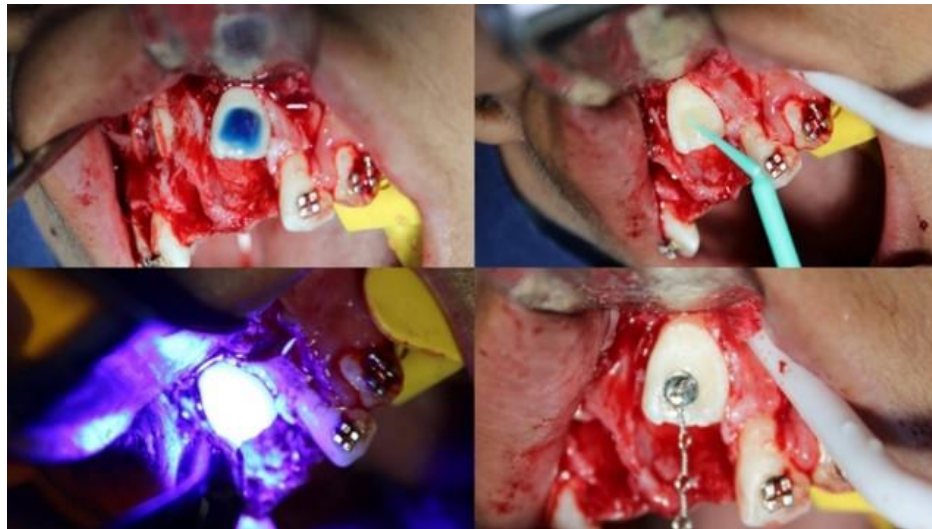


Figure 3: Traction buttons are cemented using a bonding protocol.

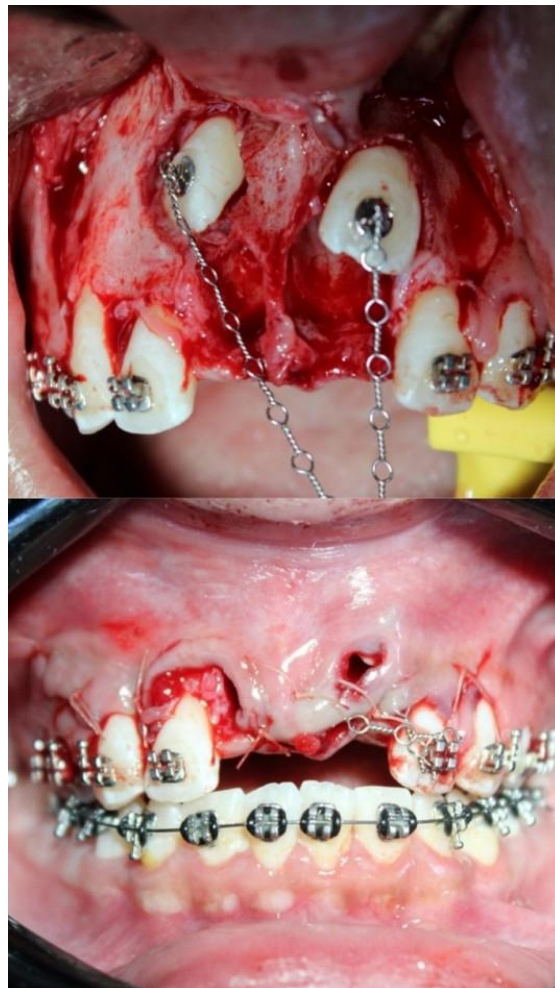


Figure 4: Traction buttons are cemented onto retained teeth and simple sutures are placed and traction chain is attached to tooth 2.2.

Follow-ups at 1 month, 2 months, 6 months, and 1 year are shown in Fig. 5.



Figure 5: 1 month, 2 months, 6 months and 1-year follow up.

