Treatment of Ectopic Permanent Maxillary First Molar Using a K-loop

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Ectopic eruption of permanent maxillary first molar can cause root resorption of adjacent primary second molar, thus leading to early loss of primary maxillary second molar. Therefore, it is necessary to correct ectopic maxillary first molar. This case report demonstrates that K-loop can be used as a simple, comfortable, and easier method to correct ectopic eruption of permanent maxillary first molar in existing severe root resorption on adjacent primary second molar.

Key words: ectopic eruption, distal tipping, permanent maxillary first molar

INTRODUCTION

When treating growing children, clinicians may encounter situations like ectopic eruption of maxillary first molar. Usually ectopic eruption of maxillary first molar appears to be impacted partially in the distal root of primary maxillary second molar. It can cause root resorption and increase mobility of the primary second molar[1]. Early loss of primary second molar and space loss may occur consequently[1,2].

Ectopic permanent maxillary first molar is usually diagnosed during regular radiographic examinations[1]. Early intervention is recommended to prevent the sequelae of ectopic eruption[3]. Ectopic eruption of permanent maxillary first molar can be corrected by distal movement[1]. Several treatment modalities have been suggested, such as brass wire technique, wedging spring, Humphrey appliance, and Halterman appliance[2,4-6]. This case report presents correction of ectopic permanent maxillary first molar using a K-loop.

Case Report

A 7-year-old boy visited our clinic with chief complaint of abnormal eruption of right maxillary first permanent molar. He had no systemic disease or any special familial history. Clinically, right maxillary first permanent molar was locked by adjacent primary molar. The mobility of right maxillary second primary molar, which restored by stainless steel crown had increased. The panoramic radiograph revealed extensive root resorption on the distal root of right maxillary primary second molar (Fig. 1).

He was diagnosed with ectopic eruption of right maxillary permanent first molar. Thus, distal movement of right maxillary permanent first molar was planned. But right maxillary primary second molar could not be an adequate anchorage alone due to increased mobility and severe root resorption. It was necessary to modify the design to strengthen anchorage. A new appliance, which is called K-loop, was considered to enhance anchorage easily and to realize distal movement of maxillary permanent first molar effectively. By extending the wire to right maxillary primary canine and primary first molar, anchorage preparation was completed easily. Also, distal movement could be effectively induced by loop mechanism.

K-loop, as shown in Figure 2, was made of .016 X .022 rectangular TMA wire. K-loop consisted of two closing loops which met at the terminal point (Fig. 2A). K-loop can be activated by increasing the distance of each loop (Fig. 2B). It was separated easily by spreading the round part of each loop. When setting the loop, ligaturing wire may be needed to obtain passive fit (Fig 2C, 2D). Wire was extended to increase retention. Extension part was bended to obtain passive fit, too.

After fitting a band on right maxillary primary second molar, single molar tube was welded. And impression of patient's maxillary arch was performed. A K-loop was fabricated on the study model.

At the second visit, the band was cemented. After inserted in the tube, the remained parts of K-loop were bonded by light cured resin (Fig. 3). Cutting the ligaturing wire was done. 4 weeks later, considerable distal movement of permanent first molar was observed (Fig. 4A, 4B). And root resorption of primary maxillary second molar was ceased (Fig. 4C, 4D). After the K-loop was removed, the right maxillary permanent first molar had erupted to the normal position spontaneously in 8 weeks (Fig. 5).

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Figure 1. Panoramic radiographs revealed the ectopic eruption of right permanent maxillary first molar. Also root resorption of adjacent primary second molar was seen.

