



Case Report

Management of impacted maxillary central incisor by using TADs in different methods

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ABSTRACT

Impaction of maxillary central incisor is one of the challenging cases in orthodontic clinics. Proper diagnosis and application of orthodontic biomechanics can limit the number of prosthetic and surgical intervention when treating maxillary central incisor impaction.

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1. Introduction

The term “dental impaction” refers to a tooth placed within the bone and/or soft tissue, which likely won't erupt by itself or fails to erupt after the expected time of eruption and the contralateral tooth has erupted six months earlier. The foremost commonly impacted teeth are mandibular third molars, maxillary canines, mandibular second premolars and maxillary central incisors, respectively.¹⁻⁵ Missing incisors are perceived as unsightly which might have an influence on self-esteem and general social interaction. Moreover, it is substantial to diagnose and manage the problem as early as possible.⁶ The incidence of impacted maxillary central incisor within the 5–12 year-old children has been reported as 0.13%.⁷ The prevalence of maxillary central incisor impaction has been mentioned to be between 0.06-3%.⁸

Studies reveal many reasons of maxillary incisors' failure to erupt. Eruption failure can occur due to supernumerary teeth, odontomas, cysts developed within the eruptive path of the tooth, with supernumerary teeth and odontomas

being the most common.^{9,10} 56–60% of supernumerary teeth lead to impaction of permanent incisors as a result of an immediately hindrance for the eruption.¹¹ Furthermore, eruption failure might be due to tooth malformation or dilacerations. Dilacerations come after trauma to a deciduous tooth, while the developing successor tooth bud is deteriorated due to close proximity.

The following cases aim at providing a simple technique for the treatment of impacted maxillary central incisors during orthodontic treatment by using Temporary Anchorage Devices (TADs).

2. First Case

10 year- and 6 month-old Saudi female, presented to the orthodontic department at King Saud Medical City, Riyadh, Saudi Arabia. The chief complaint was “I don't like my smile”. She is medically fit, and had a history of trauma to the upper anterior segment with an early exfoliation of tooth #61 since she was 3 years old.

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2.1. Diagnosis Summary

Skeletal Class III due to retrognathic maxilla, Class III malocclusion with an impacted tooth #21. (Figures 1, 2 and 3) and (Table 1).



Fig. 1: Pretreatment records showing the absence of the maxillary left central incisor.



Fig. 3: Cephalometric X-ray

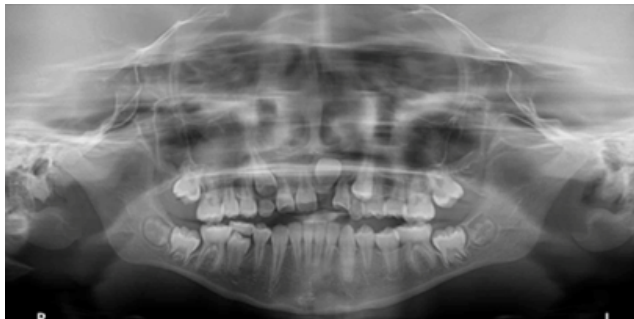


Fig. 2: Panoramic view

2.2. Treatment Objectives

1. Disimpaction and traction of tooth #21.
2. Obtaining normal appearance of the impacted tooth and gingival tissue.
3. Improving the patient's profile.
4. Improving lips harmony and balance.
5. Improving sagittal skeletal relationship.

2.3. Treatment Progress

1. Insertion of palatal TAD's (8 mm in length, Unitek 3M). (Figure 4)

Table 1: Lateral cephalometric reading

	Mean	Pre-Treatment
SNA	$82^\circ \pm 2^\circ$	76°
SNB	$78^\circ \pm 2^\circ$	80°
ANB	$2^\circ \pm 2^\circ$	-4°
NA-APog	$0^\circ \pm 5^\circ$	2°
SN-Pog	$80^\circ \pm 3^\circ$	81°
With Appraisal	-1mm/0mm	-4° mm
SN-MP	$32^\circ \pm 5^\circ$	37°
PP-MP	$25^\circ \pm 3^\circ$	34°
ANS-ME/N-ME	$55 \pm 3\%$	57°
U1-L1	$131^\circ \pm 5^\circ$	110°
U1-SN	$104^\circ \pm 2^\circ$	119°
U1-PP	$110^\circ \pm 6^\circ$	123°
U1-NA	22°	29°
U1-NA (MM)	4 mm	2 mm
L1-NB	25°	29°
L1-NB (MM)	4 mm	6 mm
L1-Pog (MM)	$1\text{mm} \pm 2\text{mm}$	7mm
L1-MP	$93^\circ \pm 6^\circ$	92°
UL-E-Line	$-4\text{mm} \pm 2\text{mm}$	-6mm
LL-E-Line	$-2\text{mm} \pm 2\text{mm}$	2mm
NLA	$90^\circ - 110^\circ$	92°

