Management of Bilateral Impacted Maxillary Canines

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Introduction

Impaction is defined as a cessation of eruption of a tooth caused by a clinically or radiographically detectable physical barrier in the eruption path or by an ectopic position of the tooth. The usual origin of the barrier appears to be lack of space which results in follicular collision between developing teeth, supernumerary teeth, odontoma, cysts, crowded tooth germs or erupted teeth [1]. The most commonly ectopically erupting permanent teeth are the maxillary first molars, maxillary canines and the mandibular lateral incisors. Maxillary canine impaction incidence in population is 1-2.5% [2]. The frequency of maxillary canine impaction is significantly higher than of mandibular canines [3]. The permanent canines are the foundation of an esthetic smile and functional occlusion. An attempt to guide impacted canines into functional occlusion should be made.

Case Report

A 25 year old male patient reported to orthodontic clinic seeking treatment for spacing between teeth (Fig. 1). Intraoral examination revealed a Class I malocclusion with both unerupted maxillary canines and right lateral incisor. Maxillary arch showed generalised spacing in anterior region with over retained upper right deciduous canine. The tip of the upper left canine was visible and mid line was shifted to right with normal overjet and overbite. Soft tissues were normal, oral hygiene was good, medical history was noncontributory and there were no signs and symptoms suggesting temporo-mandibular joint disorders.

Radiographic examination showed that all teeth including the third molars were present. Both maxillary canines and maxillary right lateral incisor were impacted. Left canine was mesially angulated near the root of the lateral incisor, right lateral incisor was distally angulated near the root of the deciduous canine and right canine was lying horizontal at the level of the roof of the palate over the roots of first premolar and deciduous canine and near the apex of the lateral incisor

root. Left canine had an angle of 50° to the vertical, right canine had an angle of 85° to the vertical and right lateral incisor had a distal angle of 125° to the vertical (Fig. 2). A horizontal tube shift technique with periapical radiographs confirmed that right canine and lateral incisor were in palatal position. Cephalogram showed a class I skeletal pattern. Analysis done by Ericson and Kuroi method [4] illustrated a very high degree of treatment difficulty.

Model analysis confirmed availability of adequate space for both canines and lateral incisor. Treatment plan consisted of guiding canines and right lateral incisor in to occlusion by closed eruption after surgical exposure and extraction of over retained right deciduous canine. 0.018" Roth PEA was placed in both the arches and suitable attachments were bonded over surgically exposed right lateral incisor and canines. 0.016" NiTi was placed and ligature wire was used to apply traction to guide impacted teeth. Patient was recalled after every week to adjust the ligature wire to maintain traction force. Once the impacted teeth broke through the gingival tissue, PEA brackets were bonded. Maxillary right lateral incisor bracket was placed in the reverse direction to torque the root. Mid treatment, patient developed anterior open bite as traction force caused NiTi wire to exert intrusive force on anterior teeth, which was corrected with RCOS wire (Fig. 3). Base wire was further changed to 0.016" x 0.022" SS and case was finished with 0.017" x 0.025" SS wire. Post treatment OPT confirmed fully erupted and well seated maxillary canines and maxillary right lateral incisor. Angle of impacted teeth to midline showed considerable improvement (Fig. 4). Treatment was completed within 18 months (Fig. 5).

Discussion

Inadequate arch space and a vertical developmental position are often associated with buccal canine impactions. It is not unusual for maxillary canine impaction to occur bilaterally, although unilateral ectopic eruptions are more frequent [5]. Genetic factors have been reported to be the primary cause of palatally impacted maxillary canines [6]. Pathological sequelae like cysts, tumors, external/internal resorption of the

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Fig. 1 : Pre treatment extraoral

