Unusual occurrence of accessory central cusp in the maxillary second primary molar

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Abstract

Accessory cusp present on the occlusal surface may seldom pose problems. While its presence may not be a cause for alarm in most instances, it can sometimes lead to serious consequences if it is damaged. This case presents a rare finding of unilateral central accessory cusp seen on the occlusal surface of the maxillary left second primary molar and discusses the need for continuous dental surveillance and preventive measures.

Keywords: Accessory central cusp, maxillary primary molars, occlusal surface

Introduction

Central cusps (occlusal supernumerary cusps) are situated between the buccal and the lingual cusp tips in the occlusal surface of the premolars and molars and on the lingual surface of the incisors and canines. The first description was provided by Leigh (1975), who reported an enamel tubercle on the maxillary right third molar of an Eskimo skull. Human teeth of both dentitions may show variations and changes in morphological structures. Such changes may be found on the crown either in the form of anomalous cusps or in an increased number of roots, which in some instances is associated with an anomalous cusp.[1] Accessory cusps are common variations of tooth morphology that are occasionally seen clinically. However, their incidence differs depending on the type and the tooth affected. The most commonly reported accessory cusps are cusp of carrabelli of the molars, talons cusps of the incisors and leong's tubercle of premolar. These variations can be seen both in primary and in permanent dentitions.[2] The frequencies of occurrence of these variations differ depending on the type, between 1% and 7.7% for the Talon cusp, 52%[3-5] and 68% for Carabelli cusp[6,7] and 8% for the Leong's turbecle.[8]

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Access this article online	
Quick Response Code:	Website: www.contempclindent.org
	DOI: 10.4103/0976-237X.83078

Presence of these extra cusps may have dental problems such as caries in the pits or developmental grooves between the accessory cusp and the tooth,[9] sensitivity or devitalisation of tooth due to fracture or attrition of the protruded portion of the cusp that has pulpal extension.[5,10,11] The etiology of extra cusp formation or abnormal shape is unknown. However, previously, it was said that, genetically, these features are probably due to overactivity of the dental lamina. But, now, it is believed that the PAX and MSX genes are responsible for the abnormal shape of the teeth.[12]

It is thought to develop from an abnormal proliferation and folding of a portion of the inner enamel epithelium and subjacent ectomesenchymal cells of the dental papilla into the stellate reticulum of the enamel organ during the bell stage of tooth formation.[13-15] The resultant formation is defined as a tubercle or supplemental solid elevation on some portion of the crown surface. Current embryological evidence indicates that tooth morphogenesis is characterized by transient signaling centers in the epithelium, consisting of epithelial cell clusters that correspond to the initiation of individual cusps.[16,17] These signaling centers of non-proliferative transitory epithelial cells, the primary and secondary enamel knots, serve a regulatory function and are surrounded by strongly proliferative epithelium and underlying mesenchyme.[18] The primary enamel knot appears at the late bud stage, grows in size until the cap stage of tooth development is reached and is responsible for the induction of the dental papilla.[19] The primary enamel knot regulates the advancing cuspal morphogenesis of the crown through expression of up to 20 molecules, such as fibroblast growth factors (FGF-4 and 9), transforming growth factor-β (TGF-β) and bone morphogenic proteins (BMP-2, 4 and 7).[20] It has been suggested that mesenchymal BMP-4 induces expression of p21, a cyclin-dependant kinase inhibitor associated with terminal differentiation and possibly linked to the programme disappearance of the primary knot cells.[21] One theory is that these cells are induced to undergo a process of apoptosis and, by the early bell stage, are no longer visible.[22] The accumulation of molecules expressed by the primary enamel

knot is thought to induce the initiation of the secondary enamel knots at the sites of epithelial findings that mark cusp formation during the early bell stage of tooth development.[21] The phenomenon of embryonic induction within and between different cell types is considered to be an important factor in the orderly formation of various parts of the tooth.

Activator from the primary enamel knot regulates the expression of secondary enamel knots. The resultant cusp morphogenesis and positions appear to be determined sequentially, and cusps that form late in development, after the main cusps, are typically small.[21] The secondary enamel knots disperse after formation of the cusp tips, indicating the termination of crown morphogenesis. Furthermore, the actual number of cusps realized in each tooth is also determined by the initiation of root formation. Thus, specific signaling molecules diffusing from the mesenchymal cells may act as inhibitors for the cusp tips while simultaneous production of other molecular signals may induce differentiation of Hertwig's epithelial root sheath at the cervical loop.

When the developmental anomaly appears in the anterior dentition, the tubercle most often forms on the lingual surface and is referred to as talon cusp.[23] When associated with the posterior dentition, the tubercle is variously located on the occlusal surface, primarily from the central groove, followed next in frequency by developing on the inclined plane of the buccal cusp. The purpose of this report is to highlight an incidental clinical finding of unilateral accessory central cusp of the maxillary left second primary molar and problems associated with it.

