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Management of an Unerupted Permanent Maxillary Incisor; Clinical Case

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ABSTRACT:- Impaction of maxillary central incisors is frequent in dental practice. However its management is challenging because of its importance in aesthetics. Supernumerary teeth are the most common dental anomaly that can cause impaction of adjacent teeth, crowding, diastema, rotation and displacement of teeth. Treatment planning with a combination of Surgical extraction of the supernumerary tooth followed by orthodontically force eruption of the impacted left maxillary central incisor and alignment of the rotated central incisor with removable orthodontic appliance. The present case reports describe the management of impacted and displaced permanent maxillary central incisors due to the presence of supernumerary teeth and associated dentigerous cyst.

Key words:- impacted central incisor, surgical exposure. orthodontic correction, supernumerary tooth, Dentigerous cyst .

I. INTRODUCTION

Missing and unerupted maxillary incisors can have a major impact on dental and facial aesthetics and were considered to be the most unattractive deviant occlusal trait. [1,2] Missing upper incisors can also have a psychological impact on a child because of its unattractiveness[3,4]

There are two approaches in Orthodontically forced eruption[5,6,7,8] :
1. Open eruption by raising a flap and leaving an open window to the tooth to allow traction or eruption.
2. Closed eruptions by doing a flap, installing attachment components for orthodontically forced eruption, and then closing the flap.

The maxillary incisor can be considered impacted if the following conditions exist:
1.) No historical record of previous extraction,
2.) Eruption of contra-lateral incisor which occur 6 months earlier,
3.) Both incisors are un-erupted and the lower incisors have erupted one year previously or deviate from the normal sequence of eruption e.g., lateral incisors erupt before the central incisor,
4.) Maxillary incisors have delayed eruption 6 months after the normal eruption date

The prevalence of unerupted maxillary incisors in the 5-12 year age group has been reported as 0.13%. In a referred population to regional hospitals the prevalence has been estimated at 2.6%. Unerupted incisors are more common in males than females with a ratio of 2.7:1. Almost half (47%) of all unerupted maxillary incisors are due to supernumeraries. The mesiodont variety has more eruptive disturbances compared to the palatodont .[[5,6,9,10,11]

The following radiographs need to be taken to assist in the diagnosis and management [7,8]:
- An anterior occlusal radiograph for general assessment purposes.
- Two periapical radiographs should be taken using the parallax technique for detailed assessment of the position, root and crown morphology. It has been shown that the use of horizontal parallax technique is better than vertical parallax.
- If an anterior occlusal and a panoramic radiograph are already available, the vertical tube shift (VTS) technique can also be used for assessment

In recent years CBCT has been introduced as a technique for imaging of dental and maxillofacial structures. CBCT is a medical image acquisition technique based on a cone-shaped X-ray beam centred on a two-dimensional (2D) detector. The source-detector system performs one rotation around the object producing a series of 2D images. The images are reconstructed in a three-dimensional (3D) data set using a modification of the original cone-beam algorithm .[5,6]

CBCT imaging provides orthodontists with an excellent tool to improve diagnosis, treatment planning and outcome assessment in appropriate malocclusion .Studies have shown that CBCT is more sensitive than conventional radiography for both impacted teeth localization and identification of root resorption of adjacent teeth.

The comprehensive images in 3 planes provided by CBCT can assist surgeons in choosing the appropriate surgical approach, identifying the tooth that should be extracted, and reducing the amount of surgical trauma on the adjacent hard and soft tissues.[5,6,9,10,11]

What follows are reasons for failure of maxillary incisor eruption[6,7]:

1. Supernumeraries: A supernumerary tooth is a common cause of failure in upper central incisor eruption. If found in the anterior maxilla adjacent to the midline, a supernumerary is thus known as a mesiodens.
2. Retained deciduous incisor: A deciduous incisor which becomes non-vital as a result of trauma or caries or ankylosed may not be resorbed. This tooth may then deflect or even prevent the eruption of the permanent successor.
3. Dilaceration: Following trauma, usually to the deciduous predecessor, the crown of the developing permanent tooth may be displaced. As a result, the crown and root may develop at an angle to each other. This is known as dilaceration.
4. Ankylosis: Ankylosis occurs when the root of a tooth becomes fused to the alveolar bone which prevents the eruption of an incisor. There is often a history of trauma.
5. Dense mucoperiosteum: The mucoperiosteum may become dense during development or due to formation of scar tissue following surgery.
6. Ectopic development: Severe malposition and/or impaction against another tooth may inhibit the permanent incisor from erupting.
7. Other pathology: Some pathology such as cysts or odontomes may also prevent the eruption of a permanent incisor.

