

Case Report

Chair time saving method for treatment of an impacted maxillary central incisor with 15-month follow-up

Saeed Noorollahian¹, Farinaz Shirban²

¹Department of Orthodontics, Dental Implants Research Center, School of Dentistry, Isfahan University of Medical Sciences, ²Department of Orthodontics, Dental Research Center, School of Dentistry, Isfahan University of Medical Sciences, Isfahan, Iran

ABSTRACT

Maxillary permanent incisors have a major role in facial esthetics. Impaction of them has great adverse effect on smile and causes serious concerns in patient and parents. Physical barriers (e.g., overretained primary teeth, supernumerary teeth, and pathologic lesions), space problems, developmental abnormalities, altered eruption sequence, trauma, palatal clefts, and genetics can act as etiologic factors. Currently, the conventional technique to treatment of impacted teeth consists of a combined orthodontic and surgical approach, to guide the impacted teeth in a constant position and surrounded by normal hard and soft tissues. Treatment is challenging because of some limitations such as patient's age, cooperation, anchorage, and mechanotherapy possibilities. Hence, sophisticated treatment planning is crucial. A 9-year-old girl with horizontally impacted maxillary left central incisor treated with surgical exposure and closed orthodontic forced eruption with 2 × 4 partial setup fixed appliances. Force was applied with 0.014 inch nickel–titanium wire as elastic overlay and handmade ligated bracket. To save chair time in each appointment, the overlay was activated by twisting of ligature wire extensions around it. After 16-month treatment, impacted incisor emerged in oral cavity, with accepted alignment and inclination. Handmade ligated bracket with ligature wire extensions is useful for the treatment of impacted teeth. Due to easy activation of overlay in this method, chair time become short in each appointment.

Key Words: Forced eruption, impacted tooth, incisor

Received: October 2016
Accepted: October 2017

Address for correspondence:
Dr. Farinaz Shirban,
Ferdosi Street, N:3,
Isfahan, Iran.
E-mail: shirban123@yahoo.
com

INTRODUCTION

Impacted teeth are those that cannot erupt into the oral cavity while more than two-thirds of their root is formed.^[1]

Under confident anatomical conditions, trauma or infective processes involving the deciduous teeth can cause problem for permanent tooth eruption, when the permanent tooth is not appear in the oral cavity in the physiological eruption timeframe, the reason is ectopic positioning. A tooth is considered “impacted”

when it fails to erupt in the oral cavity within the expected developmental window.^[2]

It seems that, in eruption timing, root formation as a physiologic age index is more important than chronologic age. Physical obstacles (e.g., supernumerary teeth),^[1] pathologic lesions, dense overlying bone and fibrous gingiva, space problems, developmental abnormalities,^[3] structural

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Noorollahian S, Shirban F. Chair time saving method for treatment of an impacted maxillary central incisor with 15-month follow-up. Dent Res J 2018;15:150-4.

Access this article online



Website: www.drj.ir
www.drjjournal.net
www.ncbi.nlm.nih.gov/pmc/journals/1480

malformations such as root dilacerations,^[4] altered eruption path^[5] or sequence, trauma,^[6] and palatal clefts and genetics^[7] can act as etiologic factors.

Most frequently impacted teeth are the third molars (20%–30%) because they are the last teeth to erupt in the oral cavity, after that maxillary canines with palatal dislocation, mandibular second premolars (0.3%), and maxillary central incisors (0.1%).^[2,8,9]

Maxillary permanent incisors have major role in facial esthetics. Several treatment options have been developed for impacted teeth, for example, autotransplantation, extraction, and replacement with prosthesis or space closing with orthodontic movement of adjacent teeth.^[1,4] The best choice is orthodontic and surgical intervention to bring these impacted teeth into proper position because its benefits in long-term esthetic, function, and stability.^[1]

This article attempts to report treatment stages of closed forced eruption in a 9-year case with horizontal impaction of left central incisor, with new handmade ligated bracket with ligature wire extensions and 0.014 inch nickel–titanium (Ni–Ti) wire as elastic overlay. Due to easy activation of overlay in this method, chair time become short in each appointment.

MATERIALS AND METHODS

A 9-year-old girl was referred to orthodontic department. The chief complaint was concern about the unerupted maxillary left central incisor.

Clinical evaluation

No history of disease was reported. She had balanced facial proportions but impaired smile esthetic due to hallow space in anterior region of dental arch [Figure 1].

Intraoral evaluation revealed Class I molar relationship, normal overjet and overbite, and carious upper primary molars. The crown bulging of impacted left upper incisor was apparent and palpable at apical of mucogingival line.

Radiographic evaluation

The panoramic view [Figure 2a] confirmed the horizontal position of impacted maxillary left central incisor because its crown and root had nearly same height from occlusal plane. The lateral cephalometric [Figure 2b] assessment confirmed horizontal position of impacted incisor. The root had buccal deviation relative to normal crown root inclination.

Treatment plan and progress

Surgical exposure and closed orthodontic forced eruption with 2 × 4 partial setup fixed appliances were planned. The Combined technique allows the traction of the impacted teeth to the correct position in the alveolar ridge.^[10] The patient was referred to the dentist to restore the carious teeth.