Discussion

Early diagnosis of impacted maxillary central incisors is important for ensuring a better prognosis and restoring the function and aesthetics of the anterior region at an earlier age. Studies conducted in Bulgaria observed 651 patients with maxillary central incisors impacted due to supernumerary teeth. Supernumerary teeth cause tooth impaction in 28%–60% of all cases (Zhou *et al.*, 2025)

The use of orthodontic appliances combined with a surgical approach to correct impacted maxillary central incisors can offer benefits regarding traction time; by utilizing the RAP (Regional Acceleratory Phenomenon) and activating the traction chains a few days after surgery, the traction of impacted central incisors can be achieved in less time compared to the conventional approach.

Early diagnosis of impacted teeth is imperative for a favorable prognosis. The conservative treatment approach for these retained teeth involves extracting the source of the obstruction, followed by orthodontic treatment to create the space required for spontaneous eruption. Spontaneous eruption is the preferred outcome when the tooth's root is not yet fully formed and eruptive forces are still active. If this treatment proves ineffective, ortho-surgical techniques are available; these involve surgical exposure of the tooth, placement of orthodontic traction attachments, and alignment of the tooth into the dental arch using orthodontic appliances (Hurry *et al.*, 2024).

Several factors must be considered when formulating a specific treatment plan, including the patient's age, an accurate diagnosis, assessment of the etiological factor, the choice of surgical intervention, and the orthodontic technique to be used to bring the tooth into the occlusal plane.

When planning an orthodontic approach, the root development of the impacted tooth must be considered, as the use of heavy traction forces carries a risk of root dilaceration (Zhou *et al.*, 2025).

Regarding the surgical approach for the traction of impacted maxillary central incisors, various methods exist to reduce traction time. The periodontal ligament, alveolar bone, and cementum constitute the periodontium, which plays a crucial role in determining the rate of orthodontic tooth movement. Orthodontists have developed strategies to accelerate orthodontic movement based on the concept of the Regional Acceleratory Phenomenon (RAP) (Keser and Naini, 2022).

RAP is a response to a noxious stimulus, describing a process in which tissue forms more rapidly than normal during regional regeneration.

There are different approaches regarding RAP:

1. Pharmacological
2. Surgical methods
3. Physical or mechanical stimuli

Surgical approaches include corticotomy, cortincision, piezocision, Minimally Invasive Rapid Orthodontics (MIRO), and micro-osteoperforations (MOPs) (Keser and Naini, 2022).

Cytokines and other inflammatory markers activate bone remodeling—characterized by bone resorption in the compression zone and bone deposition in the tension zone of the periodontal ligament—where the Regional Acceleratory Phenomenon (RAP) enhances tissue reorganization through a burst of soft and hard tissue remodeling; RAP is estimated to peak 2 to 4 months after the surgical intervention (Kuc *et al.*, 2024).

When combined with orthodontics, certain malocclusion issues—such as the forced eruption of impacted teeth—can be corrected in a shorter timeframe (Kuc *et al.*, 2024).

Conclusion

Maxillary central incisors (MCIs) are vital for oral function, phonetics, and aesthetics; their absence negatively impacts the patient's self-esteem.

Impaction of MCIs is caused by mechanical obstruction, most frequently due to supernumerary teeth, or mesiodens. Early detection of impacted MCIs is crucial for achieving optimal outcomes; diagnosis should be based on clinical assessment combined with imaging studies.

Management requires a multidisciplinary orthodontic-surgical approach to successfully guide the impacted teeth into the occlusal plane.

In conjunction with the surgical approach, the RAP technique helps reduce traction treatment time by utilizing bone apposition; this increases the release of inflammatory markers associated with orthodontic movement, thereby accelerating the movement of impacted teeth into the occlusal plane.

The correct diagnosis and the multidisciplinary approach of retained upper central incisors is imperative to have a good prognostic. The use of orthodontic appliances in hand with the surgical approach to take advantage of the RAP stimuli is important to achieve a shorter treatment time and to return the function and esthetics of the upper central incisors faster.

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Conflict of Interest: None declared.

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