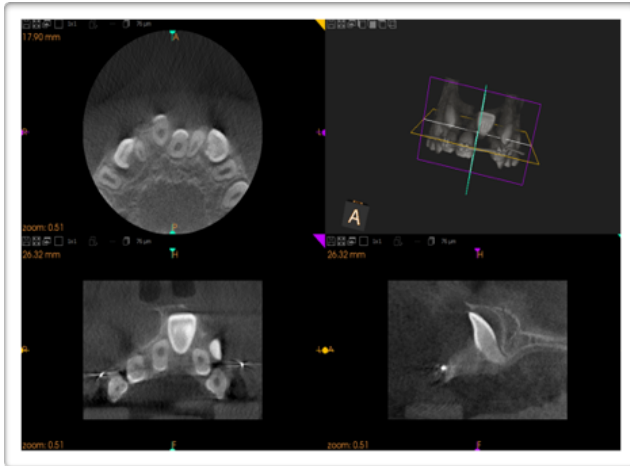


Fig. 4: CBCT view

2. Upper impression for fabrication of modified trans-platal arch with finger spring and canine
3. Hhooks for protraction. (Figure 6)
4. Extraction of upper primary canines.
5. Surgical disimpaction of tooth #21 with attachment of lingual button.(Fig1.6Figure 7)
6. Cementation of modified trans-platal arch with finger spring.(Figure 8)
7. Facemask protraction and traction of tooth #21.(Figures 9, 10 and 11)
8. Continue with facemask protraction for 3 months at night (as a retention protocol).
9. After traction of tooth #21 and achievement of positive overjet, removing the finger spring.(Figure 12)
10. Removing the modified trans-platal arch.
11. Reevaluation for phase II comprehensive orthodontic treatment.



Fig. 5: 1.4: Insertion of palatal TAD's

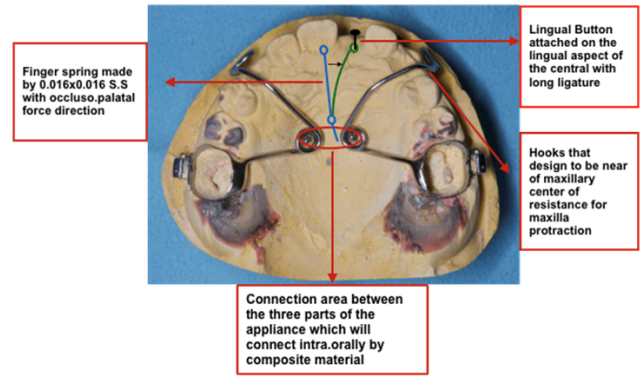


Fig. 6: Fabrication of modified transplatal arch appliance with finger spring.



Fig. 7: Surgical exposure (disimpaction) of tooth #21 with lingual button attachment.



Fig. 8: Cementation of the appliance and start of traction.



Fig. 9: After 3 months of activation and protraction.



Fig. 10: After 5 months of activation and protraction.



Fig. 11: After 7 months of activation and protraction, finger spring was removed due to the interference with occlusion and the tooth was in good path of eruption.



Fig. 12: After 9 months of activation and protraction, final result after central incisor traction and sagittal plane correction by maxillary protraction.

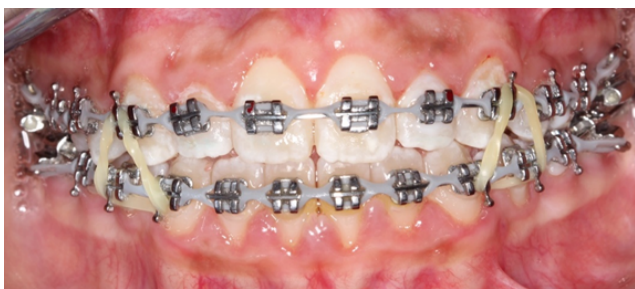


Fig. 13: During finishing stage

3. Second Case

17 year-old Saudi female, presented to the orthodontic department at King Saud Medical City, Riyadh, Saudi Arabia. The chief complain was “I have small teeth and I’m looking for better smile”. She is medically fit with no history of hospitalization nor medication use.