Case Report

A south Indian girl aged 12 years reported to the Department of Pediatric Dentistry for treatment of carious teeth. Family and health histories were non-contributory. On intraoral examination, no abnormalities of soft tissues were found. The patient was in mixed dentition period with good oral hygiene. The teeth present (in FDI notation) were

16 55 24 13 12 11 21 22 24 65 26

46 45 44 43 42 41 31 32 33 35 36

Detailed dental evaluation was carried out and it was noted that her right maxillary second primary molar had a large carious lesion. In addition to the above findings, a large central projection of a cusp was seen on the occlusal surface of the left maxillary second primary molar [Figure 1]. The projection was 4 mm × 4 mm in size with a rhomboid base and was present on the center of the oblique ridge. The tip of the extra cusp lies 1 mm above the level of the other cusps of the teeth [Figure 2]. Presence of large Carabelli cusp was also noted on the upper left maxillary second primary molar [Figure 3]. The corresponding primary molar of the mandibular arch did not exhibit any depression. Grooves

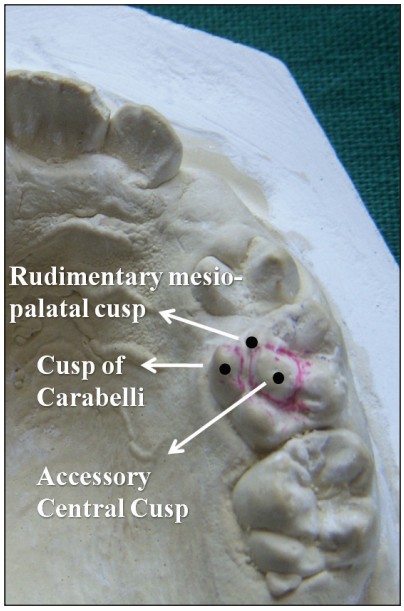

Figure 1: Cast model showing accessory cusp on the left maxillary second primary molar

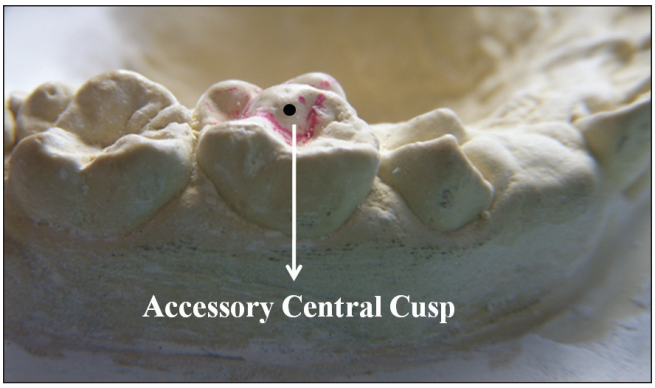

Figure 2: Cast model showing projection of the central cusp

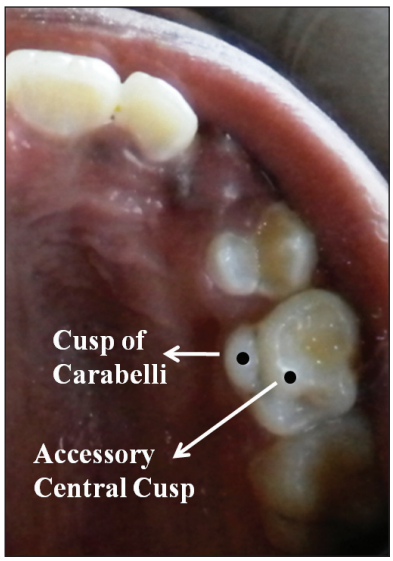

Figure 3: Intraoral picture showing occlusal anatomy of the left maxillary second primary molar

surrounding the accessory central cusps did not show any evidence of caries. Because of the carious lesion, we could not determine whether the maxillary right molar tooth had an extra cusp or not. The carious maxillary second primary molar was excavated with a fast speed hand piece, calcium hydroxide base given and restored with GC Gold Label 9™ (GC Corporation, Tokyo, Japan). Preventive measures such as oral hygiene care, diet advice and topical fluoride gel were also instituted.

