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Case Report

Talon Cusp with Bilateral Fusion in Permanent Teeth: A Review and Case Report

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Abstract

Talon cusp is a rare dental anomaly involving the projection of a cusp from an anterior tooth, whereas fusion is another dental anomaly involving the joining of two teeth. This case displays a unique combination of both dental anomalies. An 8-year-old healthy Malay girl came to the pediatric dental clinic for her regular dental check-up. The intra-oral examination revealed the fused appearance of teeth 31, 32, and 41, 42 anterior mandibular teeth and the presence of talon cusps on the lingual surface of the fused teeth 41 and 42. A fissure sealant was placed in the fused area as a preventive measure. Thorough clinical and radiographic examination, early diagnosis, and proper treatment are important to prevent any future dental complications that may be associated with these rare anomalies.

Keywords: Anomalies, fusion, permanent teeth, talon cusp

Introduction

Dental anomalies are defined as deviations of dental tissue from its origin and can occur in both primary and permanent dentition.[1] Abnormalities during the morpho-differentiation stage of the dental lamina and tooth gems can result in anomalies in tooth number, size, and shape.[2] Talon cusp and fusion are examples of dental anomalies related to the shape of the teeth.

Talon cusp is a dental anomaly characterized by an accessory cusp-like structure that extends from the cingulum or cementoenamel junction to at least half the distance to the incisal edge of maxillary and mandibular teeth. It can occur in both primary and permanent dentition. It consists of normal enamel, dentin, and varying extensions of pulp tissue.[3] This anomaly is considered as an isolated anomaly that arises during the tooth development's morpho-differentiation process. It occurs due to the outward folding of the inner enamel epithelium cells (which give rise to ameloblasts) and transient focal hyperplasia of peripheral cells of the mesenchymal dental papilla (which become odontoblasts). This complex process appears to be multifactorial, which is primarily polygenetic with environmental influence.[4]

This anomaly, however, can coexist with other anomalies or as part of a syndrome that provides a clue to the potential etiology of mechanisms such as mesiodens, odontome, supernumerary, hypodontia, hyperdontia, dens invaginatus, fused teeth, geminated teeth, radicular, and syndromes such as Mohr syndrome, Rubinstein-Taybi syndrome, Sturge-Weber syndrome, incontinentia pigmenti achromians, Ellis-van Creveld syndrome, Alagille's syndrome, oculofacio-cardio-dental syndrome, and KBG syndrome.[5]

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Mellor and Ripa in 1970 reported a case history presented by W.H. Mitchell in 1982 of a patient with a "... process of hornlike shape..." protruding from the lingual surface, which is one of the earliest references to the dental anomaly known as talon cusp.[6] Nearly a century later, the initial description of this dental anomaly, referred to as an 'accessory cusp,' based on the cingulate incisor side of a central incisor.[7] Another definition of a talon cusp, as described by Goldman, refers to it as a prominent accessory cusp, which may extend to the incisal edge, forming a T-shaped or V-shaped structure. If it is situated lower, it can create a Y-shaped crown contour.[8] Talon cusps have been known by various names since the paleopathological era, including cingulum nodules, dental tubercles, hyperplastic cingulum, medial ridges, lingual cusps, and tuberculum dentale. They were initially documented by Bohn in 1950 in the deciduous teeth of children with cleft lip or palate.[9]

The appearance of the tubercle is typically categorized into three types: Type 1 (major), Type 2 (semi-talon), and Type 3 (trace talon).[4] Type 1, known as a major talon, is characterized by a well-defined additional cusp that extends either over the entire tooth or over at least half the distance from the cementoenamel junction to the incisal edge of the tooth crown. Type 2, or semi-talon, also features an additional cusp that extends over the entire tooth or at least half the distance from the cementoenamel junction to the incisal edge. Type 3, referred to as trace talon, is defined by an enlarged or prominent cingulum, exhibiting variations such as conical, bifid, or tubercle-like structures. In all three types, a V-shaped radiopacity can be observed originating from the cervical area in radiographs. Type 1 and Type 2 talon cusps are the most commonly encountered, with the permanent maxillary central incisor being the tooth most frequently affected (50%).[10]

A new systematic review by Decaup et al[5], 2021, whose purpose is to propose a new system meant to improve the homogeneity and accuracy of the results of further studies. The classification is based on the description of a locus in which Locus 1 refers to corresponds to palatal and lingual talon cusps and Locus 2 refers to labial cases, whereas Locus 3 refers to the combination of two loci and is followed by the stages, which are composed of 5 stages.