3.1. Diagnosis Summary

Class I skeletal pattern, Class II division 1 malocclusion complicated with supernumerary teeth (mesiodens) and impacted central incisor #11.(Figures 14, 15 and 16) and (Table 1).



Fig. 14: Pretreatment records showing the absence of the maxillary right central incisor.



Fig. 15: Panoramic view

3.2. Treatment Objectives

1. Extraction of supernumerary teeth.
2. Space reopening for right maxillary central incisor.
3. Wait-and-see approach for spontaneous eruption of the impacted tooth.



Fig. 16: Cephalometric X-ray

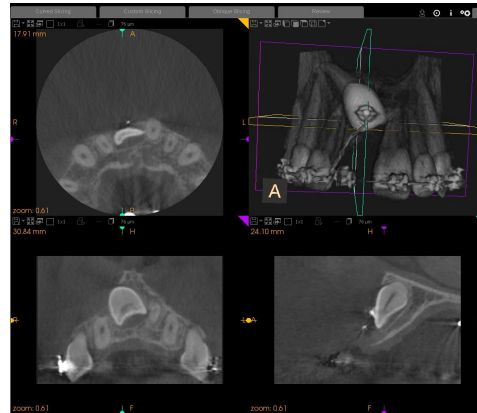


Fig. 17: CBCT view

4. Disimpaction of impacted tooth by exposure of the crown and delivering force to the tooth if no movement occurred spontaneously.
5. Obtaining normal appearance of the impacted tooth and gingival tissue.

3.3. Treatment Progress

1. Trans-platal arch was fabricated and cemented to upper first molars, one miniscrew inserted in paramedian of palate and ligated with trans-platal arch for anchorage.
2. Extraction of supernumerary teeth and upper first premolar were performed to correct crowding and proclination.
3. Bonding fixed orthodontic appliance with Roth 0.022 bracket prescription.
4. Opening of enough space for impacted right central incisor and waiting for spontaneous eruption of the impacted tooth. (Figure 18)
5. No movement of impacted tooth occurred. The patient was referred to a periodontist for surgical exposure and bonding of button with ligature using closed flap approach. Then, the chain was passed through the flap to the oral cavity. (Figures 19 and 20)
6. Fixed Pontic tooth was placed in the space that was created on arch wire for esthetic purposes and traction of Pontic tooth by power chain was initiated. (Figures 21 and 22)
7. The patient visited the clinic monthly to re-activate the elastic power chain.
8. After one year the incisor had erupted to a good level, after which the traction was discontinued and bracket on tooth #11 was bonded. (Figure 23)

Table 2: Lateral cephalometric reading

	Mean	Pre-Treatment
SNA	82° ± 2°	81°
SNB	78° ± 2°	77°
ANB	2° ± 2°	-4°
NA-APog	0° ± 5°	4°
SN-Pog	80° ± 3°	77°
With Appraisal	-1mm/0mm	2 mm
SN-MP	32° ± 5°	35°
PP-MP	25° ± 3°	26°
ANS-ME/N-ME	55 ± 3%	60%
U1-L1	131° ± 5°	116°
U1-SN	104° ± 2°	112°
U1-PP	110° ± 6°	118°
U1-NA	22°	30°
U1-NA (MM)	4 mm	6 mm
L1-NB	25°	29°
L1-NB (MM)	4 mm	7 mm
L1-Pog (MM)	1mm ± 2mm	6 mm
L1-MP	93° ± 6°	95°
UL-E-Line	-4mm ± 2mm	2 mm
LL-E-Line	-2mm ± 2mm	4 mm
NLA	90°-110°	100°

9. Starting of leveling and alignment.
10. Space closure.
11. Finishing and detailing.
12. Retention phase with fixed retainer from 3-3.



Fig. 18: Opening of space for impacted right central incisor

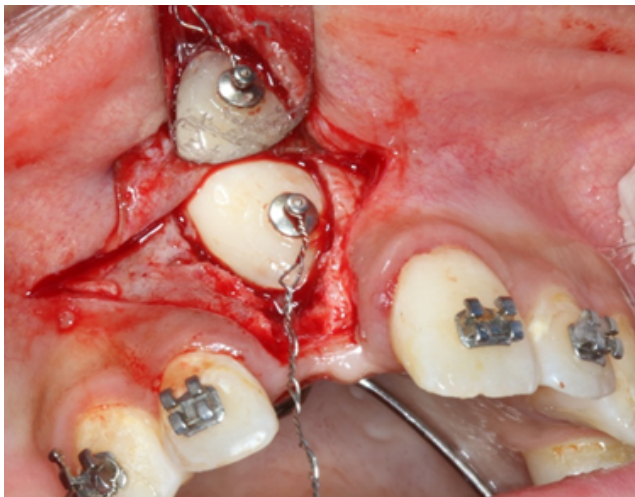


Fig. 19: Surgical exposure and bonding of button with ligature.

