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REVIEW ARTICLE

CONCRESCENCE: AN ENIGMA OF ROOT ANOMALY

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ABSTRACT

Concrescence is a rare developmental dental disorder where the roots of the adjacent teeth are united by cementum. It occurs commonly in maxillary molar region. It may lead to periodontal tissue destruction through the loss of gingival architecture. Unpredicted extraction of an adjacent tooth, fracture of the maxillary tuberosity or floor of the maxillary sinus and oral-antral communication are reported at the time of extraction of concrescent tooth. Therefore, a correct and early diagnosis prior to surgical intervention is important to ensure that patients can make an informed decision about their treatment and to reduce the potential for dento-legal action against the responsible clinician.

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INTRODUCTION

Disturbances in the epithelium and mesenchyme can markedly alter the normal odontogenesis leading to the developmental anomaly of teeth. Depending on the stage of development, anomalies are related to abnormalities in number, structure, size and/or shape, colour, structure, texture, eruption, exfoliation and position (Mahapatra *et al.,* 2010). The manifestation of the precise anomaly depends on the defect in genes that are responsible for odontogenesis, though influence by both local and systemic factors (Kapdan *et al.,* 2012). Such effects not only occur after birth, but also begins before birth, therefore both deciduous and permanent dentitions are affected (Tahmassebi *et al*., 2010; Meer & Rakesh, 2011; Sharma *et al.,* 2013). Developmental anomalies in number, size and shape may occur during morpho-differentiation stage of the dental lamina and the tooth germ. Gemination, fusion and concrescence are the examples of developmental anomalies that affect the shape of a tooth (Shafer *et al.,* 1983). Concrescence is a rare dental anomaly where there is a cemental union of two fully-formed adjacent teeth without confluence of the underlying dentin showing independent pulp chambers and root canals (Gunduz *et al.,* 2006) (Fig. 1). Notably, the proximity of the roots does not mean concrescence, it requires the loss of root individuality at some points.

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The cemental union is due to close proximity of the roots of the involved teeth, especially when both or one of them is without significant functional activity of the periodontal tissues either because of its infraocclusal position or due to noneruption (Consolaro *et al.,* 2020). It may occur before or after the teeth have erupted. Though concrescence is common on the root surfaces, a case of concrescence between the roots of one tooth and crown of an unerupted adjacent tooth is reported in the literature (Sugiyama *et al.,* 2007). Cemental union can occur between two normal teeth, between a normal and supernumerary teeth, or between two super numerals (Gunduz *et al.*, 2006). Concrescence in anterior teeth is extremely rare, and even rarer between two teeth in function in the dental arch. Because two teeth with active function of the periodontal ligament cannot eliminate the periodontal ligament, thus there is no possibility of occurrence of concrescence (Consolaro *et al*., 2020). The cemental union may vary from a single small site to a cemental mass extending over the entire surface of the root. This disorder is believed to occur during root formation (Developmental/True) or after completion of the development of radicular phase (Acquired/post-inflammatory). Developmental concrescence occurs when roots of the adjacent teeth are in close proximity and often involves 2nd molar and impacted third molars. The spaces required to accommodate all the teeth in the dental arches of the maxilla and mandible are not always sufficient. Due to late chronological eruption time, it is common for the third molar to turn its crown distally, while its developing root ends up bringing it too close to the roots of the second molar

(Consolaro *et al*., 2020). In contrast, acquired concrescence occurs due to deposition of additional cementum as chronic inflammatory response to a non-vital tooth after completion of root formation and frequently, it involves carious second molar in which the apices overlie the roots of horizontally or distally angulated third molars (Shafer *et al.,* 1983).

ETIOLOGY

- Concrescence of teeth is actually a form of fusion which occurs after completion of root formation. Teeth are united by cementum only and is thought to arise as a result of traumatic injury or crowding of teeth with resorption of the interdental bone, so that the two roots/supernumerary teeth are in approximate contact and become fused by the deposition of cementum between them (Consolaro *et al*., 2020).
- In concrescence, cemental union may occur due to exertion of excessive pressure by one tooth on another when the roots of the affected teeth are in close proximity with lack of space in between them (Gunduz *et al*., 2006; Meer & Rakesh, 2011).
- Localised hypercementosis usually presents as thickening of the cementum in the apical third of a tooth and can occur to the point of fusion and concrescence of adjacent teeth (Raghavan & Singh, 2015).

INCIDENCE

Concrescence is found in both permanent and primary dentition (Meer & Rakesh, 2011). Foran *et al.,* (2012) reported concrescence as 0.2 - 3.7% and 0.8% in primary and permanent extracted teeth, respectively. It mostly affects maxillary molars (Consolaro *et al*., 2020), commonly between second and third molars though reported in first molar also (Khegdikar and Khegdikar, 2015) without showing any prevalence in age, gender or race (Gunduz *et al.,* 2006). Radiographic survey on dental anomalies conducted by Bruce *et al*., (1994) involving 2267 black pediatric patients reported only one case of concrescence and indicated the prevalence rate of concrescence as 0.04%.

SIGNS AND SYMPTOMS

- Problems in occlusion causing cheek biting and traumatic ulcers.
- Concrescent teeth may have difficulty in eruption or may not erupt completely.
- It may results in loss of gingival architecture whereby facilitates plaque accumulation and causes localized destruction of periodontal tissues.
- Extraction of concrescent tooth may cause fracture of the tuberosity or floor of the maxillary sinus and oral-antral communication

DIAGNOSIS

Diagnosing a dental abnormality needs a thorough evaluation of the patient, involving a medical, dental, familial and clinical history. It is nearly impossible to detect concrescence clinically as it affects only the roots, thereby the condition is sub gingival. Crowns of the affected teeth appear normal due to lack of enamel involvement and thereby, it is diagnosed mostly after extraction (Martinez *et al.,* 2018). In spite of having independent pulp chamber (Foran *et al.,* 2012), radiographic diagnosis may also be difficult sometimes and misinterpreted as simple radiographic overlap or super-imposition of adjacent teeth (Gunduz *et al*., 2006).