Talon cusps are also identified as supernumerary cusps that appear in the anterior dentition, which is commonly found on the incisors or canines of the deciduous or permanent dentition, and the tubercle most often observed on the lingual surface.[11] In deciduous teeth, the most commonly affected teeth are the maxillary central incisors, whereas, in permanent dentition, the maxillary lateral incisors are more often affected.[12] In addition to that, the permanent successor has a high chance to exhibit an odontogenic abnormality, the most frequent of which is a supernumerary permanent successor when the talon cusp was present on their predecessor's primary maxillary lateral.[13] They may be unilateral or bilateral with no side preferences.[14]

The prevalence of talon cusp in India is 0.02%–0.97%,[10,15] 0.34%–1.2% in Türkiye,[16,17] 0.55% in Jordan,[18] 0.6% in Mexico,[19] 2.5% in Hungary.[20] In contrast to Malaysia, it is reported slightly higher (5.2%), which is probably due to the small sample size population, and there was no sex predilection in the occurrence.[21] Similarly, a review from Hattab reported a considerably varied prevalence in different populations worldwide ranging from 0.06% to 7.7%.[22] This is in agreement with one of the systematic reviews that reported the mean prevalence of talon cusp at 1.97%.[5] Furthermore, talon cusp is less common in Caucasian and Black populations, but the incidence is higher in Mongoloids and Arab populations.[22,23] In line with that, it is agreeable worldwide that this anomaly affects people of Asian origin more frequently.[24]

The prevalence of talon cusp in the mandibular dentition is extremely low at 8.4%,[10,15] which poses a dilemma as well for any invasive management. According to Mallineni et al[25], lingual mandibular talon cusp anomalies statistically prevail over the facial type in permanent dentition, and they are frequently associated with double teeth, predominantly on the left side.[26] It's important to note that the term "double tooth" typically encompasses both fusion and gemination.[27] Interestingly, this uncommon combination is predominantly found in the Indian population, accounting for approximately 90% of cases.

Fusion, also known as synodontia, is characterized by the coalition of two or more separately developing tooth buds at the enamel or dentinal level with a presentation of one single huge tooth structure and the appearance of one missing tooth. Fusion can be complete or incomplete depending on the stage of development during the union of the teeth. Complete fusion occurs before calcification of two tooth buds, whereas incomplete fusion occurs usually at the root level after the crown formation.[28]

Two independent pulp chambers and root canals can be seen radiographically on some occasions.[29] Fused teeth have been categorized according to their mor-

phology and extent of fusion by Aguiló et al[30] as follows: Type I: a bifid crown with a single root; Type II: a large crown with a large root; Type III: two fused crowns with a double conical root; Type IV: two fused crowns with two fused roots.

Currently, there is no definitive etiology for fusion. The close contact between two developing tooth germs produced by the surrounding pressure and physical forces are thought to be the main causative factors that result in fusion. Besides, genetic factors, environmental factors, and trauma are also listed as possible contributing factors. As mentioned by Grover and Lorton, the possible factor that causes fusion might be due to the local metabolic interferences that took place during the morpho-differentiation. On the other hand, fusion can also be associated with syndromes such as achondroplasia and chondroectodermal dysplasia.[31]

The incidence of fusion is higher in Asians and Native Americans, with males and females being equally affected. It also can be seen in both primary (0.4–0.9%) and permanent dentition (0.2%).[32] The prevalence of fusion can be seen more frequently in the mandibular anterior teeth compared to the maxillary teeth, which might be associated with genetic, racial, and also geographical factors. Furthermore, fusion can be observed commonly as a unilateral presentation, which is frequently associated with lateral incisors and canines. Reddy and Munshi reported about 0.14% incidence of unilateral fusion in the Indian population.[1]

However, on rare occasions, fusion can also be presented as a large tooth with a normal number of dentitions. This can be presented due to the union of the normal tooth germ with the supernumerary tooth bud. In this case, it is quite difficult to differentiate between fusion and gemination. As gemination is also presented as a large tooth with a normal number of teeth in the dentition except that it arises when two teeth develop from a single tooth bud.[33] In order to determine the definitive diagnosis of these anomalies, a thorough radiographic and clinical oral examination is needed.[1] The aim of this case report is to present an uncommon occurrence of bilateral fusion with talon cusps in the permanent teeth of an 8-year-old child.