Figure 1: Intraoral view showing the absence of 11

Supernumerary tooth is a disorder of odontogenesis resulting from the continuous budding of the enamel organ or from excessive proliferation of cells. It can be responsible for a variety of irregularities in the developing occlusion particularly the impaction or ectopic eruption of adjacent permanent teeth,[11,12,13] A dentigerous cyst is defined as a cyst that originates by the separation of the follicle from around the crown of an unerupted tooth.[6] These cysts are developmental in origin and predominately involve the mature mandibular

third molar. [11;12] The dentigerous cyst around supernumerary teeth accounts for 5% of all dentigerous cysts most developed around a mesiodens in the anterior maxilla. They are uncommon in the first decade of life.[7] These cysts are discovered on routine radiographic examination or accidentally during surgical removal of supernumerary teeth.[12,14] The present case reports describe the management of impacted and displaced permanent maxillary central incisors due to the presence of supernumerary teeth and associated dentigerous cyst.

Figure 2: Preoperative maxillary occlusal radiograph revealing impacted 11 and multiple supernumerary teeth

II. CASE REPORT

A 13-year-old boy reported to the department with the chief complaint of a missing permanent maxillary right central incisor. Figure1 The patient's medical and family history was insignificant. Intraoral examination showed the clinical absence of the permanent maxillary right central incisor . Radiographic examination (panoramic radiograph) revealed the presence of the impacted permanent maxillary right central incisor and supernumerary tooth (mesiodens). Figure2Radiographically radiolucent space was observed surrounding the crown of supernumerary tooth and impacted the permanent maxillary right central incisor. A multidisciplinary treatment plan was planned; surgical removal of supernumerary tooth followed by orthodontic correction of the un-erupted permanent maxillary right central incisor. Prior to the surgical phase, routine blood investigations were done which were within normal limit..

After administration of local anesthesia, a labial muco-periosteal flap was reflected to expose the supernumerary tooth. Supernumerary tooth along with soft tissue was surgically removed, which were sent for histopathological examination. Figure3

Figure 3: Panoramic radiograph showing mild eruption of 11

The flap was repositioned, approximated, and closed with 3-0 silk suture, which were removed after 1 week. Microscopy of the lesion demonstrated a dentigerous cyst. The impacted permanent maxillary right central incisor was kept under observation to check natural eruption. Thereafter patient did not report for 8 months. Even after 8 months, the permanent maxillary right central incisor was not clinically evident. The panoramic radiograph revealed mild eruption of the permanent maxillary right central incisor . It was further decided to orthodontically correct the impacted permanent maxillary right central incisor. In the subsequent visit two-third crown of the permanent maxillary right central incisor was surgically exposed . Figure4

Figure 4: Surgical exposure of 11

After exposure of the permanent maxillary right central incisor, Begg's appliancewas placed and a 0.016 inch nickel titanium wire was used for initial alignment and leveling . The traction was applied with the help of a ligature wire tied to the maxillary right central incisor. After 1 month, a 0.016 stainless steel Australian wire and later a 0.018 stainless steel Australian wire was placed. Figure5The traction was continued till permanent maxillary right central incisor reached the occlusal plane. To correct mesiodistal inclination, the uprighting spring was placed . Debonding was done after achieving good intercuspation and normal overjet and overbite. Figure6

Figure 5: Intraoral view showing the alignment of 11 with a NiTi wire

III. Discussion

The presence of supernumerary tooth is one of the most common causes for failure of eruption of maxillary central incisors.[15] There are various other problems that may be associated with supernumerary teeth like crowding, displacement of permanent teeth and cystic formation. In order to avoid pathologies relating to supernumerary teeth it is always suggestive that supernumerary teeth should be extracted .[16] The

literature reports that 80% to 90% of all supernumerary teeth occur in the maxilla. The greatest proportion are found in the maxillary anterior region .[6,7,16,17]

Figure 6; Intraoral view showing the complete alignment of 11

Supernumerary teeth's common oral complications are impaction of adjacent teeth, crowding, diastema formation, rotation, displacement of teeth, occlusal interference, caries, periodontal problems, difficulty in mastication, and compromised esthetic[18]. Other pathologic manifestations associated with multiple supernumerary teeth are formation of a dentigerous cyst with associated bone destruction, displacement of adjacent teeth, root resorption, and oronasal fistula.[19,20] The reported percentage of the dentigerous cyst associated with supernumerary teeth is 2.7% to 11%.[6,7,18,19,20]