Fig. 2 : Pre treatment panoramic radiograph

Fig. 3 : Mid treatment intraoral photograph

impacted teeth and/or adjacent teeth, transmigration, referred pain and periodontitis have been associated with tooth impaction [7]. The clinician can investigate the presence and position of the cuspid by visual inspection, palpation and radiography. In the approach to the orthodontic patients, the application of traditional radiographic techniques is indispensable. However CBCT provides information which is not revealed during traditional radiographic analysis and is therefore indicated in case of impacted teeth or craniofacial structural anomalies [8]. There are four treatment options for impacted teeth; observation, intervention, relocation and extraction [7]. When the condition is identified early, interceptive extraction of the primary canines completely resolves permanent impaction in majority while others show some improvement in terms of more favorable canine positioning. However extraction of the primary cuspids does not guarantee elimination or correction of the problem. As a general rule, when the degree of overlap between the permanent maxillary cuspid and the neighbouring lateral incisor exceeds half the width of the incisor root, the chances of complete recovery are poor. An angle exceeding 31° from the vertical significantly reduces the chance of normal eruption following an extraction [9].

Clinical studies support resolution of palatal impaction in 91% of cases in which the crown of the canine is distal to the midline of the lateral incisor when the treatment is initiated [10]. Orton et al [11], reported a principal of treating unerupted canines by assessing the vertical axial eruptive path and suggested that labial tipping of 45° is generally orthodontically untreatable. Horizontal position, age of the patient, vertical height and bucco palatal position in descending order of importance are the factors which determine the difficulty of canine alignment [12]. When the interceptive treatment fails, efforts to reposition impacted teeth surgically or orthodontically should be considered. The prognosis of orthodontically erupting and repositioning an impacted tooth with in the alveolar process depends on the angulation and position of the impacted tooth,

Fig. 4 : Post treatment panoramic radiograph

Fig. 5 : Post treatment extraoral

available space, and presence of keratinized gingival tissue, patient cooperation and the length of treatment time [13].

In the surgical management of impacted maxillary canines the surgeon must choose between closed eruption versus an apically positioned flap to expose the tooth and facilitate its orthodontic eruption. Labially impacted maxillary canines uncovered with an apically positioned flap have more unesthetic sequelae, such as increased clinical crown length, increased width of attached tissue, gingival scarring, intrusive relapse and damaged periodontium than those uncovered with the closed eruption technique [14]. We chose closed eruption as the impacted teeth were situated quite high.

Ankylosis needs to be ruled out after surgical exposure by determining tooth movement with reasonable digital force or metallic sound on percussion. It is desirable to deliver a light force in the occlusal direction, using elastics, elastic chain, NiTi spring, or tie wire. Cole et al [15] have described the use of magnets in the management of teeth that fail to erupt. We used ligature wire as traction attachment. Ligature wire were tied to the 0.016" NiTi wire which would get deformed under the traction force. The spring back property of NiTi would bring the wire in its original shape thus transmitting a continuous traction force to the tooth through ligature wire. Ligature was adjusted every week to maintain traction force. However it is felt that auxiliary NiTi wire for ligature tie in addition to the base wire could have avoided the complication of mid treatment open bite.

Complications associated with orthodontic

repositioning of impacted teeth includes absence of or inadequate keratinized tissue, reduced sulcular depth, gingival recession, increased gingivitis, ankylosis, multiple exposures, devitalization, pulpal obliteration, external root resorption, injury to adjacent periodontium, marginal bone loss and extraction of the adjacent and/or impacted tooth. Failure of the surgical orthodontic treatment of impacted permanent upper canines can be caused by a range of factors like ankylosis, unsuitable position, inflammation, periapical granuloma, collision of the crown of the impacted canine with the root of the adjacent tooth, insufficient space, unsuitable procedure of the surgical exposure, unsuitable direction of the applied orthodontic force, malformed root of the adjacent lateral incisor [16]. The option to extract the canine should be considered for ankylosed teeth, canines undergoing external or internal root resorption, teeth with severe root dilacerations, canines lodged between the roots of the central and lateral incisors, teeth with pathologic changes, and when the occlusion is acceptable and the first premolar substitutes for canine in an otherwise functional occlusion with good alignment.

The aim of this case report is to demonstrate the potential of aligning extremely malpositioned, bilaterally impacted canines and lateral incisor.

Conflicts of Interest

None identified

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