Case Report

A healthy 8-year-old female reported to the Pediatric Dental Clinic for a regular dental check-up. Her medical and dental history is unremarkable. Extra-oral examination revealed no significant findings, whereas the intra-oral examination showed fair oral hygiene with mild gingivitis. There were multiple dental caries on the primary and permanent molars, and the patient was in mixed dentition with the presence of permanent teeth 16, 26, 36, 46, 11, 21, 24, 32–42, and deciduous teeth 55, 54, 53, 52, 62, 63, 64, 75, 73, 83, 84, and 85. Dental caries were assessed using the International Caries Detection and Assessment System (ICDAS). They were identified as ICDAS 02 at 55, 65, 75, 85, ICDAS 03 at 54, and 52, ICDAS 06 at 64, and ICDAS 00 at the remaining teeth. On further examination, bilateral fusion of teeth 31, 32 and 41, 42 was disclosed with the presence of a talon cusp on fused teeth 41, 42 (Fig. 1). A dental examination showed crowding of the lower labial sulcus and otherwise, no noticeable abnormalities were observed. An extraoral radiograph was taken for further investigation. The orthopantomogram showed the presence of teeth up to age with anterior mandibular teeth exhibiting open apex and no periapical lesion associated with the teeth (Fig. 2a). An intraoral periapical radiograph showed the fusion of teeth 41, 41, and 31, 32 (Fig. 2b, c). Since no pulp involvement was present with no occlusal interference, we decided to monitor the condition. Therefore, routine scaling and oral prophylaxis, compomer restoration placed on teeth 55 and 85, composite restoration on tooth 65, fissure sealant placed on tooth 75, fused teeth 31 and 32, 41 and 42, and extraction of teeth 54, 64, and 82 were performed (Fig. 3). Written consent was obtained from the mother for dental treatment and agreement to use her records or photographs for publication purposes. A 3-month review showed intact fissure sealants on the fused teeth 31, 32, and 41, 42 (Fig. 4a, b). The patient is under regular review every 3–6 months.

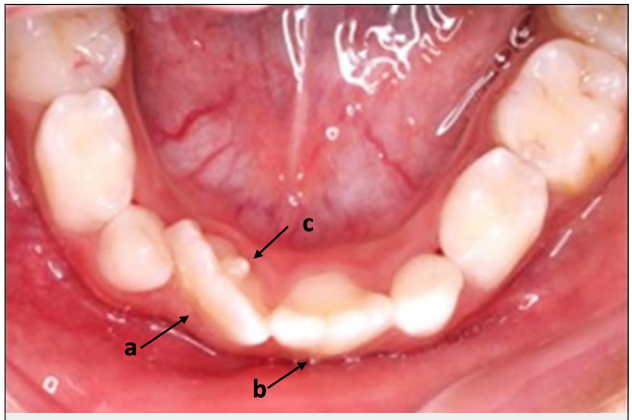

Figure 1. Occlusal view photograph showing the fused teeth and talon cusp, (a) Fusion of teeth 41, 42, (b) Fusion of teeth 31, 32, (c) Talon cusp on the lingual surface of fused teeth 41, 42

