Case Report

Permanent Mandibular Protostylid: A Rare Developmental Anomaly and its Overview

Abstract
Developmental malformations of the teeth might result in alterations of their size, shape, and structure. An accessory cusp is a developmental alteration to the shape of the teeth and is more commonly found in anterior teeth, and its occurrence in permanent molars is quite rare. Accessory cusps occurring in permanent mandibular molars are termed as protostylids. Although they do not pose any significant problem with respect to the function and occlusion, it is of tremendous importance in forensic odontology. This case report presents a rare finding of protostylid on the permanent mandibular molar, and its clinical implications are illustrated.

Keywords: Accessory cusp, paramolar cusp, protostylid, supernumerary cusp

Introduction
Paramolar cusp is supernumerary eminences that occur on the buccal surface of upper and lower permanent or deciduous molars.\(^1\) Protostylid is a term referred to differentiate them from general group of paramolar cusp, with its reference to a supernumerary or accessory cusp located on the mesiobuccal surface of lower molars, with its finding first reported by Dahlberg in Eskimos skull.\(^2\) De jonge cohen gave them the term “Mesio Buccal Edge Prominence.”\(^3\) Asian population are said to have prevalence rate of 2% and the paramolar cusp is most commonly found in permanent mandibular molars.\(^4\) However, conclusive data of the prevalence and incidence of these protostylid are lacking as no extensive studies have been conducted with respect to its occurrence. However, data from previous studies suggest that there is strong correlation with respect to the genetic influence of such findings.\(^2,3\)

Data also suggest that two individuals having similar cuspal patterns have a high chance of being genetically related. Ethnic influence on the dental morphology cannot be denied but the final tooth morphology is a sum total of the genetic and environmental influence.\(^5\) The purpose of this report is to highlight the rare incidental finding of protostylid on the buccal surface of permanent mandibular second molar, its clinical significance, and its implications on forensic odontology.

Case Report
A 30-year-old female patient reported to the Department of Dental Surgery, Royapettah Government Hospital. Family and medical histories were not relevant. On routine dental examination, protostylid condition was found on the buccal surface of mandibular second molar [Figure 1].

According to the classification of protostylid given by Hanihara,\(^6\) it falls into the type 6 (protostylid is strongly developed so that the tooth seems to have an extracusp on the buccal surface) [Figure 2]. Intraoral periapical radiograph reveals that the cusp was devoid of any pulp extension and appears as a radiopaque area extending from the occlusal surface up to the cementoenamel junction [Figure 3]. As the accessory cusp did not cause any functional complications, no occlusal modifications were carried out.

Discussions
This case report deals with an uncommon condition of protostylid found as a bulbous accessory cusp on mandibular second molar found in a female patient aged 30 years. In the previous studies, it has been shown that individuals with protostylid in deciduous molars were also found to express similar pattern in the succedaneous permanent teeth.\(^2\) Etiology of such an analogous cusp is usually due to overactivity of dental lamina.\(^2,3\) The protostylid originates

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Dr. Lingeshwar D, Government Royapettah Hospital, Chennai, Tamil Nadu, India. E-mail: lingeshwar25@gmail.com

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development.\[4\] It was reported that PAX and MSX genes are responsible for the development of protostylid.\[5\] PAX9 of the paired box genes coding tissue-specific transcription factors and MSX Homeobox 1 also known as MSX1, a protein that in humans is encoded by the MSX1 genes, are the strongest candidate genes for specific form of tooth agenesis and are found in very few individuals.\[5\] These independent defective genes expressed in early dental epithelium along with combinations of other genes can lead to specific morphological or developmental characteristics. Such change in cuspal configurations depends upon the genetically determined molecular pattern.\[5\]

There are few dental problems posed due to such conditions of protostylid which are the pit and fissure caries, sensitivity, and devitalization due to fracture or attrition of protruded portion of cusp leading to pulp exposure.\[6\] Occlusal interference due to premature tooth contact and habitual repositioning of jaw, and sharp prominent cusp causes irritation to the buccal mucosa. During orthodontic correction, it may interfere with cementation of brackets and in the alignment of arch wires.\[6\] In such conditions, protostylid is removed by ameloplasty (selective removal of enamel by grinding) after the pulpal extension into the protostylid is ruled out.

The protostylids act as a useful tool in forensic odontology since dental tissues remain unchanged even after a long period of stay in extreme environments such as immersion under water, buried under soil, and exposure to biological agents.\[7,8\] Identification of distinctive feature of dentition are morphology of tooth size, shape and occlusal surface, bite mark analysis, rugae pattern, lip prints, and extraction of DNA from teeth is the important stage in forensic odontology.\[8,9\] If the tubercle was found in two coeval individuals in a population, it increases the likelihood that the persons are genetically related. The occlusal morphology of an individual is one of the most preferred choices in identifying the dead as it is simple and easy to evaluate the gender of an unidentified individual, age estimation of both living and deceased.\[9,10,11\]

**Conclusion**

Type 6 protostylid occurring in permanent mandibular molar is a rare finding and very few cases have been reported. Although these are usually fortuitous findings, one should take into account the functional problems that it can cause leading to temporomandibular joint disorders in some patients and also the enormous forensic value that it possess.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not
be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

**References**

1. Dahlberg A. Analysis of the American Indian Dentition. Dental Anthropology1963. p. 149-77.
2. Nirmala SV, Gaddam KR, Vimaladevi P, Nuvvula S. Protostylid: A case series. Contemp Clin Dent 2013;4:349-52.
3. Surendran S, Babu P, Geetha V, Thomas AE. Dental anatomic variations in primary dentition: A case series. Int J Dent Sci Res 2013;1:36-39.
4. Skinner MM, Wood BA, Hublin JJ. Protostylid expression at the enamel-dentine junction and enamel surface of mandibular molars of *Paranthropus robustus* and *Australopithecus africanus*. J Hum Evol 2009;56:76-85.
5. Mostowska A, Kobiela A, Trzeciak WH. Molecular basis of non-syndromic tooth agenesis: Mutations of MSX1 and PAX9 reflect their role in patterning human dentition. Eur J Oral Sci 2003;111:365-70.
6. Gaspersic D. Morphology of the most common form of protostylid on human lower molars. J Anat 1993;182(Pt 3):429-31.
7. Nagaveni NB, Umashankara KV, Radhika NB, Garewal RS. “Paramolar tubercle” in the primary dentition: Cases reports and literature review. Int J Dent Anthropol 2009;14:12-8.
8. Shetty S, Shetty P. Occlusal morphology in identification of individual – A useful forensic tool. J Forensic Dent Sci 2011;3:23-6.
9. Sweet D, DiZinno JA. Personal identification through dental evidence – Tooth fragments to DNA. J Calif Dent Assoc 1996;24:35-42.
10. Mosharraf R, Ebadian B, Ali Z, Najme A, Niloofer S, Leila K, et al. Occlusal morphology of mandibular second molars in Iranian adolescents. Indian J Dent Res 2010;21:16-9.
11. Pretty IA. Forensic dentistry: 1. Identification of human remains. Dent Update 2007;34:621-2, 624-6, 629-30.