Orthodontic preparation

018 slot orthodontic brackets and buccal tubes (American Orthodontics, Master Series, Wisconsin, USA) were bonded to the upper permanent incisors and first molars. Wire sequence was 0.016 inch Ni–Ti and then 0.016 inch stainless steel arch wire (American Orthodontic, Sheboygan, Wisconsin, USA). On recent wire, Ni–Ti open coil (G & H Wire Co., Indiana, USA) was used to provide proper space.^[4] Then, 0.017 × 0.025 inch stainless steel arch wire was inserted as stiff and base arch wire to consolidate dentition.^[11] The same Ni–Ti open coil was maintained to keep proper space.

Surgical exposure

After local anesthesia, partial thickness labial flap was raised and an orthodontic bracket was bonded on the labial surface of impacted incisor. A new handmade ligated bracket used in this study. A 0.012 inch ligature wire was twisted around the bracket wings two times [Figure 3] and its extensions were directed around left lateral incisor bracket. Then, the flap was repositioned and sutured.

Orthodontic forced eruption

Based on the force analysis of the impacted tooth position, treatment prioritized three orthodontic



Figure 1: Pretreatment intraoral photographs.

movements: Extrusion, verticalization, and lingualization. After a week, orthodontic traction was initiated with a 0.014 inch Ni–Ti wire as elastic overlay [Figure 4]. The overlay was activated to verticalize and expose the tooth crown in the oral cavity, extrusive force vector passes from buccal of center of resistance due to bonding the bracket in the buccal surface of the tooth, so clock-wise rotation of tooth had been predicted and the lingualization movement accrued.^[11]

At each monthly appointment, the Ni–Ti overlay was deflected 2 mm apically, and the ligature wire extensions twisted toward it as activation. After 4 months, the impacted incisor emerged into oral cavity. Hence, its bracket was repositioned into proper position 0.014, and after that 0.016 Ni–Ti arch wire was fully engaged into all brackets. The crowns alignment had been achieved. In this time, patient missed four appointments due to her father illness. After 4 months, the inclination of left central incisor was acceptable. Therefore, the alignment continued with a 0.016 × 0.022 inch Ni–Ti and stainless steel wire (American Orthodontic, Sheboygan, Wisconsin, USA). After 2 months, all the brackets removed [Figure 5]. Alignment after 15-month follow-up was seen in Figure 6.

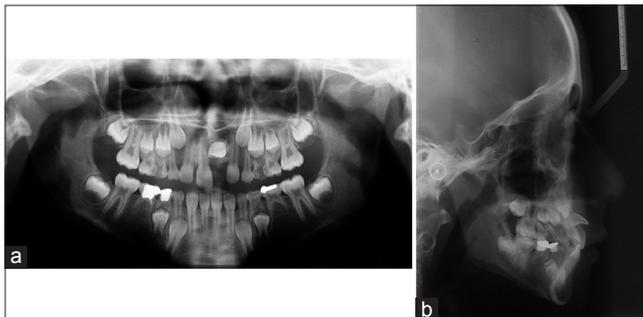


Figure 2: Pretreatment radiographs: (a) Panoramic radiograph; (b) lateral cephalometric radiograph.



Figure 3: Bracket with 0.012 inch ligature wire that was twisted around the wings.

RESULTS

After 16-month treatment, impacted incisor emerged in oral cavity, with accepted alignment and inclination. The smile arc is consonant and the patient is satisfied with the result [Figure 5].

DISCUSSION

It is strongly recommended that all teeth that have not erupted 6 months after the normal eruption time should be examined radiographically to assess any possible cause for the delayed eruption.^[12] Early diagnosis and interception in these cases is the best approach for their management.^[4] When more than three-fourth of root is completed and the tooth does not emerge to oral cavity, it can be considered as impacted, especially if its antimere has erupted more than 6 months ago. The longer impaction time, the weaker prognosis is expected.^[4] Evaluation of mechanotherapy possibilities to provide enough space and anchorage should be considered when forced eruption is planned. In this case, presence of teeth #11 and #22 can act as anchorage for extrusion of tooth #21. The early interception permits the epithelial root sheath to be redirected and offers the chance for the developing root to adapt to the correct spatial relationship of the aligned crown.^[4]

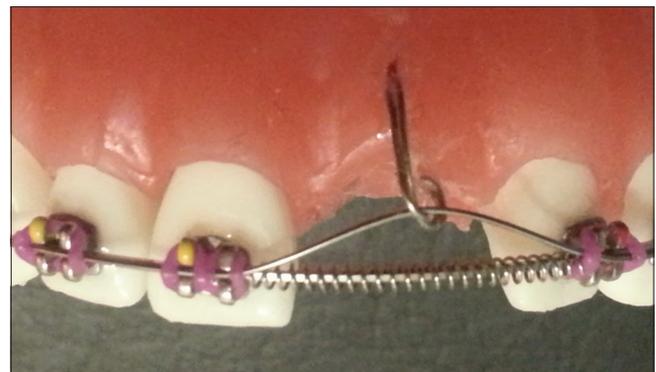


Figure 4: Orthodontic traction with a 0.014 nickel–titanium wire as elastic overlay on stiff base arch wire.