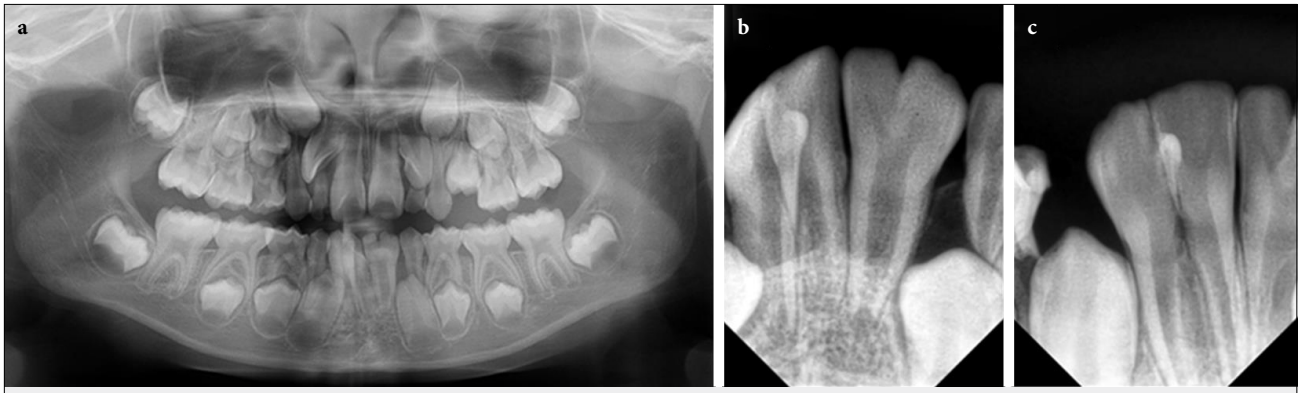

Figure 2. (a) Orthopantomogram showing a mixed dentition stage. (b) Periapical radiograph of teeth 31,32 showing fused canal. (c) Periapical radiograph of teeth 41,42 showing a separate canal with open apex

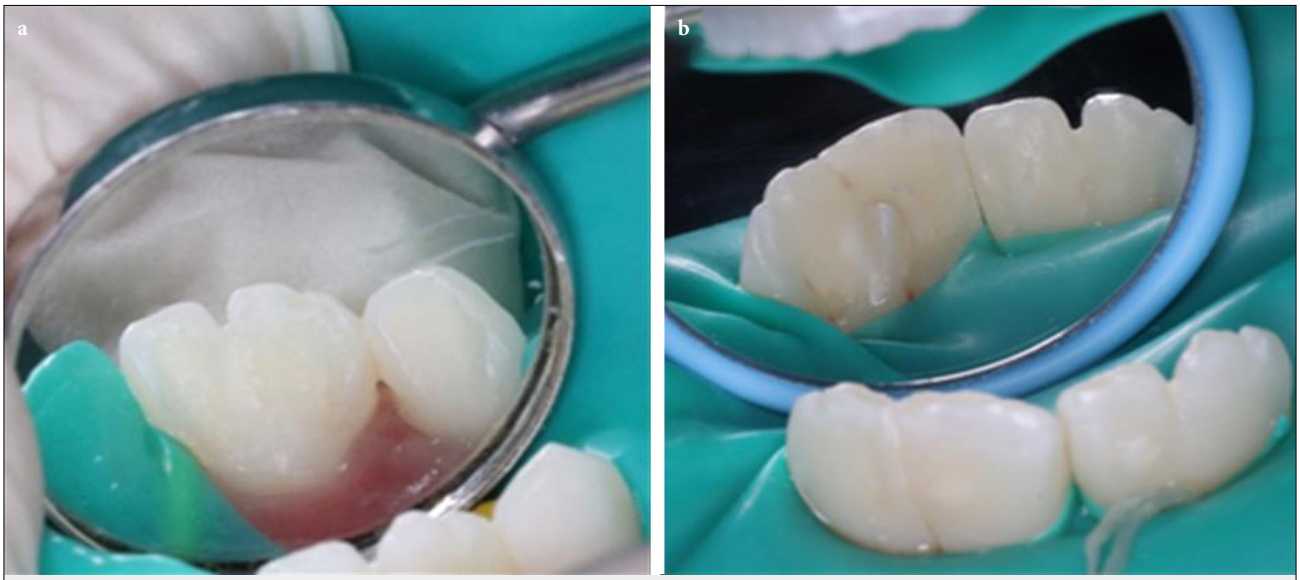

Figure 3. Fissure sealant placed on fused teeth 31,32 and 41,42 (mirror image)

