

Research Paper: Prevalence and Distribution of Carabelli Cusp in Maxillary Molars in Deciduous and Permanent Dentition and Its Relation to Tooth Size in a Group of Iranian Adult and Pediatric Dental Patients

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ABSTRACT

Background: Carabelli cusp is a dental morphologic anomaly arising on the palatal side of the mesiopalatal cusp of maxillary first or second molars. It is believed that this cusp is seen in people with larger teeth. Since it has different prevalence among populations, it can be used in forensic dentistry. As well, dentists should be aware of common dental anomalies that might impact dental treatments. In this study, the prevalence of Carabelli cusp and its relation to tooth size in permanent and deciduous dentitions in Iranian population was assessed.

Methods: This analytic-descriptive study was performed on 129 (43 deciduous, 86 permanent) patients and their dental casts. First and second molars were observed for the presence of Carabelli cusp. Mesiodistal width of teeth was recorded by using a vernier calliper. The data were analyzed by the Independent t test, Chi-square and Mann Whitney statistical tests using SPSS 18.

Results: Frequency of Carabelli trait were respectively 72% and 62% in deciduous and permanent dentitions. No significant difference was seen between males and females in this study in both studied dentitions ($P>0.05$). Dentitions with Carabelli cusp had larger mesiodistal width compared to other groups in both dentitions ($P<0.001$).

Conclusion: Carabelli cusp in the studied Iranian population was higher compared to other Asian populations. In addition, its bilateral occurrence like a shallow groove in first maxillary molars was related to larger tooth size in both dentitions.

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1. Introduction

Cusp of Carabelli is a morphological tooth anomaly or an accessory cusp occurring as a well-developed tooth cusp, narrow groove, or furrow on palatal surface of the mesiopalatal cusp of maxillary first molars on both sides of deciduous and permanent dentition. When present, it is supposed that teeth show larger dimension in mesiodistal width, but this correlation was not seen in deciduous dentition [1, 2].

Studies indicate different prevalence of this cusp among nations, e.g. 70%-90% in Europeans, 54.2% in Malaysians, 52.77% in Indians, and 26%-27% in Asians with a high prevalence in Caucasians [2]. Apparently, the presence of Carabelli cusp is under the influence of several genes, and it has been proposed as a useful tool for anthropology and identification of races [3]. Especially as the tooth as a hard tissue will remain after decomposition of soft tissue can be used as an ethnic index [3, 4]. Thus in this study, the prevalence and distribution pattern of Carabelli cusp and its relation to tooth size was assessed and compared between deciduous and permanent dentition in a group of Iranian people.

2. Materials and Methods

Having already mentioned, the, presence of Carabelli cusp is related to a larger mesiodistal tooth size in permanent dentition although such a relationship has not been observed in deciduous dentition [1]. Thus in this analytic descriptive study, Carabelli cusp was studied on and compared between 129 patients and their dental casts composed of 86 adults (12-40 years old) and 43 children (4-12 years old), referring to Khorasgan Dental School and private clinics in Isfahan, Iran. Patients missing first or second permanent or deciduous molars or with excessive cavities, big restorations or crowns on these teeth were excluded from the study. Demographic data including age and gender were recorded. First and second molars were observed for the presence of Carabelli cusp. Mesiodistal width of central incisor, canine, first and second molar in permanent dentition and canine, first and second molars in deciduous

dentition were measured with the same vernier calliper by one examiner. Identification and grading of Carabelli cusp were performed as described by Hanihara [5] as mild: A small flat groove; medium: u or y shaped groove; and severe: clear and distinct cusp like cusp. The obtained data were analyzed by the Independent t test, Chi-square, and Mann-Whitney statistical tests.

3. Results

Deciduous dentition

A total of 43 casts were studied; 23 casts belonged to female participants and 20 to male patients. Carabelli cusp was seen in 31 (72%) cases with no significant difference between males (75%) and females (69.5%) ($P=0.69$) (Table 1). The cusp was seen unilaterally in 5 (16.12%) cases and bilaterally in 26 (83.87%) ($P<0.001$) (Table 2). Regarding the cusp grade, mild, moderate, and severe presentation of cusp were seen respectively in 41.9%, 32%, and 25.8% of cases. The difference between mild and moderate presentation to severe presentation was statistically significant ($P=0.04$) (Table 2). Mean(SD) mesiodistal width of studied deciduous teeth was 7.73(0.6) mm in the group with Carabelli cusp presentation compared to 7.2(0.2) mm in the other group ($P=0.01$). Tooth size did not show correlation with the size of the Carabelli cusp ($P=0.88$) (Table 3).

Permanent dentition

A total of 86 permanent casts were studied; 41 cases belonged to female casts and 45 casts to male casts. Frequency of Carabelli cusp was 62.7% ($n=54$) in permanent dentition. In particular, 63.4% was seen in females and 62.2% in males. The Chi-square test did not show this difference to be statistically significant ($P=0.91$) (Table 1).

