



EVALUATION OF CARABELLI'S TRAIT IN A GROUP OF TURKISH PATIENTS

Bir Grup Türk Hastada Karabelli Özelliğinin Değerlendirilmesi

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ABSTRACT

Purpose: Dental morphological characteristics are useful for providing information in phylogenetic and genetic studies and also for understanding variations within and among species. Carabelli cusp is expressed in several degrees and in different frequencies among humans; thus, it is helpful in comparing and characterizing populations. The objective of this retrospective study was to evaluate Carabelli's trait (CT) in a group of Turkish patients.

Materials and Methods: In this study, 213 patients between age of 14-65 (mean age 29.99 ± 10.04) were analyzed retrospectively according to presence or absence of CT on permanent maxillary first and second molars. All data were statistically analyzed using the IBM SPSS version 22 program (IBM SPSS, Turkey) and the chi-squared test; $p < 0.05$ was considered as statistically significant.

Results: Prevalence of CT was found to be 47.9% in the selected Turkish group. Incidence of CT in any of the teeth on #16/26 was 46.9% and 4.2% on #17/27. Incidence was detected more on #26 (43.2%) than on #16 (40.4%). Bilateral presence of CT on #16/26 was detected in 78%. CT was seen in 50.7% of females and in 42.9% of males. There was no statistically significant difference between genders ($p > 0.05$).

Conclusions: Expression of CT can be placed in moderate prevalence group. There was no sexual dimorphism in its occurrence in the studied group. CT can be a valuable criterion to determine differences among various populations and a significant insight into the migratory patterns in a selected geographical area.

Key Words: Carabelli's trait, Non-metric trait, Dental morphological feature, Sexual dimorphism, Maxillary molars

ÖZ

Amaç: Diş morfolojik özellikleri, filogenetik ve genetik çalışmalarda bilgi sağlamak ve ayrıca türler içinde ve türler arasında varyasyonları anlamak için yararlıdır. Karabelli tüberkülü insanlarda çeşitli derecelerde ve farklı frekanslarda tespit edildiğinden, popülasyonları karşılaştırmakta ve karakterize etmek de yararlıdır. Bu retrospektif çalışmanın amacı, bir grup Türk hastada Karabelli özelliklerini (KÖ) değerlendirmektir.

Materyal ve Metod: Bu çalışmada, 14-65 yaş arası 213 hastanın (ortalama yaş 29.99 ± 10.04), sürekli maksiller büyük azı dişleri KÖ'nin varlığına veya yokluğuna göre retrospektif olarak incelendi. Tüm veriler, IBM SPSS sürüm 22 programı (IBM SPSS, Türkiye) ve ki-kare testi kullanılarak istatistiksel olarak analiz edildi. $p < 0,05$ istatistiksel olarak anlamlı kabul edildi.

Bulgular: Seçilen bir grup Türk hastada KÖ sıklığı %47,9 bulundu. 16/26 numaralı dişlerin herhangi birinde Karabelli görülme oranı %46,9 iken 17/27 numaralı dişlerde bu oran %4,2 olarak belirlendi. KÖ'nin görülme oranı 26 numaralı dişte (%43,2) 16 numaralı dişten (%40,4) daha fazla bulundu. KÖ'nin iki taraflı olarak 16/26 numaralı dişlerde görülme oranı %78 olarak saptandı. KÖ, kadınların %50,7'sinde, erkeklerin ise %42,9'unda görüldü. Cinsiyetler arasında istatistiksel olarak anlamlı bir fark belirlenmedi ($p > 0,05$).

Sonuçlar: Çalışılan grup KÖ açısından orta derece prevalans grubu içinde değerlendirilebilir. KÖ'nin oluşumu açısından cinsiyet farklılığı bulunmamaktadır. KÖ, çeşitli popülasyonlar arasındaki farklılıkları belirlemek ve seçilmiş bir coğrafi alandaki göçmen gruplar hakkında önemli bir fikir edinmek için değerli bir kriter olabilir.