Discussion

Accessory cusps are relatively rare anomalies. Central cusp and talon cusp both are referred to as dens evaginatus,[24] which is composed of enamel and dentin with or without pulp projections. The reported prevalence of dens evaginatus in the Asian population was 2%. The size, shape and location of these anomalies have wide variations. Because of this variation, accessory cusp formed on the maxillary or mandibular anterior teeth is often referred to as talon cusp and accessory cusp formed on the occlusal surface of the premolar or molar is referred to as dens evaginatus.[25] The central cusp on the occlusal surface of posterior teeth has also been given several descriptions such as supernumerary occlusal cusp, premolar odontome, occlusal tubercle, tuberculated premolar and leong's premolar.[26]

Presence of central cusp or tubercle at the center of a tooth is often said to be due to abnormal proliferation of the epithelial fold during the morphodifferentiation stage of tooth development.[13] Dens evaginatus occurs primarily in the people of Asian descent, such as Japanese, Chinese, Malay, Eskimo, American Indians, Thai and Filipinos.[27] Dens evaginatus can arise on any tooth, but it is most commonly associated with premolars.[28] There is typically a bilateral symmetric distribution with a slight predilection for females.[29]

The dens evaginatus tubercles of posterior teeth average 2.0 mm in width[30] and up to 3.5 mm in length,[31] 3.5 mm in width and 6.0 mm in length for anterior teeth.[22] Other than the cusp like variable size and shape tubercle of teeth with dens evaginatus, the remaining portion of the crown has a normal anatomy.[29] This is an additional distinguishing characteristic from the accessory cusp of carabelli, which, when present, shows that the associated teeth are often larger than the normal teeth, mesiodistally.[32] Schulge distinguishes the following five types of dens evaginatus for posterior teeth by the location of the tubercle.[27]

- A cone-like enlargement of the lingual cusp.
- A tubercle on the inclined plane of the lingual cusp.
- A cone-like enlargement of the buccal cusp.
- A tubercle on the inclined plane of the buccal cusp.
- A tubercle arising from the occlusal surface obliterating the central groove.

Accordingly, Lau[15] further classified each type of tubercle on the basis of four anatomical shapes of smooth, grooved, terraced and ridged.

Finally, Oehlers identified the evagination according to the pulp contents within the tubercle by examining the histological appearance of the pulp using the decalcified serial sections of extracted teeth with dens evaginatus.[33] These categories are listed as follows along with their percentage of occurrence:

- Wide pulp horns (34%)
- Narrow pulp horns (22%)
- Constricted pulp horns (14%)
- Isolated pulp horn remanents (20%)
- No pulp horn (10%)

Dens evaginatus is more commonly found on permanent dentition.[32] Most of the reported literatures were on the presence of talon cusps on permanent and primary dentitions[34,35] and also on dens evaginatus on permanent dentition.[11] Although it has been mentioned that the occurrence in central cusps in primary dentition is rare, there is no evidence to justify this statement. There is only one reference of dens evaginatus on primary molars.[36]

In the present case, we found that the accessory cusp is situated centrally in the oblique ridge and the cuspal tip is below the level of the other cusps.[37] Looking at the clinical presentation, we assume that this case is similar to dens evaginatus. The patient is kept under observation in order to know whether the permanent successors also show evidence of dens evaginatus later.

Conclusions

Patients with additional tooth projections should be placed under routine and periodic dental surveillance, which include monitoring of the degree of attrition and tooth vitality. Early diagnosis and management are important if complications are to be avoided.

References

1. Kallay J. Extra Cusp Formation in the Human Dentition. J Dent Res 1966;45:1381-93.
2. Ooshima T, Ishida R, Mishima K, Sobue S. The prevalence of developmental anomalies of teeth and their association with tooth size in the primary and permanent dentitions of 1650 Japanese children. Int J Paediatr Dent 1996;62:87-94.
3. Curzon ME, Curzon JA, Poyton HG. Evaginated odontomes in the Keewatin Eskimo. Br Dent J 1970;129:324-8.
4. Chawla HS, Tewari A, Gopalakrishnan NS. Talon cusp – a prevalence study. J Indian Soc Pedod Prev Dent 1983;1:28-34.
5. Shay JC. Dens evaginatus: Case report of a successful treatment. J Endod 1984;10:324-6.
6. Kannapan JG, Swaminathan S. A study on a dental morphological variation. Tubercle of Carabelli. Indian J Dent Res, 2001;12:145-9.
7. Mavrodisz K, Rósza N, Budai M, Soós A, Pap I, Tarján I. Prevalence of accessory tooth cusps in a contemporary and ancestral Hungarian population. Eur J Orthod 2007;29:166-9.