In 97.7% of cases, Carabelli cusp was only observed on the first molar. We did not see the occurrence of Carabelli cusp on the second molars without the involvement of the first molars. In 2.3% of cases, the accessory cusp was seen on both first and second molars (Table 2). The unilateral occurrence of Carabelli trait was seen in 24%

Table 1. Prevalence of Carabelli cusp in the studied groups and its prevalence in relation to gender ($\alpha=0.05$)

	Prevalence of Carabelli Cusp (%)	Male (%)	Female (%)	P
Primary dentition	72	46.52	53.48	0.69
Permanent dentition	62.7	62.2	63.4	0.91

Table 2. Frequency distribution of Carabelli cusp in the studied groups ($\alpha=0.05$)

	Involved Tooth			Bilateral Presentation (%)	Unilateral Presentation (%)	Grading of Carabelli Cusp		
	First Molar Individually (%)	Second Molar Individually	First and Second Molar Together (%)			Mild (%)	Moderate (%)	Severe (%)
Primary dentition	100	-	-	83.88	16.12%	41.9	32	25.8
				P<0.001		P=0.04		
Permanent dentition	97.7	-	2.3	76	24	46.2	37.03	16.6
				P<0.001		P=0.01		

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Table 3. Mean (SD) mesiodistal width of teeth in the studied groups ($\alpha=0.05$)

Dentition	Mean (SD)		P
	Dentition Without Carabelli Cusp (mm)	Dentition With Carabelli Cusp (mm)	
Primary	7.25(0.2)	7.7(0.6)	0.01
Permanent	8.64(0.5)	9.13(0.5)	<0.001

International Journal of
Medical Toxicology & Forensic Medicine

of cases (n=13), which was significantly different from bilateral occurrence (P<0.001) (Table 2).

Regarding the grade; mild, moderate, and severe presentation of cusp was seen respectively in 46.2%, 37.03%, and 16.6% of cases. The difference between mild and moderate presentation to severe presentation was statistically significant (P=0.01) (Table 2). Mean (SD) mesiodistal width values of six teeth; 2 canine, 2 first, and 2 second molars in cases of permanent dentition with Carabelli cusp were 9.15(0.5) mm and 8.6(0.5) mm in the other group with no Carabelli cusp (P<0.01) (Table 3). Tooth size did not show correlation with the degree of severity of Carabelli cusp (P=0.39).

4. Discussion

Sound knowledge of common dental anomalies in different populations can be important for two reasons. First, recognizing these anomalies is helpful for treatment planning [6], and second, it can be used in forensic dentistry [7].

Carabelli cusp is also known as trait of Carabelli, tubercle of Carabelli, molar tubercle, enamel elevation, the fifth cusp, accessory cusp, mesiopalatal prominence,

or tuberculum anomalum. This anomaly is reported to be more prevalent in Caucasian compared to mongoloid and Chinese [8]. In contrast, Hsu et al. [9] believed that talon cusp is more common in Chinese.

In our study, the prevalence of Carabelli cusp was 62.7% in permanent and 72% in deciduous dentition. In Eskandari et al. study in Gilan Province, Iran, 10 the prevalence of Carabelli on the first molar in children aged 8-15 years was 85.7% Province. In our study, there was no gender difference in presenting the cusp of Carabelli, which was in accordance with studies of Eskandari et al. [10], Dissanayake et al. [11], Falomo [12], and Harris [13]. Although, Hsu et al. [9] had mentioned Carabelli cusp is mostly seen in males.

In our study, Carabelli cusp was seen bilaterally as observed in similar studies. And the presence of Carabelli cusp on just the second maxillary molar, was not seen. Although, Al-Shethri [14] has reported 86.4% bilateral involvement of second maxillary molars with Carabelli cusp.

Simultaneous involvement of the first and second molar was seen in 2.3% of permanent dentition in the present study. Similarly, Falomo reported a simultane-

ous occurrence of Carabelli cusp on the first and second maxillary molars [11] in 1.98% of cases.

Hsu et al. [9] reported a relationship between the presence of Carabelli cusp and buccolingual tooth size, similar to the present study ($P < 0.05$). Although in the present study, the mesiodistal width of teeth was measured. It is hypothesized that the longer the evolution of a tooth germ takes, the larger the tooth size and the chances of formation of accessory cusps. In the present study, no relationship was seen between Carabelli cusp grade or Carabelli cusp size and mesiodistal tooth size, although Kondo et al. [15] mentioned that greater Carabelli cusp occur on larger molars while smaller molar crowns show smaller Carabelli cusp. In the present study, Carabelli cusp was mostly seen as a furrow or groove in the studied population. Eskandari et al. [10] also reported Carabelli cusp as a small vertical ridge. However, Al-Shetheri saw the expression of this cusp as a total cusp, mostly in a Saudi population. Also, Mann-Whitney test revealed no difference between the severities of the cusp of Carabelli in both dentitions, which means that if the cusp is strongly seen in deciduous dentition, it would appear in the same grade in permanent dentition.

5. Conclusion

Prevalence of cusp of Carabelli in the studied population in Isfahan was higher than other parts of Asia. This cusp is seen bilaterally, also it is possible (but rare) for the cusp to be seen on both molars. Dentitions, both deciduous and permanent, with Carabelli cusp had bigger mesiodistal width.

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Conflict of Interest

The authors declared no conflicts of interest.

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