

Dilacerated Maxillary Central Incisor Alignment using 2 X 4 Appliance: A Rare Case Report

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Abstract

The 2 X 4 is a fixed appliance which consists of bands on the first permanent molars, brackets bonded to the erupted maxillary incisors and continuous arch wire incorporated on these teeth to provide/maintain good arch form, as well as control anterior teeth. The most ideal time to start an orthodontic treatment is the mixed dentition phase. One of the parents' myth on orthodontic treatment is that it should only be carried out after the eruption of all permanent teeth. Identifying a dilaceration as causing a malocclusion at an early stage and intervening at a correct age can help achieve reduction in the degree of dilaceration, thereby ensuring stability in the treatment results. A 2 X 4 appliance is a safe, cost-effective and simple treatment in the correction of various malocclusions in the early mixed dentition period, with shorter treatment time, better stability and improved masticatory function.

Keywords: 2 X 4 appliance, Root dilaceration, Interception, Incisors

Introduction

Dilaceration is the 90° or greater angulation of the tooth or root along the long axis of tooth or root towards mesial or distal direction.¹ Dilaceration can also be defined as a distorted root form and it can occur from a distortion of the crown relative to the root.² According to Chohayeb,³ a root deviation can be considered root dilaceration when the angle between the root and the long axis of the tooth is equal to or greater than 20°. This condition in a permanent tooth is mostly caused by trauma to the corresponding deciduous tooth.⁴⁻⁶ If so, the degree and location of the dilaceration will depend on the stage of development of the tooth germ, when the trauma occurred. The cause of root dilaceration is controversial, being attributed to a strong relation with trauma to the primary dentition, as intrusive luxation or avulsion of its deciduous corresponding tooth. A transposition abnormality can also occur after trauma, due to prolonged retention of primary teeth, early loss of primary teeth, lack of root resorption of primary canine teeth and interchange in the position of the developing tooth buds. Trauma can cause the erupting

tooth to migrate to a position of least resistance, to occupy the space of the adjacent tooth.⁷ If the trauma occurs after the crown is complete, the crown may be displaced relative to the root. Root formation may even stop forming, leaving a permanently shortened root or agenesis of the root depending on the age of the child, when the trauma occurred. More frequently, however, root formation continues, but the remaining portion of the root then forms at an angle to the traumatically displaced crown. If distortion of root position is severe enough, it is almost impossible for the crown to assume its proper position.⁸

The early treatment of (non-skeletal and skeletal) orthodontic anomalies in the deciduous and early mixed dentition is intended to prevent the development of pronounced anomalies in the late mixed and permanent dentition with the ultimate aim of reducing or even eliminating the need for later orthodontic treatment.⁹ Partial fixed treatment with the 2 X 4 appliance helps in the early correction of simple and minor malocclusions such as dilacerations or malpositioning involving one or more teeth. It can also help in preventing complex malocclusions, which then must be carried out in two steps, when attempted later in life. Early recognition and correction are extremely important in cases such as a developing dilaceration or ectopic eruption in order to prevent further complications in malocclusion. However, the need for treatment should depend on the severity of the malocclusion and the effect on the neuromuscular and skeletal system.¹⁰

The 2 X 4 is a fixed appliance which consists of bands on the first permanent molars, brackets bonded to the erupted maxillary incisors and continuous arch wires incorporated on these teeth to provide/maintain good arch form, as well as control anterior teeth.¹¹ The major advantages in carrying out this treatment with a 2 X 4

appliance are the easiness with which single tooth movements and space closure can be controlled, and the possibility to control the force magnitude and vector with much more precision than with a removable appliance.¹² Supporting stainless steel tubing is placed in the long archwire spans between the molars and the incisors to prevent trauma to the cheek and damage to the archwire. The NiTi archwire left protruding from the distal aspect of the molar tubes can be annealed to allow it to be turned down hard against the tube.¹³ This prevents the archwire sliding forward, increasing the arch length, causing trauma to the soft tissues or loss of anchorage of the molar teeth. If the anterior teeth are in crossbite or scissor bite however, this annealing and bending is avoided so as to bring about increase in arch length and correction of the relationship. The functional correction coupled with the obvious psychological benefit gives this simple and easily placed appliance a significant advantage over the traditional method of treating these potentially challenging mixed dentition problems.¹⁴

In this case report, a description of how a dilacerated upper central incisor was identified early and moved into its proper position with orthodontic treatment avoiding extraction, and prosthetic/implants replacement.

Case report

A 9-year-old female patient reported to our department with the chief complaint of distally slanting upper front tooth in the anterior region with midline spacing. The patient's mother gave a history of delayed eruption of primary teeth until the age of 2 years. Intraoral examination showed the presence of erupting 11 and probably 21 with the 21 migrating distally forming a median diastema. Functional tongue thrusting habit was present with accompanying anterior open bite and mild deficiency in arch length due to the lingual positioning of the maxillary central incisors. There was mild crowding in

the lower anterior region. There were multiple primary teeth which were carious.