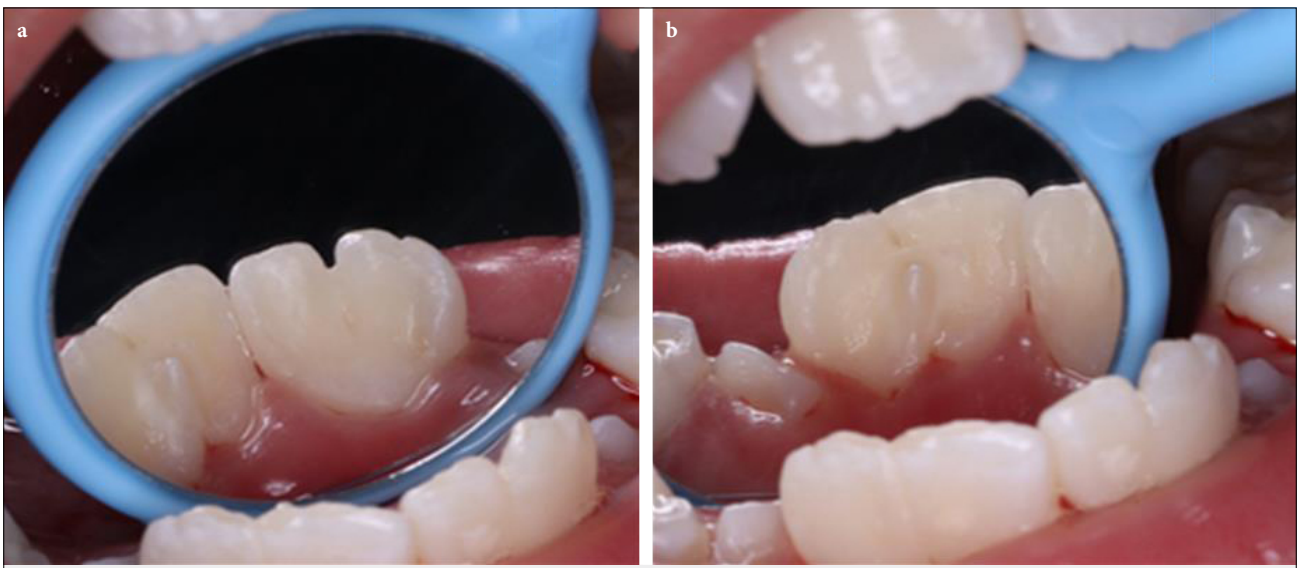

Figure 4. Fissure sealant remained intact on fused teeth 31,32 and 41,42 after 3 months (mirror image)

Discussion

In our case, the ICDAS score was employed because it has demonstrated high accuracy and is considered the gold standard for identifying early carious lesions during visual inspections.[34] It was widely used over the region and has enabled better integration/communication of knowledge across caries research, education, public health, and clinical practice.[35] It incorporates both cavitated and non-cavitated carious lesions with acceptable reliability, hence allowing an early diagnosis of non-cavitated carious lesions, which enables preventive measures ultimately preventing dental caries-related morbidity, thus reducing the financial burden associated with restorative or rehabilitative dental care.[36]

Talon cusp is classified as facial, lingual, and facial and lingual types.[27] Its occurrence in the mandibular anterior teeth is rare, and the concomitant occurrence of its fusion is rarer.[37] For tooth fusion, the occurrence in the permanent dentition is less frequent compared to the deciduous dentition, and it mostly affects the incisors and canines.[38] It can occur either unilaterally or bilaterally. For this case report, the occurrence of the fusion teeth involved the 31 and 32 and between 41 and 42, which is bilateral. Bilateral fusion in permanent dentition is rare compared to unilateral fusion, and there were 0.05% of cases have been reported in the literature.[39]

In general, the presence of talon cusps can result in clinical challenges, including problems with food retention, dental caries, periapical lesions, irritation of the tongue during speaking and eating, discomfort in other soft tissues, and potential aesthetic concerns, particularly related to facial appearance.[18] The presence of a tubercle in this child at the lingual side contributes to becoming a part of the plaque retentive factor. Moreover, this area is known to have the greatest amount of supragingival calculus as the lingual surfaces of mandibular anterior teeth are close to the orifices of salivary ducts.[40]

The presence of facial talon cusps in the mandible and palatal talon cusps in the maxilla can lead to occlusal interference, potentially resulting in accidental cusp fractures, tooth displacement, temporomandibular joint pain, and periodontal problems due to excessive occlusal force.[17] In addition to that, tubercles have an enamel layer covering a dentine core containing a thin extension of the pulp. These cusp-like protrusions are susceptible to pulp exposure from wear or fracture because of malocclusion, thus leading to pulpal complications soon after eruption.[41]