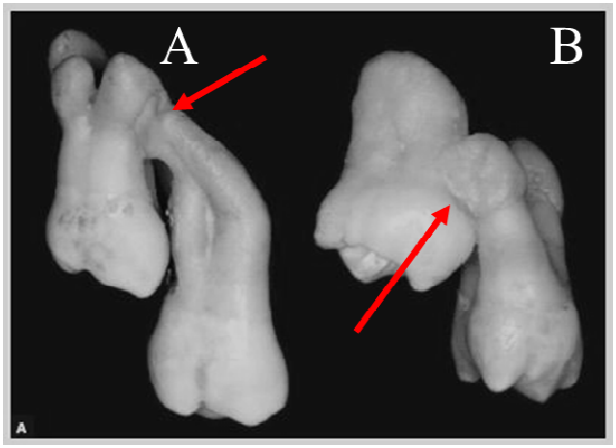

Figure 1. Dental specimen showing Concrescence of maxillary third molar with the maxillary second molars. It is obtained during surgical extraction of third molars. Note the cemental union that varies from a single small site (A) to the cemental mass extends over the entire root surface (B), shown by red coloured arrows.

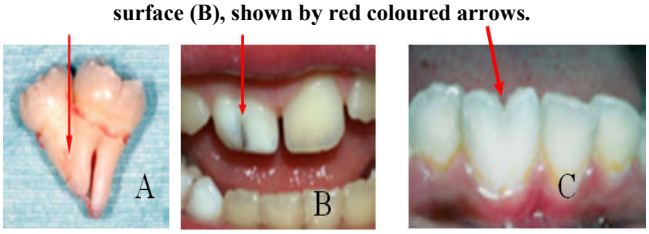

Figure 2. Differential diagnosis of Concresecence. Note the differences amongst concrescence (A), Fusion (B) and Gemination (C), shown by red coloured arrows.

So, radiographs with different angulations and exposure parameters, and Cone Beam Computed Tomography (CBCT) are applied for effective diagnosis (Palermo & Davies-House, 2016). Because of its three-dimensional (3D) images, CBCT would be a powerful adjunct and would provide a very accurate diagnostic acuity. It has been recently seen that it allows an accurate diagnosis of dental concrescence based on very precise conceptual and imaging criteria. Histological examination for extracted teeth could confirm diagnosis (Gunduz *et al*., 2006).

DIFFERENTIAL DIAGNOSIS

Differential diagnosis of concrescence is made with the fusion and germination (Fig. 2). To illustrate germination and fusion, various terms are used. Those are double tooth, fused teeth, connoted teeth, conjoined teeth, double formation and dental twinning. Fusion is union between two teeth by dentin and or enamel besides the cementum, while in germination, a single tooth bud unsuccessfully attempts to give rise to two teeth, leaving the involved tooth with a bifid crown and larger in its mesiodistal diameter. Fusion and gemination almost always affect the anterior teeth, while concrescence involves the second and third molars, particularly of maxilla. Crowns in fusion and gemination are clinically modified, anticipating differentiation with free and morphologically normal clinical crowns. In the event of lack of orthodontic movement, the differential diagnosis of concrescence is made with the alveolodental ankylosis and replacement resorption. The detailed analysis of the images allows an accurate

differentiation. Alveolodental ankylosis leads to continue reshaping of the bone and tooth is eventually replaced by bone, while in concrescence the cementum does not undergo remodeling, rather there is continued apposition (Consolaro *et al*., 2020).

TREATMENT

Early diagnosis of dental anomalies should allow for more comprehensive prolonged treatment planning, more proper prognosis and in certain instances, less extensive interception. Concrescence should be identified to reduce the risk of complications associated with surgical procedures (Khanna *et al.,* 2011).

- If the condition is not affecting the patient, no treatment is needed.
- Concrescent teeth could be reshaped and replaced with full crowns.
- Based on the extension of concrescence and surgical access, it is possible to separate the involved teeth biologically. However, the simple separation with the maintenance of the proximity and the lack of function of one of the teeth will established a new concrescence. After a period of 1 to 3 months, new cementum deposition takes place in the sectioned area and the separated teeth are biologically prepared to be distanced from the original site via orthodontic movement (Suter *et al.,* 2011). The most important detail in this separation of teeth presenting concrescence is that the diagnosis should be made in advance, and not at the time of the intervention.
- Alternate treatment options to maintain the fused teeth is non-surgical root canal treatment (Foran *et al.,* 2012).
- If the teeth are having recurrent problems of pain and are non-restorable, extraction should be considered. Notably, to reduce the adverse and unexpected outcomes, sectioning of the adjacent teeth is required for separate tooth extraction in most of the occasions (Meer & Rakesh, 2011).

COMPLICATIONS

Concrescent teeth may give rise to complications, particularly at the time of extraction. If the cemental union is minimal, the adjacent teeth may become separated at the time of extraction. In case of extensive cemental union, it may result in an unexpected removal of an adjacent tooth, fracture of the maxillary tuberosity or floor of the maxillary sinus and even an oro-antral communication (Khanna *et al.,* 2011). Owing to the potential complications that can occur during an endodontic or extraction procedure of the involved teeth, the preoperative diagnosis of concrescence is of paramount significance to minimize the risk of complication. Thus, it is imperative for a clinician to have a suspicious eye, a defensive practice methodology and a fair sense of clinical judgement that can benefit the patient.

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