Anahtar Kelimeler: Karabelli özelliği, Metrik olmayan özellik, Diş morfolojik özellik, Cinsiyet farklılıkları, Maksiller büyük azı dişleri

INTRODUCTION

Carabelli is a tubercle, cusp, or groove usually found at the palatal surface of the mesiopalatal cusp of maxillary permanent first molars and maxillary deciduous second molars.^{1-3,4} It can also be detected on the maxillary permanent second and third molars, although considerably less frequently than on the first molars.⁴ Carabelli cusp has usually been found bilaterally.^{1,3} Although it was pointed out that the frequency appeared to be higher in men than in women, no significant sexual dimorphism was observed.³

Carabelli's cusp is absent in some people. Due to numerous variations in cusp size and shape, the term Carabelli's trait (CT) is customarily used.⁵

The phenotypical appearance of the CT is a result of interaction between genetic and environmental factors.⁶ The genetic factors underlying the expression of CT are best represented by the upper first molars, which are used as the key teeth for population comparisons.⁷

All human populations have some degree of dental morphological variation. It is commonly accepted that dental characteristics, such as size, shape, presence, number of cusps, and the size of the dental arches, are genetically determined.⁸

In the literature, it was found that the frequency of this structure varies from population to population.⁹⁻¹³ Interestingly, studies about the prevalence of CT in the Turkish population have not been reported to date. Substantially, this trait may provide a valuable criterion for racial differentiations among various populations and a significant insight into the migratory patterns of communities in a selected geographical area. Also, CT can be useful in establishing phylogenetic relationships among closely related populations.¹⁴ Therefore, it would be important to investigate this trait among nations which

were not previously considered. Herewith, the aim of this retrospective study was to evaluate the prevalence of CT on maxillary permanent first and second molar teeth in a group of Turkish patients.

MATERIALS AND METHODS

In this retrospective study, dental records of 420 patients referred to the Restorative Dentistry Department, Faculty of Dentistry, Istanbul Aydın University in Istanbul, Turkey from January 2014 to January 2015 were examined. The project has been reviewed and approved by the Ethical Committee of Istanbul Aydın University, Faculty of Dentistry, Istanbul (25.11.2015 and No: 073). All healthy permanent maxillary first (16/26) and second molars (17/27) as well as the 16/26 and 17/27 molars that did not have dental caries or restorations were included in the study. In addition, four permanent maxillary molars that missed on any side were also eliminated. After excluding improper data, a total of 213 patients between age of 14 to 65 were evaluated according to the presence or absence of CT.

Statistical analysis

All data were statistically analyzed with the IBM SPSS version 22 program (IBM SPSS, Turkey) and the chi-squared test. $P < 0.05$ was considered as statistically significant.

RESULTS

A total of 213 patients (852 teeth) between age of 14 to 65 (mean age 29.99 ± 10.04) were examined. Of the total patients, 36.2% were males (n:77) and 63.8% were females (n:36). The male/female ratio was 1:1.77. The prevalence of CT was 47.9% for the entire studied group. The incidence of CT in any of the teeth on #16/26 was 46.9% and 4.2% on #17/27 (Table 1).

Table 1. Prevalence of CT in the studied Turkish group

#	Presence	Absence	Total	%
16/26	100	113	213	46.9%
17/27	9	204	213	4.2%

The incidence of CT was detected more on #26 (43.2%) than on #16 (40.4%) (Table 2).

Table 2. Prevalence of CT on # 16, # 26, # 17, # 27

#	Presence	Absence	Total	%
16	86	127	213	40.4%
26	92	121	213	43.2%
17	7	206	213	3.3%
27	7	206	213	3.3%

The incidence of CT on #17 and #27 was the same (3.3%) (Table 2). Bilateral presence of CT on #16/26 was 78%; on #17/27 was 55.6% (Table 3); and on both #16/26/ and #17/27 simultaneously, it was found to be 1.9% (Table 4).

Table 3. Bilateral presence of CT on # 16/26, # 17/27

#	Bilateral presence	Total	%
16/26	78	100	78.0%
17/27	5	9	55.6%

Table 4. Bilateral presence of CT on all molar teeth

#	Bilateral presence	Total	%
16/26	78	213	36.6%
17/27	5	213	2.3%
16/26/17/27	4	213	1.9%

CT was observed in 50.7% of the females and in 42.9% of the males; there was no statistically significant difference between genders ($p > 0.05$) (Table 5).