On radiographic examination it was seen that the midroot of 21 was dilacerated and the root apex was incomplete. The crown of 21 was distally placed occupying the position of 22 clinically. The 22 was found to be impacted.

Prognosis of 21 was explained to the patient and the parent and an informed consent was obtained from the parent. The treatment was decided as 2 X 4 appliance in the upper arch for the uprighting and aligning of 21, before the dilacerated root completed its formation. This was to be followed by habit breaking appliance and correction of the sagittal relationship of the maxilla.



Figure 1: Pre-operative photograph



Figure 2: Pre-operative Intraoral Periapical radiograph

Impression was made with alginate for the study model. Molar band with buccal tubes were placed on 16 and 26. Since the lateral incisors had not erupted the decision was taken to include the primary maxillary canines in the treatment. MBT brackets were placed in relation to 11, 21, 53 and 63. 0.012 Nickel Titanium (NiTi) wire was placed and stabilised with modules. The distal annealing and bend of the archwire was avoided to bring about correction of arch length. Periodic recall and review were done. The archwire was replaced with 0.014 NiTi after 4 weeks, till alignment was complete.



Figure 3: MBT brackets and NiTi wire in position

After 12 weeks, the archwire was replaced with 0.014 Stainless Steel wire and E chain was placed on 11 and 21 for closure of diastema. Post-operative IOPA of 21 revealed that the dilaceration of the root had reduced considerably and the alignment of the roots of 21 and 11 was attained, thereby creating space for 22 to erupt.



Figure 4: E chain placed on SS wire



Figure 5: Post-operative radiograph

Discussion

There are currently contrasting opinions on both the therapeutic choice for cases of dilacerated teeth. Treatment of younger children in the early mixed dentition period offers advantages in terms of stability and avoidance of future complications, which helps them build their self-respect and aesthetic appearance, thus improving their overall personality. In growing patients, it is often possible to save dilacerated teeth with a multidisciplinary approach. The factor determining prognosis is whether the tooth is already ankylosed or if excessive or intermittent orthodontic forces will lead to external resorption of the roots.^{15,16} Ericsson et al found that performing active orthodontic treatment in the early mixed dentition has definite advantages for the developing tooth, and does not lead to root resorption, when the case is properly chosen.¹⁷ Others state that it must be limited to cases showing a marked angle between crown and root.⁴ We found that the angulation of the root of the left central incisor reduced as treatment progressed. The time taken for the correction of the angulation and closure of diastema, was only 3 months. Early diagnosis and early intervention are essential to bring about this change in a

short period of time. In a study of Mckeown, 32.79% of general dentists and 49.46% of orthodontists used the 2 X 4 for young children and the time taken for correction of malocclusion was less than 6 months of treatment.¹⁸

The major advantages in carrying out this treatment with a 2 X 4 appliance is the ease with which the tooth can be moved and the space closure can be controlled using a fixed appliance and also the possibility to control the force magnitude and vector with much more precision than with a removable appliance.¹⁴

The most commonly mentioned therapeutic solution in literature, for a dilacerated tooth in adults, is surgical extraction and substitution with Maryland-bridge or prosthetic/implants devices.^{19,20} This is most likely because of the technical difficulty involved in exposure and orthodontic alignment and the uncertain prognosis of such malformed teeth.^{21,22} But when the condition was diagnosed and intercepted at an early developmental stage, the angle of the tooth to the root of the central incisor, was automatically reduced by the 2 X 4 appliance. Moreover, only a minimum amount of force needs to be used and the alignment could be completed in a short time. Displaced tooth in children should be repositioned as early as possible, so that when root formation does resume, distortion of the root position will be minimized.²³ Careful planning is required to avoid any progression of the root dilaceration and resorption through orthodontic treatment.²⁴ Sufficient space could be created for the eruption of the adjacent lateral incisor, which would otherwise have been impacted or erupt ectopically. Early correction can help correct the relationship of malaligned or malpositioned teeth with their opposite and contralateral ones.¹⁰ Early orthodontic treatment has been found to improve both psychosocial development and masticatory function in children.²⁵ The advantages of this treatment modality include aesthetic improvement,

avoidance of prosthetic rehabilitation, and better periodontal results.

The main diagnostic problem in dilacerations is definitely the difficulty of radiological diagnosis of the exact morphology of the dilacerated tooth and predicting whether it will be possible to reposition it into the arch. It was therefore difficult to establish the prognosis. It depends on both the degree and position of the dilaceration as well as the stage of formation of the root. A dilacerated tooth with a crown-root obtuse angle, a position near the marginal crest and incomplete formation of the root has better prognosis with orthodontic traction.²⁵⁶⁵ However, this difficulty has been lessened with the advent of the Cone Beam Computer Tomography, which can give us a three-dimensional picture of the anomaly. The diagnosis of the dilaceration is no longer a difficulty and the prognosis of the situation can also be assessed earlier.