Fusion should be able to be recognized and differentiated from tooth germination. In this case report, clinically, two units of the teeth with crowns larger than normal were identified at the 32, 31, 41, and 42 regions with a reduced number of teeth noted in the dentition. A notch on the incisal edge of both crowns was noted. However, an additional cusp, which is a talon cusp, was noted in the middle of the large crown involving teeth 41 and 42. Radiographically, the 31 and 32 teeth exhibited a fused canal with a bifid pulp chamber (Type I). Meanwhile, teeth 41 and 42 exhibited two clearly separate root canals with joined roots (Type IV). Based on the clinical and radiographic examinations, the definitive diagnosis for this case was a fusion that occurred between teeth 31 and 32 and also between teeth 41 and 42. Ultimately, the management of talon cusp depends on its size and shape, and it necessitates careful clinical judgment. Treatment options include a range of approaches, from no treatment to sequential grinding, pit and fissure sealing, pulp therapy, restorative treatment, full crown coverage, or even extraction of the affected tooth.[42] For the mandibular lingual talons, it poses a dilemma for the author whether to do intervention as it does not interfere with the occlusion since grinding will cause more problems from these cusps.[43] Besides, it is agreed that the removal of the cusp may be useful in the presence of occlusal and speech impediments.[44]

In fusion, usually, most of the cases are incidental findings and the patient was not aware of the presence of dental anomalies, as most of the time it was asymptomatic.[45] However, it can lead to the presence of space between teeth and result in tooth size discrepancy, which will affect the alignment of the dentition, the occlusion, and also the arch symmetry. Besides that, the morphology of the fused teeth is not esthetically pleasing as a deep groove or fissure is usually present at the junction between the two teeth involved. This will expose the tooth to being more susceptible to bacterial plaque retention, which then can lead to the formation of dental caries and periodontal problems.

Clinical examination, coupled with a clear and high-definition radiograph, such as the intraoral periapical radiograph, is typically sufficient unless there are intricate endodontic diagnoses or complications that require the use of cone beam computed tomography (CBCT).[46] As the morphology and clinical implications of the fusion vary, the management also varies depending on the issues that include orthodontic correction, sectioning of the fused teeth after the endodontic

therapy, orthodontic correction, and also selective resection. One of the acceptable methods is the selective resection of fused teeth with subsequent orthodontic alignment, followed by ridge preservation.[28] The primary consideration in managing fused teeth was the condition of the affected teeth and the specific needs of each patient. Therefore, all issues related to fusion should be addressed and intervened accordingly depending on the indications.[47]

Therefore, thorough oral health education and strict oral hygiene maintenance should be introduced to the patient to maintain good dental and periodontal health. Besides that, a protection layer such as fissure sealant can be applied on the groove in order to protect the teeth and to reduce the susceptibility of caries on the teeth involved.[47] In the case when the caries is too deep, it may lead to infection, and endodontic treatment of the fused teeth is then needed. Endodontic treatment in the fused teeth can be quite challenging as the internal morphology of the fused teeth varies, with the pulp chamber being either fused or separated, and this will result in difficulties in accessing the canals.

Dankner, in a case report, outlined the commencing of selective grinding of lingual talon cusps to prevent caries development in the fissure, whereas Ekambaran reported no active treatment was done on lingual talon cusp with a double tooth because it does not pose any significant problem, and the patient also was not bothered by the appearance.[43,44] In addition, two case series reported by Goswami showed that the occurrence of unilateral fused teeth with talon cusp remains asymptomatic and was arranged with periodic review after the fissure sealant was placed.[37] Thus, in this case report, as no signs and symptoms were noted on the involved teeth, fissure sealant was applied on both fused teeth 32 and 31, and on the fused teeth 41 and 42 to protect the teeth from being susceptible to caries.

Conclusion

Early diagnosis of the talon cusp and fusion can help the clinician in preventing further complications. It has to be carefully identified clinically and radiographically for early diagnosis, and long-term follow-up is required in order to prevent issues in the future.

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