4. Discussion:

The risk of tooth injury depends on the developmental stage during eruption as well as the sort and direction of the trauma.⁹⁻¹² The orthodontist offers multiple options for treatment, but it is essential to detect dental impaction at the appropriate time to obtain acceptable results.¹³ Palpation and radiographs, including panoramic tomography, should be done during examination.¹⁴ Nowadays, cone beam computed tomography(CBCT) technology is the best choice

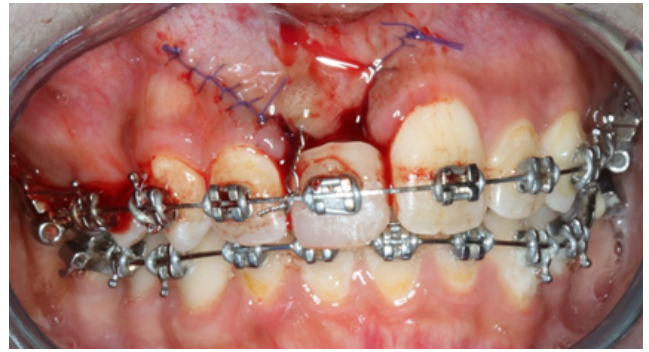


Fig. 20: Closed approach flap.



Fig. 21: Bonding button on palatal surface and starting of traction on button by power chain.



Fig. 22: Pontic tooth #11 for esthetic wise and traction in same time.

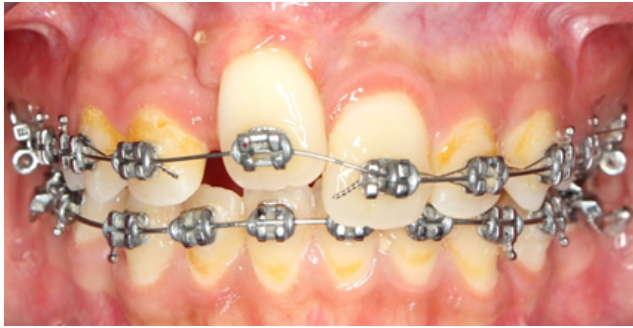


Fig. 23: After one year the incisor had erupted to a good level and Starting of leveling and alignment.

for accurate diagnosis and evaluation of an unerupted tooth. Before any surgical exposure, it is mandatory to determine the location of impacted tooth. This diminishes the harm to surrounding tissue, and ameliorates the healing.¹⁵ A multidisciplinary evaluation should be fulfilled when assessing an impacted tooth and follow-up appointments should be arranged until it is consolidated with the remaining teeth.¹⁶

Orthodontic intervention with surgical exposure of impacted tooth represent an excellent choice to treat dental impaction with good aesthetic and functional results. A few reports mentioned effectively treated impacted teeth by surgical crown exposure and orthodontic traction.^{17,18} Numerous studies noticed that an impacted tooth can be delivered to good alignment in the arch.^{18,19} The modern treatment methodology utilizes a surgical crown exposure with placement of an auxiliary followed by orthodontic dragging of the tooth. The efficiency and effectiveness of treating complicated cases have significantly improved with Temporary Anchorage Devices (TADs). TADs are considered a good option to move impacted teeth before starting a fixed orthodontic treatment. TADs became popular due to their simple insertion and removal, minimal need for patient compliance.²⁰ Furthermore, TADs are stable within the bone, are able to increase anchorage capacity, and have no complications that could hinder health or treatment outcomes.²¹ Different shapes, diameters, and lengths of TADs are available in the market. A failure rate of 13.5% was associated with TADs.²² On the other hand, an increase in the success rate was found when screws with a diameter of at least 1.2 mm and a length of ≥ 8 mm were used.²³

4.1. Conclusions

It's crucial to identify the etiology of eruption failure and prepare a proper treatment plan accordingly. CBCT should be considered as a routine diagnostic aid in cases of impacted teeth, because it gives highly detailed three-dimension information. The treatment should consist creating space for the unerupted tooth, surgical removal

of obstacles, exposure of impacted tooth, and orthodontic traction by different ways. The use of TADs can facilitate difficult orthodontic tooth movements and allow controlled movement of the impacted tooth.

5. Source of Funding

None.

6. Conflict of Interest

None.

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