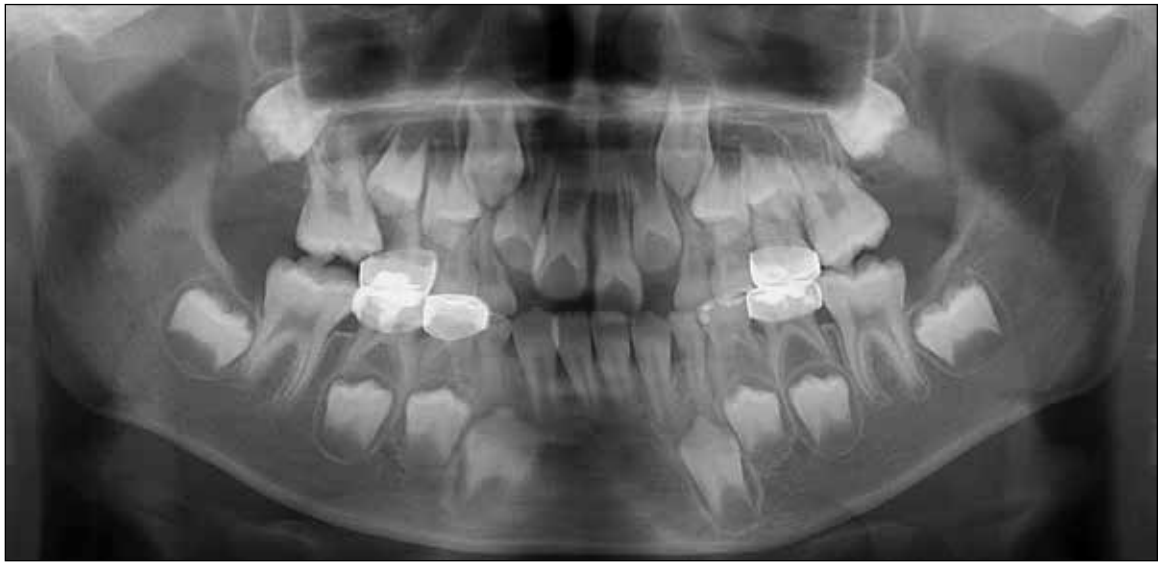

Figure 2. (A) K-loop before activation. (B) K-loop after activation. (C) and (D) ligaturing was done to obtain passive fit as before.

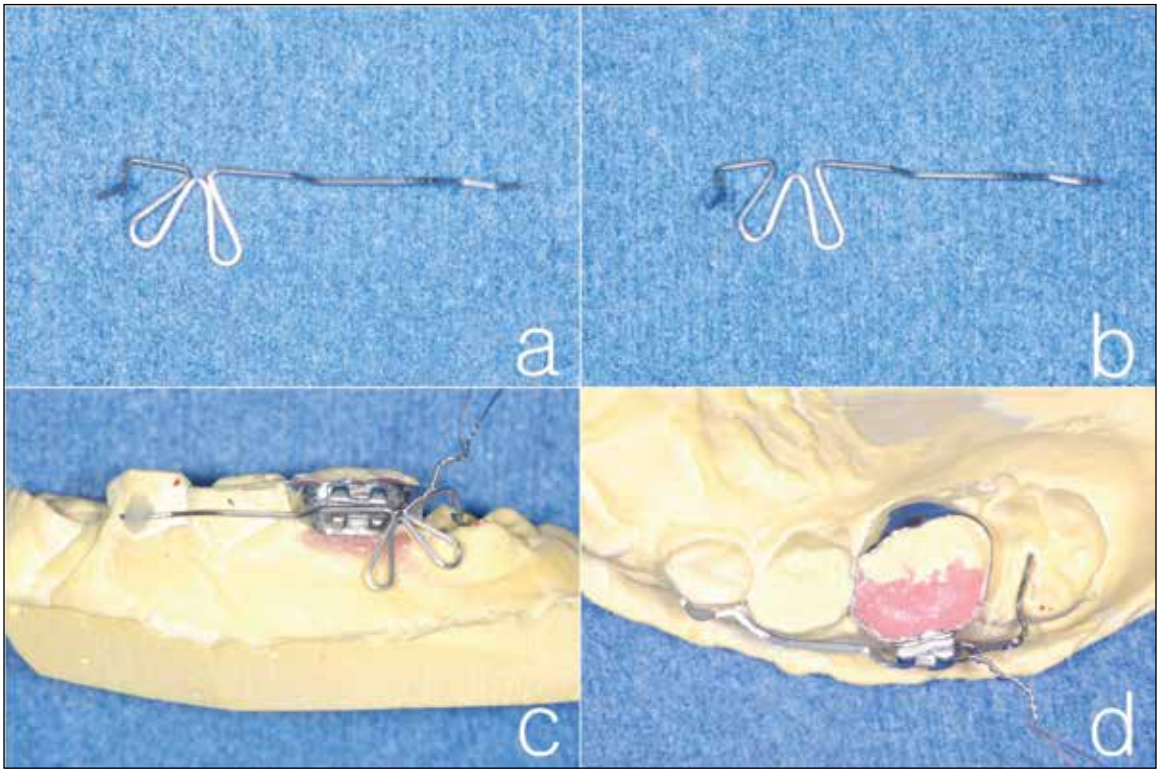

Figure. 3. (A) and (B) K-loop was delivered.