Table 5. Incidence of CT according to gender

CT	Gender		p
	Female (n:136)	Male (n:77)	
	n (%)	n (%)	
Presence	50.7% (n:69)	42.9% (n:33)	0.269
Absence	49.3% (n: 67)	57.1% (n:44)	0.269

$p > 0.05$ Chi-Square test

DISCUSSION

Dental morphological traits are important because they are genetically determined, do not remodel during lifetime, and can be compared equally among different populations.¹⁵ CT is one of the non-metric traits that is considered to

be the most commonly occurring dental morphological feature.^{13,16} In European populations, the frequency of CT varies from 51 to 90%, which means it is included in the moderate to high prevalence group.^{3,4} However, the prevalence of this trait was 0% in Eskimos, 11% in Japanese, and 21% in Chinese populations, which means it is categorized in the low prevalence group.^{4,17-19} The prevalence of CT in the current study was found to be 47.9% which is lower than the European incidence and higher than the Arctic and Asian countries' averages. This result can be explained as follows: Turkey is an Eurasian country with land in both Asia and Europe.²⁰ Because it is located on two continents, it is necessary to focus on which groups the Turkish population belongs to. In 2001 Hanihara & Ishida²¹ divided the populations into six main groups (Eastern Asia, Arctic/New World, Pacific/Oceania, Central/South/West Asia, Europe, Africa) on the basis of linguistic, ethnological, and geographical backgrounds. In that study, Turkey was included in the West Asia group with two other countries (Israel and Cyprus); it was a subgroup of the Central/South/West Asia population. In another study by Hanihara²² Turkey was included in the West Asia group together with Afghanistan, Iran/Iraq, Israel, Syria/Palestine, and Cyprus. Reviewing the literature revealed that no studies have been conducted in Turkey about the prevalence of CT. Therefore, the studies previously done in the countries that were involved with the same group as Turkey should be focused on in order to correlate the presence of CT.

In one Iranian study, the cases of 500 adolescents were investigated, and the prevalence of CT was found to be 96.6%.¹⁰ In another Iranian study, 356 random cases were evaluated, and a total of 214 cases (61%) had Carabelli's cusp.²³ Although Turkish and Iranian populations were categorized in the same group, the prevalence of CT in both studies was found higher than in the present

study. These findings can be attributed to the fact that more individuals were evaluated in those studies. Different methods used in the studies could also have produced different results.

Cyprus is another country that should be evaluated for the prevalence of CT. Evaluating the first inhabitants of Cyprus and where they originated from, it was found that the most common origins of the early immigrants were from areas where the island was viewable from the mainland, including parts of present-day Turkey and Syria.²⁴ In 1977, Angel²⁵ evaluated the prevalence of CT in Cyprus and found that the frequency varied from 0% to 0.07% on M² and 0% to 0.37% on M¹. In the same study, Syria was examined for CT, and the frequency of this trait was found to be 0.07% on M² and 0.32% on M¹. Interestingly, the prevalence of CT in both studies was found to be lower than in the present study, even though Cyprus, Syria, and Turkey were categorized in the same population group. This can be attributed to the differences among the selected groups.

Peretz & Smith²⁶ evaluated the dental morphology and pathology of middle Bronze Age populations in Israel and observed the frequency of Carabelli's cusp on upper first molars. They found its incidence to be 25%–46%. The result of this study is consistent with the findings of our study.

In the literature, CT was found most frequently in first upper molars and was usually detected bilaterally.^{3,4,10,27-29} A correspondence between the higher prevalence of CT on 16/26 than on 17/27 and bilateralism is prominent in the literature, and this was found also to be the case in our study.

Simultaneous bilateral involvement of CT on maxillary permanent first and second molars accounted for 1.9% in the present study; this was in agreement with Falomo's findings.⁹

In some studies, no significant sexual dimorphism was observed in the occurrence of

the trait;^{3,9,30} however, in other studies, contrasting results were obtained.³¹⁻³³ In the present study, no statistically significant difference was detected between genders ($p > 0.05$) in terms of CT, although it was found that the trait was more frequent in females (50.7%) than in males (42.9%). Therefore, the results of the current study appear to confirm the suggestion made by Synder *et al.*³⁴ that sexual dimorphism varies between populations.

The limitation of this study was that it was conducted in a small group of patients who applied to the faculty. Therefore, based on the results of the present study, performing a study with more patients will benefit using Carabelli trait as a valuable criterion for determining differences between diverse populations and for gaining an important insight into groups of immigrants in a selected geographical area.

CONCLUSIONS

1. The expression of CT can be placed in the moderate prevalence group.
2. There was no sexual dimorphism in its occurrence in the studied group.
3. CT can be a valuable criterion to determine differences among various populations and a significant insight into the migratory patterns in a selected geographical area.

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Conflict of Interests

None declared.

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