

TOOTH ANKYLOSIS AND ITS ORTHODONTIC IMPLICATIONS

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ABSTRACT

Tooth ankylosis is a clinical condition, which may be an aetiological factor in the development of malocclusion. Though of unknown aetiology, it is most prevalent in the primary dentition. Its occurrence in the permanent dentition though less frequent than in the primary dentition is usually associated with trauma.

Diagnosis is usually based on clinical findings and the most definitive diagnostic test is the failure of the tooth to move following the application of orthodontic forces. Management of the affected tooth depends on several factors. This paper presents some considerations in proper diagnosis and treatment.

Key words: *Tooth ankylosis, orthodontics, submergence, infraocclusion, impaction.*

INTRODUCTION

Tooth ankylosis is defined as an anatomical fusion of alveolar bone with tooth cementum. It occurs during eruption and *may* take place before or after emergence of the tooth into the oral cavity.¹ Ankylosis occurs when the root becomes fused to the surrounding alveolar bone. Some areas of cemental resorption are found, and the repair by calcified tissue is histologically found in continuity with alveolar bone.¹⁻³

The aetiology is unknown. However, several theories have been proposed which include the disturbed local metabolism theory.⁴ In a normal process of exfoliation of a primary tooth, disappearance of the ligament occurs after resorption. However, with the disturbed local metabolism theory, the process is reversed, and periodontal ligament disappears before root resorption. Hence cementum and alveolar bone come together with the resultant ankylosis.^{4,5} Via⁶ suggested a genetic tendency after showing a high prevalence among members of the same family.

Trauma to teeth involving the alveolar bone or periodontal ligament has been variously suggested as causative factors of tooth ankylosis.^{7,8} Included in the traumatic injuries is excessive occlusal or masticatory forces especially in the molars. Ankylosis is a complication following replantation or autotransplantation of avulsed teeth and has been found to occur in the periodontal ligament following injuries sustained during the extra alveolar period.⁹ Congenitally missing premolars are frequently associated with ankylosed deciduous molars.^{1,10}

Experimentally, tooth ankylosis was found to occur by tooth luxation and thermal injury to the apex of a tooth.¹¹ Thermal injury to the apex of tooth arising during orthodontic tooth movement may result in ankylosis and it may be the cause of a localised occlusal abnormality.

PREVALENCE

Incidence of ankylosis in the primary dentition varies from 1.3% to about 10%.¹² The wide discrepancy

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among different studies is suggested to be due to differences in ages studied, different diagnostic criteria and ethnic differences. Ratio of mandibular to maxillary deciduous molar involvement is as high as 8:1 with the mandibular first deciduous molar the tooth most often affected.¹³ The mandibular second deciduous molar was also reported to be the most affected.^{2,14} There was no sex difference in the prevalence at any age group.¹⁴ In the permanent dentition, ankylosis affects mostly the mandibular and maxillary first molars, followed by the maxillary canines and incisors.^{15,16}

Certain conditions predispose to ankylosis; endocrine conditions, congenital diseases, cleidocranial dysostosis and ectodermal dysplasia with submergence of the teeth involved.¹⁷

Another study showed that infraoccluded deciduous molars exhibit on average a slight delay in the eruption of the permanent successors. Teeth without the permanent \ successors where the successor teeth are congenitally absent however show a higher prevalence of submergence.^{1,10}

DIAGNOSIS

Diagnosis is usually based on clinical findings. An ankylosed tooth usually has its occlusal surface being below the functional occlusal plane and usually found to be immobile.¹⁸ A tooth that reached the occlusal and later drops out of occlusion should be considered ankylosed.^{15,16,19} There is also an accompanying characteristic sharp sound on percussion of an ankylosed tooth. These symptoms are found when about one fifth of the root is affected.²⁰ However, the most definitive diagnostic test is the failure of the tooth to move following the application of orthodontic forces.^{13,21} It was concluded that a sharp, solid percussion sound may be indicative of ankylosis but the absence of movement with orthodontic traction is a definitive sign of ankylosis.^{22,23} However, there may be false impression of submergence of an ankylosed tooth due to continuous eruption of adjacent teeth.¹⁸ Cephalometric studies have revealed that such condition of submergence is the result of enclosure by surrounding tissues and not by active tooth movement.²⁴