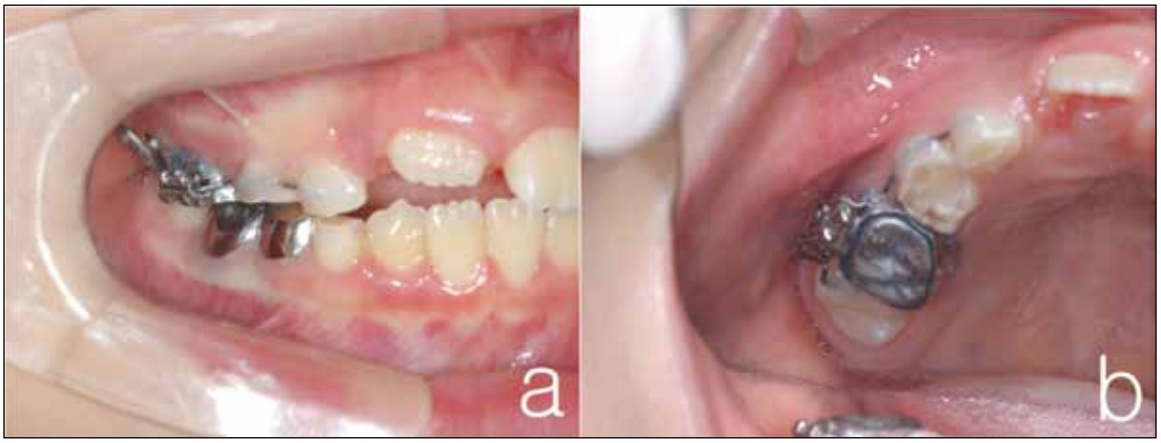

Figure. 4. (A) and (B) 4 weeks later, considerable distal movement of right permanent maxillary first molar was observed. (C) Root resorption of right primary maxillary second molar ceased.

