Surgical Exposure and Orthodontic Treatment of Impacted Maxillary Central Incisors. A Case Report

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INTRODUCTION

Although impaction of a permanent tooth is rarely diagnosed during the mixed dentition period, an impacted central incisor is usually diagnosed accurately when there is delay in the eruption of the tooth.\(^\text{1}\) Many patients with impacted maxillary central incisors are referred to orthodontists by general practitioners or pediatric dentists because parents are concerned about the impaction of an incisor in the early mixed dentition, even though its occurrence is less frequent.\(^\text{2,3}\) The frequency of maxillary incisor impaction ranges from 0.06% to 0.2% and the most common causes of impaction seem to be odontoma, supernumerary teeth, and loss of space. Impactions caused by disturbances in the eruption path related to crowding are somewhat less common.\(^\text{4}\) Alteration in the eruption path or formation of scar tissue due to trauma or premature loss of the primary incisors, and abnormal root angulation or dilaceration; Other causes are apical follicular cysts that prevent normal eruption.\(^\text{5,7}\) In clinical practice, the treatment of the impaction of permanent teeth caused by supernumerary teeth is frequently prolonged. This requires the setting of certain guidelines in the treatment of tooth impaction caused by supernumerary teeth. Spontaneous eruption of the impacted maxillary incisors there are no doubt has an advantage over its surgical-orthodontic
treatment approach. But is it possible to predict spontaneous eruption of impacted maxillary incisor and its timing after removal of the supernumerary tooth? There is no clear answer yet, because a lot of factors, such as initial location and axial inclination of impacted teeth, lack of space in the dental arch and many others can influence the process.\(^{(1)}\)

**MATERIALS AND METHODS**

*Case Presentation:*

An 11 years old female patient was reported to the Department of Pedodontics, Orthodontics and Preventive Dentistry, College of Dentistry, University of Mosul with the chief complaint of missing permanent maxillary central incisors. No previous history of trauma to the dental or facial region was reported and her medical history showed no contraindications to orthodontic treatment. Intraoral examination showed Patient was having Angle’s class I molar relationship of right side and unilateral cross bite of left side ,the permanent lateral incisors erupted in maxillary arch and the lower permanent anterior teeth erupted in the mandibular arch Figure (1).

![Image](image1.jpg)

**Figure (1): The Cast of the Patient Before Treatment.**

**Diagnosis and treatment planning**

The orthopantomogram Figure (2) demonstrated both maxillary central incisors were impacted due to the presence of two impacted supernumerary teeth located in their eruption path. The impacted maxillary central incisors were positioned vertically, and the supernumerary teeth were placed between the crowns of the impacted central incisors.

![Image](image2.jpg)

**Figure (2): Orthopantomogram of the Patient Before Treatment.**

To confirm the position of supernumerary teeth, upper occlusal radiograph, Figure (3) taken which showed the presence of supernumerary and impacted permanent central incisor teeth on the labial side.
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Figure (3): Occlusal View of the Patient Before Treatment.

For the treatment of impacted incisors different options were discussed. Out of which three treatment alternatives were explained to the patient and her parents.
1. Extraction of the impacted central incisor along with mesiodense and restoration with a bridge or an implant later when active growth period had ceased.
2. Surgical extraction of supernumerary teeth and wait for normal eruption of Central incisors.
3. The surgical extraction of supernumerary teeth followed by surgical exposure of impacted central incisors and alignment of the impacted incisor into the arch using fixed orthodontic treatment.

Treatment Progress

The patient was sent to the Department of Oral and Maxillofacial Surgery to remove the supernumerary teeth. Local anaesthesia was administered and the surgeon raised a mucoperiosteal flap to remove supernumerary teeth. A sufficient amount of bone was removed with a round bur and then surgical removal of supernumerary teeth was done Figure (4).

Figure (4): Surgical Removal Of Supernumerary Teeth.

After two months, the patient recall and another orthopantomogram taken, there is no spontaneous eruption of impacted central incisors. Then after eight months follow up Figure (5).
Figure (5): Orthopantomogram of the Patient Show No Spontaneous Eruption.

After eruption of all remaining permanent teeth had occurred, a fixed appliance was subsequently placed on the upper arch by the orthodontist to create adequate space for the impacted central incisors. A 0.0180*0.0250 slot straight wire appliances were placed on the two maxillary permanent lateral incisors, canines and premolars. The initial leveling was performed with a 0.016-inch Ni-Ti wire, followed by a 0.016-inch stainless steel wire then 0.016*0.022-inch superelastic nickel titanium used for final leveling and alignment. A, 0.016*0.022-inch stainless steel wire with an open coil spring between the two lateral incisors. By activating the open coil spring, adequate space for aligning the impacted incisor was obtained Figure (6), the treatment for this step take four months.

The patient was transferred to the oral surgeon for exposure of the impacted incisor. Local anesthesia was administered and the surgeon raised a mucoperiosteal flap, bracket was bonded at the time of surgery to the labial surface of the crowns of the impacted central incisors. A 0.010-inch ligature wire ligated on them. The flap was reclosed and sutured, leaving a tied ligature wire with a hook protruding through the mucosa Figure (7).