Failure of eruption of permanent incisors due to supernumerary teeth have been reported variably at 28 % and 38%. Tuberculate supernumerary teeth are more likely to cause an obstruction than conical supernumerary teeth. The technique to be used during forced eruption should be based on the angulations, degree of impaction, root completion and other local factors . [21]These factors were considered during treatment planning of the case. Closed eruption surgical technique was not used for this case. Circular excision of the overlying mucosa immediately over the impacted central incisor was done as suggested by Becker A in 1998.[22]

Epithelial attachment of the impacted central incisor should be retained as possible in order to obtain normal contour of gingiva and attached gingiva.[23]

Most of the dentigerous cysts associated with supernumerary teeth are accidentally diagnosed on routine radiographic examination. Sometime, difficulty exists in a differentiating dentigerous cyst and enlarged follicular space, similar to the present case report 1. Goaz et al, stated that if the radiolucent space surrounding the tooth crown is 5 mm or more in diameter, then it should be considered as a dentigerous cyst. [24]Furthermore, such supernumerary teeth when associated with soft tissue attachment warrant histological inspection to rule out the suspected diagnosis. However, in most of the cases the histopathologic appearance of the cystic lining epithelium is not specific. Thus, the diagnosis of dentigerous cyst should relay on the radiographic and surgical observation of the cyst to the cemento-enamel junction.[25]

Profit has considered problems in treating impacted teeth in three distinct areas: Surgical exposure for access, placement of a utilitarian attachment and orthodontic force application . The first two areas have common solutions.[1]

Factors to be considered for successful alignment of an impacted tooth are the position and direction of an impacted tooth, the degree of root completion, and the presence of space for the impacted tooth. Based on this case study, the impacted incisor was in normal position. Using Cvek's classification, the maturity of this un-erupted incisor was allocated to Group 3 when teeth had root two-thirds of their final length and adequate space for the impacted incisor. The treatment was removal of the retained deciduous incisor, thereby allowing spontaneous eruption for permanent incisor., After two months, however, the impacted toothfailed to naturally erupt. The surgical exposure and forced eruption was then designed for intervention.

Several techniques are commonly used to uncover maxillary labial impaction. The apically positioned flap technique permits ready reattachment of a bracket if unintended debonding occurs, while the closed-eruption technique is believed to provide the best esthetic result. [6,7,23,25]This case study decided that the closed eruption technique was the treatment of choice since it was more reliable as far as esthetic and periodontal health was concerned. Nonetheless, extensive removal

of mucoperiosteal soft tissue and underlying bone exacts a price in terms of periodontal prognosis, gingival contour and appearance of the erupted tooth. The approach presented in this article was the semi-fixed appliance.[26] The technique was easier, cheaper and did not require more equipment, Moreover it reduces the overall treatment time required for fully bonded fixed appliance therapy. In the regional hospital providing this appliance to the patient who has this problem was possible. [27]In this case, spontaneous eruption was achieved after force eruption was removed when the permanent tooth reached the oral cavity. This result is in line with that of McDonald and Yap, who in 1986 expected only in a case with incompleted root formation.[28]

Recently, Cone Beam Computed Tomography (CBCT) has become available for high effective localization of unerupted teeth. However, CBCT still has a higher effective radiation dose and cost to the patient than conventional radiography, and arguably, is not needed in determining the position and condition of most unerupted teeth.[5]

Orthodontic traction resulted in good periodontal and periapical health of the tooth. This may influence the length of clinical crown and post alignment vitality. [29The traction force greater than 50 g may lead to postalignment non-vitality. However, in young children chances of postalignment non-vitality is rare due to wide apical foramen. In the present case reports, the traction force less than 50 g was applied as the patients were 12 year old.[29,30]

The present case showed successful results after multidisciplinary approach maintaining the natural tooth in desired position. In comparison with other treatment modalities like extraction and prosthetic appliances including dental implants, the patient's own tooth being the most biocompatible one brings about better functional, esthetical, and emotional results.

IV. CONCLUSION

Impaction of maxillary anterior teeth can be a challenging orthodontic problem. Treatment of impacted teeth varies widely depending on the state of the impacted tooth, the degree of impaction and its position. Every case should be analyzed individually to develop the proper treatment plan. Mutidisplinary team approach should be utilized to ensure successful outcome of the treatment.

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