Radiographically, there is obliteration of periodontal ligament space suggestive of fusion between root

and the alveolar bone.²⁰ Conventional radiographic diagnosis is however, limited when ankylosis occurs in the lingual, labial and interradicular areas.² Impacted teeth are more often ankylosed in the adult population. This makes diagnosis very difficult to make since the tooth is not accessible to clinical examination.¹⁸ However, diagnosis is enhanced with the use of computerized tomography (CT). A CT of the impacted tooth is thus of importance to determine the position of the tooth and the presence of an area of fusion between the cementum and the alveolar bone.²⁵

Management of ankylosis

The management of tooth ankylosis depends on several factors; extent of ankylosis, time of diagnosis, location and type (deciduous or permanent) of affected tooth.²² Treatment varies from simple observation (no treatment), to restoration of the occlusion and interproximal contacts in infraocclusion^{15,16} or extraction in deciduous dentition when advanced carious lesions are present.¹⁸

In the permanent dentition, treatment options are numerous and more complicated and usually involve orthodontic intervention to close spaces or prosthetic replacement after extractions. Lim et al²⁶ suggested some treatment approaches which include no treatment, orthodontic treatment, prosthetic buildup, segmental osteotomy, and extraction. When orthodontic treatment is an option, it is usually combined with luxation. This treatment approach however, carries some risk factors such as root or bone fracture, especially in adults.^{27,28}

Surgical extractions are usually advocated because of difficulty with extraction.¹⁸ If a decision is made to keep the tooth, different procedures to help bring the affected tooth into occlusion include subluxation, corticotomy or osteotomy.¹⁸

Segmental osteotomy, a surgical procedure where the alveolar bone including the affected tooth is sectioned and repositioned often results in an exaggerated bony defect.²⁶

Orthodontic treatment of ankylosed teeth

Tooth ankylosis can be an aetiological factor in the development of malocclusion. The severity of

malocclusion related to ankylosis however, depends on the developmental stage when ankylosis occurs, the amount of remaining growth and the timing of treatment.²⁹

Characteristically, there is delayed exfoliation^{10,16}, impacted succedaneous tooth, deflection of succedaneous tooth with the consequence of ectopic eruption.¹⁸ Tilting of adjacent teeth, supraeruption of the opposing tooth, and lack of development of the involved alveolar area are some of the consequences of ankylosis; leading to problems in function and aesthetics.²⁶ There is a high incidence of crossbites of buccal and anterior segments¹⁰ and dental aplasia related to tooth ankylosis. Posterior open bite is associated with ankylosis. The tongue usually escapes habitually into the space. Loss of arch length and midline shift to the affected side are prevalent in ankylosed dentition. Supraeruption of the antagonistic tooth/teeth is commonly seen. Orthodontic treatment of an ankylosed permanent tooth once diagnosed should be carried out early after thorough examination and evaluation. Orthodontic traction helps to bring ankylosed permanent tooth into occlusion. The tooth may be further assisted in the proper occlusion using procedures like luxation, corticotomy or osteotomy. Forced eruption, an approach where orthodontic force is applied after luxation provides a functional tooth in the presence of alveolar bone.³⁰

CONCLUSIONS

Tooth ankylosis is a pathologic condition in the primary and permanent dentitions. Aetiology is unknown however, certain predisposing factors have been identified. Clinically, an affected tooth may manifest different stages of infraocclusion, submersion or even impaction depending on the developmental stage at occurrence. The key to diagnosis in an erupted tooth is the failure of the ankylosed tooth to move following the application of orthodontic forces. High percussion sound and decreased mobility are sensitive and accurate signs of ankylosis. Orthodontic treatment of an ankylosed tooth once diagnosed should be carried out early after thorough examination and evaluation.

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