8. Segura-Egea JJ, Jiménez-Rubio A, Velasco-Ortega E, Ríos-Santos JV. Talon cusp causing occlusal trauma and acute apical periodontitis: Report of a case. Dental Traumatol 2003;19:55-9.
9. Rusmah M. Talon cusps in Malaysia. Aust Dent J 1991;36:11-4.
10. Güngör HC, Altay N, Kaymaz FF. Pulpal tissue in bilateral talon cusps of primary central incisors: Report of a case. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2000;89:231-5.
11. Stecker S, DiAngelis AJ. Dens evaginatus: A diagnosis and treatment challenge. J Am Dent Assoc 2002;133:190-3.
12. Sedano HO, Ocampo-Acosta F, Naranjo-Corona RI, Torres-Arellano ME. Multiple dens invaginatus, mulberry molar and conical teeth. Case report and genetic considerations. Med Oral Patol Oral Cir Bucal 2009;14:E69-72.
13. Ngeow W, Chai W. Dens evaginatus on a wisdom tooth: A diagnostic dilemma. Case report. Aust Dent J 1998;43:328-30.
14. Oehlers F. The tuberculated premolar. Dent Prac Dent Rec 1956;6:144-8.
15. Lau T. Odontomes of the axial core type. Br Dent J 1955;99:219-25.
16. Jernvall J, Thesleff I. Reiterative signaling and patterning in mammalian tooth morphogenesis 2000;92:19-29.
17. Weiss KM, Stock DW, Zhao Z. Dynamic interactions and the evolutionary genetics of dental patterning. Crit Rev Oral Biol Med 1998;9:369-98.
18. Jernvall J. Linking development with generation of novelty in mammalian teeth. Proc Natl Acad Sci 2000;97:241-5.
19. Hargreaves K, Goodis H, editors. Seltzer and Bender's dental pulp. 1st ed. Chicago: Quintessence Publishing; 2002. p. 13-7.
20. Thesleff I, Keranen S, Jernvall J. Enamel knots as signaling centers linking tooth morphogenesis and odontoblast differentiation. Adv Dent Res 2001;15:14-8.
21. Thesleff I. Epithelial-mesenchymal signaling regulating tooth morphogenesis. J Cell Sci 2003;116:1647-8.
22. Matalova E, Tucker A, Sharpe P. Death in the life of a tooth. J Dent Res 2004;83:11-6.
23. Hattab F, Yassin O, Al-Nimri K. Talon cusp—clinical significance and management: Case reports. Quintessence Int 1995;26:115-20.
24. Yip WK. The prevalence of dens evaginatus. Oral Surg Oral Med Oral Pathol 1974;38:80-7.
25. Levitan ME, Himel VT. Dens evaginatus: Literature review, pathophysiology, and comprehensive treatment regimen. J Endod 2006;32:1-9.
26. Jerome CE, Hanlon RJ Jr. Dental anatomical anomalies in Asians and Pacific Islanders. J Calif Dent Assoc 2007;35:631-6.
27. Scott GR, Turner II CG. The Anthropology of Modern Human Teeth. Dental Morphology and Its Variation in Recent Human Populations. Cambridge: Cambridge University Press; 1997. p. 35-7.
28. Kocsis GS, Marcsik A, Kókai EL, Kocsis KS. Supernumerary occlusal cusps on permanent human teeth. Acta Biol Szeged 2002;46:71-82.
29. Hill FJ, Bellis WJ. Dens evaginatus and its management. Br Dent J 1984;156:400-2.
30. Merrill RG. Occlusal anomalous tubercles on premolars of Alaskan Eskimos and Indians. Oral Surg Oral Med Oral Pathol 1964;17:484-96.
31. Priddy W, Carter H, Auzins J. Dens evaginatus—an anomaly of clinical significance. J Endod 1976;2:51-2.
32. Palmer M. Case reports of evaginated odontomes in Caucasians. Oral Surg Oral Med Oral Pathol 1973; 35:772–9.
33. Neville B, Damm D, Allen C, Bouquot J. Oral and maxillofacial pathology. 2nd ed. Philadelphia: WB Saunders; 2002. p. 77-9.
34. Oehlers F, Lee K, Lee E. Dens evaginatus (evaginated odontome): Its structure and responses to external stimuli. Dent Pract Dent Rec 1967;17:239-44.
35. Ferraz JA, de Carvalho Júnior JR, Saquy PC, Pécora JD, Sousa-Neto MD. Dental anomaly: Dens evaginatus (talon cusp). Braz Dent J 2001;12:132-4.
36. Chen RJ, Chen HS. Talon cusp in primary dentition. Oral Surg Oral Med Oral Pathol 1986;62:67-72.
37. Nagarajan S, Sockalingam MP, Mahyuddin A. Bilateral accessory central cusp of 2nd deciduous molar: An unusual occurrence. Arch Orofac Sci 2009;4:22-4.

How to cite this article: Nirmala S, Challa R, Velpula L, Nuvvula S. Unusual occurrence of accessory central cusp in the maxillary second primary molar. Contemp Clin Dent 2011;2:127-30.

Source of Support: Nil. **Conflict of Interest:** None declared.