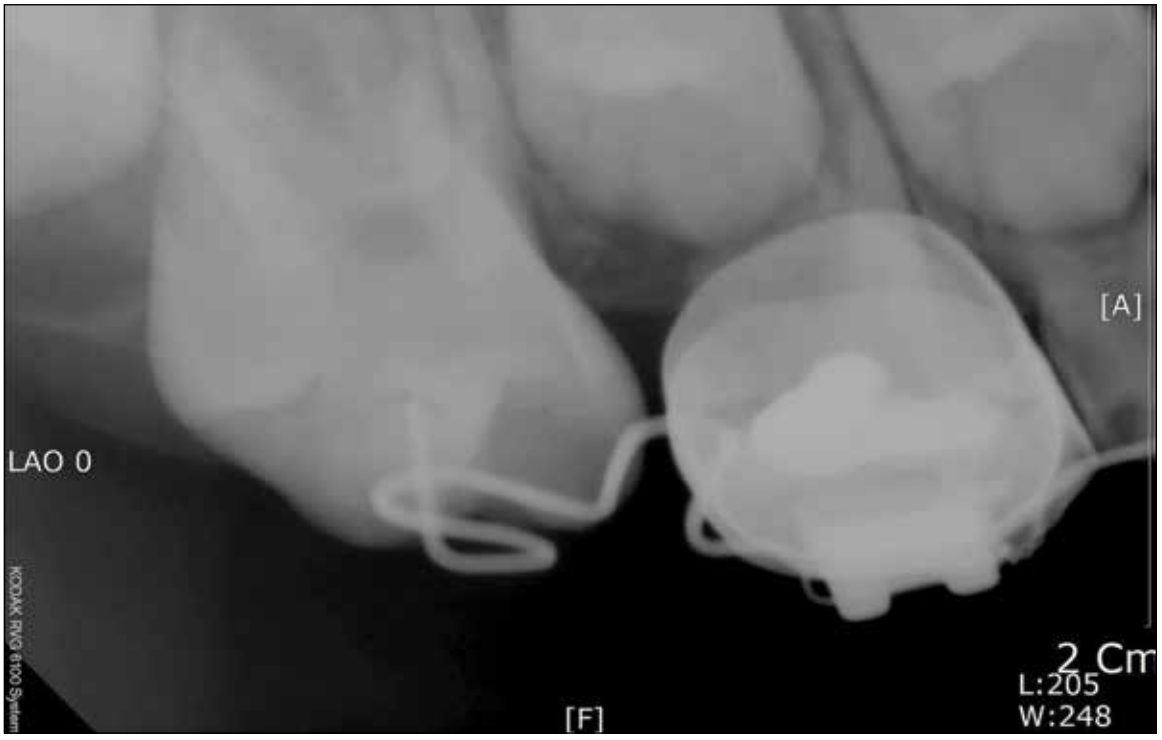

Figure 5. Spontaneous eruption of right maxillary permanent first molar was observed in 8 weeks.

DISCUSSION

Two types of correction of ectopic permanent maxillary molar have been reported: interproximal wedging and distal tipping[1,7]. Treatment modalities depend on severity of impaction of the permanent maxillary first molar[2]. Mild to moderate impaction can be treated by the former, while more severe impaction needs the latter[2]. Traditionally, Halterman appliance, which is one of distal tipping technique has been used for correcting ectopic eruption of the permanent first molar[4]. It consists of a band and distal extension loop[7]. It can be activated through elastics between distal extension loop and occlusal button bonded on the permanent molar[8]. But this appliance relies mainly on primary second molar for retention[7]. Therefore, it can give a detrimental effect on primary second molar, thus increase mobility of that tooth. Kurol and Bjerklin[9] reported that severe root resorption on primary second molar was found in most of their samples. In addition, distal extension loop can be bitten. Tissue impingement can also be a problem. Under these circumstances, some alterations may be necessary[7,10]. Alterations on appliance, however, may increase its volume and patient's discomfort.

To deal with the weaknesses of Halterman appliance, K-loop is used in this case. K-loop is composed of three parts: active, retention, and action part. Active part has continuous two closing loops. Two loops can easily make three dimensional forces by bending the wire to move tooth free. They also increase total wire length, thus increasing springiness. So force system can be achieved effectively. Retention part is easily extended by requiring anchorage value. Action part is bonded on the surface of ectopic erupted tooth. Bonding position would be either occlusal or buccal surface of ectopic erupted tooth depending on the amount of crown exposure above the gingiva.

K-loop is made of TMA wire. TMA (β-titanium) has an outstanding balance of properties, including high spring back, high formability, and low stiffness[11]. Kapila and Sachdeva[12] stated that lower force was generated by TMA wire than SS wire. Thus, TMA wire can be bended easily and has appropriate force system to move tooth effectively.

K-loop can be useful in areas where severe root resorption on primary secondary molar is found, because it has additional anchor preparation by extending wire to primary first molar and canine. And K-loop can induce light and continuous force by TMA wire, thus requiring no additional elastic changes once bonded in the tooth. This way it can reduce chair side time and hospital visits. Unless the abutment tooth is restored by stainless steel crown, there are no needs for band fabrication and impression, since this treatment can be performed in chair side. Furthermore, it is less bulky than Halterman appliance because of simplicity of design and no need to extend posterior area like hamular notch, thus making patients feel more comfortable.

But there are some limitations of using K-loop. Re-activation of loop is difficult because it uses pre-activation system in laboratory. If re-activation is necessary, the loop should be detached from the tooth. Once tooth happens to move, contact between two loops will be disappeared. So, re-activation of loop may not guarantee the desirable outcome. Besides loop cementation mainly relies on light cured resin system, bonding failure could be possible in children who are lack of cooperation because of contaminations.

CONCLUSION

Ectopic eruption of permanent maxillary first molar can cause root resorption and increase mobility of adjacent primary second molar. Early loss of primary maxillary second molar can happen consequently. This clinical report demonstrates that K-loop can be used as a simple, comfortable, and easier method to correct ectopic eruption of permanent maxillary first molar in existing severe root resorption on adjacent primary molar.

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