Figure 5: Posttreatment intraoral photographs.



Figure 6: Fifteen months follow up intraoral photographs.

The aim of treatment of impacted tooth is a proper alignment in the dental arch, in a stable position, with a sufficient keratinized gingiva. The surgical and orthodontic technique allows the traction of the impacted teeth to the correct position in the alveolar ridge.^[10]

In this case, extrusive force vector passes from buccal of center of resistance, so clock-wise rotation of tooth had been predicted. This type of tooth movement is favorable in this case because it brings the crown to line of occlusion root near the normal inclination.

The surgical techniques used to expose impacted anterior maxillary teeth are apically positioned flap, closed eruption, and closed flap.^[13] The more extensive surgery, the more adverse side effects such as gingival recession, bone loss, and reduced width of keratinized gingiva.^[14] These complications have negative effect on esthetic result. In this case, the position of crown was apical to the mucogingival line but enough keratinized tissue was there, so we used closed eruption technique. In this approach, more esthetic results will be predicted.^[15] Therefore, the function has been recognized, besides position and esthetic tooth in the oral cavity, and the integrity of the periodontium and surrounding structures was maintained.^[11]

The method of traction used in this paper has several advantages. The Ni–Ti arch wire has long range of action due to high springiness and low load-deflection rate. The 0.012 inch ligature wire has been twisted around deflected Ni–Ti overlay to produce force. In the next visit, the Ni–Ti overlay has been deflected again between two tags of ligature wire. This kind of activation is very simple and fast so it needs short

chair time. The less manipulation during activation causes less patient pain, discomfort, and less probability of ligature wire disruption or debonding on impacted tooth.

CONCLUSION

The use of overlay as an easy technique to traction of the upper incisor has enabled, professional, and predictable result, minimizing side effects in orthodontic arch.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient's parents have given consent for images and other clinical information to be reported in the journal. The patient's parents understand that name and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or non-financial in this article.

REFERENCES

1. Ajith SD, Shetty S, Hussain H, Nagaraj T, Srinath M. Management of multiple impacted teeth: A case report and review. *J Int Oral Health* 2014;6:93-8.
2. Dinoi MT, Marchetti E, Garagiola U, Caruso S, Mummolo S, Marzo G, *et al.* Orthodontic treatment of an unerupted mandibular canine tooth in a patient with mixed dentition: A case report. *J Med Case Rep* 2016;10:170.
3. Goho C. Delayed eruption due to overlying fibrous connective tissue. *ASDC J Dent Child* 1987;54:359-60.
4. Pavlidis D, Daratsianos N, Jäger A. Treatment of an impacted dilacerated maxillary central incisor. *Am J Orthod Dentofacial Orthop* 2011;139:378-87.
5. Stewart DJ. Dilacerate unerupted maxillary central incisors. *Br Dent J* 1978;145:229-33.
6. Smith DM, Winter GB. Root dilaceration of maxillary incisors. *Br Dent J* 1981;150:125-7.
7. Vichi M, Franchi L. Eruption anomalies of the maxillary permanent cuspids in children with cleft lip and/or palate. *J Clin Pediatr Dent* 1996;20:149-53.
8. Gyulai-Gaál S, Mihályi S, Martonffy K, Suba Z. Etiology and diagnostics of upper canine tooth retention. *Fogorv Sz* 2010;103:49-52.
9. Dinoi MT, Lacarbonara M, Dimartino S, Monaco A, Marzo G.

- Periodontal probing of an impacted tooth recovered through a surgical-orthodontic approach: A case report. *J Med Case Rep* 2014;8:25.
10. Spuntarelli M, Cecchetti F, Arcuri L, Testi D, Melone P, Bigelli E, *et al.* Combined orthodontic-surgical approach in the treatment of impacted maxillary canines: Three clinical cases. *Oral Implantol (Rome)* 2015;8:63-7.
 11. Nakandakari C, Gonçalves JR, Cassano DS, Raveli TB, Bianchi J, Raveli DB, *et al.* Orthodontic traction of impacted canine using cantilever. *Case Rep Dent* 2016;2016:4386464.
 12. Becker A. Early treatment for impacted maxillary incisors. *Am J Orthod Dentofacial Orthop* 2002;121:586-7.
 13. Jacoby H. The ‘ballista spring’ system for impacted teeth. *Am J Orthod* 1979;75:143-51.
 14. Kocadereli I, Turgut MD. Surgical and orthodontic treatment of an impacted permanent incisor: Case report. *Dent Traumatol* 2005;21:234-9.
 15. Becker A, Brin I, Ben-Bassat Y, Zilberman Y, Chaushu S. Closed-eruption surgical technique for impacted maxillary incisors: A postorthodontic periodontal evaluation. *Am J Orthod Dentofacial Orthop* 2002;122:9-14.