The patient was recalled after 2 weeks and orthodontic traction was started. The extrusion force applied on the impacted central incisor in the present case was very light and measured in the range of 40-50 grams and measured by tension gauge (Anthogyr, France). As the tooth moved downward, the ligature wire was cut shorter to maintain the effective force until the impacted teeth became exposed to the oral environment. When the impacted teeth exposed to the oral environment, the bracket was then rebonded to its correct position on incisors so that the tooth could be properly positioned. The final alignment was completed with 0.014 inch NiTi arch wire followed by 0.016 x 0.022 inch NiTi wire.

The finishing and detailing of the arches was done using full dimension arch-wire after proper positioning of incisors. This treatment was taken approximately 9 months to bring the incisor in proper position. The total treatment time...
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from placement of the fixed appliance to it

RESULTS

The impacted maxillary central incisors were successfully positioned into proper alignment through the crown exposure and the conventional ligature traction. The exposed incisors presented an acceptable gingival contour after treatment and sufficient amount of attached gingiva. Figure (8) Radiographically, the newly positioned incisor reveals an intact straight root and no apparent root resorption.

DISCUSSIONS

Supernumerary teeth can affect the normal position and eruption of adjacent teeth and often require clinical intervention, this reported by Harris and Clark.

Rajab and Hamdan concluded that the most common complication due to presence of supernumerary teeth is the failure of eruption of maxillary incisors. The treatment protocol available for management of impacted permanent teeth due to supernumerary teeth are diverse. Methods of management of impaction due to supernumerary teeth are; removal of supernumerary teeth or tooth only, removal of supernumerary teeth and bone overlying impacted teeth, incision of fibrous tissue over the alveolar ridge to promote the eruption with or without orthodontic traction, this reported by Regezi et al. and Bhat.

Spontaneous eruption of impacted maxillary incisors occurs in 54-76% of cases when supernumerary tooth is removed and if there is enough space in the dental arch, this result reported by Crawford and Smailiene et al. However, research data by Witsenburg et al. and Mason et al. indicate that the spontaneous eruption of impacted maxillary incisor may take up to 3 years and sometimes orthodontic treatment is necessary to achieve adequate alignment of the erupted tooth in the dental arch.

If the root of the impacted tooth is still developing, the tooth may erupt normally; but once the root apex has closed, the tooth has lost its potential to erupt, this result concluded by Kokich and Mathews. In the present case the root formation was almost complete and because of its rotation and labial placement, it was not desirable to wait for spontaneous eruption.

After thorough clinical and radiographic examination, it was decided that the present case required a combination approach comprising of both surgical and orthodontic treatment to bring an unerupted maxillary central incisor into position as done by various authors like Cangialosi, Kamakura et al., Kocadereli and Turgut. Surgical exposures of impacted incisors or surgical repositioning have also been used to bring impacted teeth into occlusion, this method cited by Kamakura et al., Kocadereli and Turgut and Shetty et al.

Combination approach using conservative surgical treatment and careful orthodontic management to bring tooth into good position in the dental arch has also been reported with success by Cangialosi, Hemalatha and Balasubramaniam, Chew and Ong. Hence, extraction of the impacted supernumerary tooth was done and was followed by an innovative orthodontic traction of the unerupted permanent central incisor to bring the tooth into proper position in the arch.

Three accepted ways of surgical exposure have been suggested by Becker as:

a. Circular excision of the oral mucosa immediately overlying the impacted tooth.

b. Apically repositioning of the raised flap.
that incorporates the attached gingiva overlying the impacted tooth.

c. Closed eruption technique in which the raised flap that incorporates attached gingiva is fully replaced back in its former position after an attachment has been bonded to the impacted tooth.

The closed eruption technique has been favored by many clinicians who claim that the aesthetic and periodontal outcome is far more superior when compared with the circular excision and apically positioned flap technique like Lin (6) Uematsu et al.,(3) and Paola et al.(22) In the presented case closed eruption technique was used for better and esthetic gingival margin. At the end of the treatment, patient showed normal clinical crown length with acceptable gingival contour.

The extrusion force applied on the impacted central incisor in the present case was very light and measured in the range of 40-50 grams ,this result cited by Chawla and Kapur(23) but in the present case the patient was 12 years old at the time of initiation of the treatment. In our view, forces for traction greater than 50 grams should not be applied as it may be the cause of non-vitality as reported by Uematsu et al.(3) In the present case the duration of treatment was around 8-9 months and the aligned maxillary incisors remained vital and responded normally to percussion and mobility and sensitivity testing as reported by Kumar.(24)

Smailene et al.,(1) cited that early diagnosis of the maxillary central incisor impactions with surgical removal of supernumerary tooth coupled with adequate space, spontaneous eruption of the impacted maxillary central incisors occurs . Bayram et al.,(25) reported that if the impacted tooth is diagnosed at a later stage with its root completely formed or if present in the unfavorable position, combination of surgical and orthodontic treatment has to be carried out.

CONCLUSION

Supernumerary teeth may result in the non eruption of adjacent permanent incisors. Early diagnosis of the presence and removal of supernumerary teeth is essential. Maxillary permanent central incisors were successfully positioned in the maxillary arch by surgical exposure and orthodontic traction, which showed good stability.

REFERENCES