Conclusion

The most ideal time to start an orthodontic treatment is the mixed dentition phase. One of the parents' myth on orthodontic treatment is that it should only to be carried out after the eruption of all permanent teeth. Identifying a dilaceration as causing a malocclusion at an early stage and intervening at a correct age can help achieve reduction in the degree of dilaceration, thereby ensuring stability in the treatment results. A 2 X 4 appliance is a safe, cost-effective and simple treatment in the correction of various malocclusions in the early mixed dentition period, with shorter treatment time, better stability and improved masticatory function.

References

1. Proffit WR, Fields WH, Sarver DM. *Contemporary Orthodontics*. Elsevier, 2012.

2. Chohayeb AA. Dilaceration of permanent upper lateral incisors: frequency, direction and endodontic treatment implication. *Oral Surg*. 1983;55(5):519-20.
3. Odegaard J. The treatment of class I malocclusion with horizontally impacted maxillary canines. *Am J Orthod Dentofacial Orthop* 1997;111:357-65.
4. Farronato GP, Santoro F, Pignanelli M. Terapia chirurgico ortodontica di denti inclusi in soggetti adulti. *Mondo Ortodontico* 1982;1:38-49.
5. Kearns HP. Dilacerated incisors and congenitally displaced incisors: three case reports. *Dent Update* 1998;25:339-42.
6. Savas S, Candabakoglu N, Kucukyilmaz E, Veli I. Management of incomplete transposition of mandibular lateral incisor using removable appliances: Two case reports. *J Pediatr Dent* 2014;2:105-9
7. Lin YT. Treatment of an impacted dilacerated maxillary central incisor. *Am J Orthod Dentofacial Orthop* 1999;115:406-9.
8. Fatima J, Jain P, Anuj Kumar P, Paras A. A witty hand of orthodontic treatment Fixed partial appliance. *J Applied Dental and Medical Sciences* 2015; 1(3): 86- 89.
9. Jafarzadeh H, Abbott PV. Dilaceration: review of an endodontic challenge. *J Endod*. 2007;33:1025-30.
10. Olatokunbo daCosta O, Aikins EA, Isiekwe GI, Adediran VE. Malocclusion and early orthodontic treatment requirements in the mixed dentitions of a population of Nigerian children. *journal of orthodontic science*. 2016 Jul;5(3):81.
11. Quinzi V, Ferro R, Rizzo FA, Marranzini EM, Federici Canova F, Mummolo S, Mattei A, Marzo G. The two by four appliance: a nationwide cross-sectional survey. *European journal of paediatric dentistry*. 2018 Feb;19(2):145-50.

12. Loli D. The versatility of the 2X4 appliance.
13. Rao A, Tiwari S, Krishnan R, Sivadas S, Khare M. Sectional fixed appliance therapy in the mixed dentition. Dental update. 2017 Dec 2;44(11):1083-8.
14. Dowsing P, Sandler PJ. How to effectively use a 2× 4 appliance. Journal of orthodontics. 2004 Sep 1;31(3):248-58.
15. Becker A. The orthodontic treatment of impacted teeth. London: Martin Dunitz Ltd; 1998.
16. Kolokithas G, Karakasis D. Orthodontic movement of dilacerated maxillary central incisor. Am J Orthod Dentofacial 1979;76:310–5.
17. Ericson S, Bjerklin K, Falahat B. Does the canine dental follicle cause resorption of permanent incisor roots? A computed tomographic study of erupting maxillary canines. Angle Orthod 2002; 72: 95-104.
18. Mckeown HF, Sandler J. The two by four appliance: a versatile appliance. Dent Update 2001; 28: 496-500.
19. Archer WH. Oral and maxillo-facial surgery. Philadelphia: Saunders company; 1975
20. Howe GL. Minor oral surgery. John Wright; 1985.
21. McNamara T, Woolfe SN, McNamara CM. Orthodontic management of a dilacerated maxillary central incisor with an unusual sequela. J Clin Orthod 1998;32:293–7
22. Agnihotri A, Marwah N, Dutta S. Dilacerated unerupted central incisor: a case report. J Indian Soc Pedod Prev Dent 2006;24:152–4.
23. Tanaka E, Hasegawa T, Hanaoka K, Yoneno K, Matsumoto E, Dalla-Bona D et al. Severe crowding and a dilacerated maxillary central incisor in an adolescent. Angle Orthod 2006;76:510–8.
24. Kiyak HA. Does orthodontic treatment affect patients' quality of life?. Journal of dental education. 2008 Aug;72(8):886-94.
25. Farronato G, Maspero C, Farronato D. Orthodontic movement of a dilacerated maxillary incisor in mixed dentition treatment. Dental Traumatology. 2009 Aug;25(4):451-6.

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