

Original Article

Prevalence of talon cusps in a Portuguese population: Forensic identification significance of a rare trait

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ABSTRACT

Background: Dental techniques are frequently used in human identification; some of those include comparative analyses of dental features that, being rare or unique to an individual, can establish a positive identification. The usefulness of each feature depends on its population, frequency, and uniqueness. The aim of this study was to determine the prevalence of talon cusps in a Portuguese population.

Materials and Methods: A prospective study was performed. Three hundred and two patients were studied, and talon cusps presence was assessed. Statistical tests were carried out using Statistical Package for the Social Sciences (SPSS) 17 software (SPSS Inc., Chicago, IL, USA). Statistical analysis relied primarily on descriptive statistics and crosstabs, with Chi-square analysis.

Results: Results showed that talon cusps were observed in only 6.3% of patients. The maxillary lateral incisors were the most common teeth showing this feature (82.1% of all teeth).

Conclusion: It can be concluded that talon cusps are an uncommon trait in these Portuguese population, and therefore, it is a feature that can be potentially very useful in forensic human identification, when antemortem dental records are available.

Key Words: Dental anatomy, forensic anthropology, forensic odontology, forensic science, human identification, talon cusps

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INTRODUCTION

Dental identification relies on comparative analyses and dental profiling.^[1] In comparative analyses, antemortem and postmortem data should match in sufficient detail,^[2] and no minimum number of concordant points is required to establish a positive identification. Medical changes to teeth, such as fillings or prosthetics, have provided most of the traits utilized in comparative analysis, because they are frequently unique to an individual. On

the other hand, dental anatomic features have been less frequently used in this manner and are used mainly to establish a person's origin^[3,4] and sex.^[5,6] However, dental anatomic features can contribute to human identification in a comparative analysis, where a certain dental anatomical trait can be more or less important according to its frequency in a given population. If the frequency is low, there is a greater potential for the trait to not be shared by many individuals and thus aid in the identification of unknown cadavers or remains, as long as there is antemortem records which document the presence of that trait.

Dental anatomy has been used to determine origin^[3,4] and sex,^[5,6] being also useful in comparative analysis. A dental anatomical trait importance depends on its frequency in a given population. Talon cusps are developmental dental anomalies affecting both

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dentitions,^[7-16] of unknown etiology,^[17] consisting in a lingual projection from the *cingulum*^[7,8,18-28] [Figure 1],^[22-28] formed by enamel, dentin, and pulp extension,^[7] with a distinct radiopaque image [Figure 2].^[29] Some authors have described its occurrence in the facial aspect of the teeth; nevertheless, this is considered extremely rare.^[30-32] The maxillary lateral incisor is the most affected tooth followed by the central incisor and canine.^[33,34]

The aim of this investigation is to analyze the prevalence of talon cusps in a sample of the Portuguese population, determining if it is a low- or high-frequency trait, thus, assessing its potential usefulness for a forensic identification.

MATERIALS AND METHODS

A prospective study was performed. Three hundred and two Portuguese patients with ages ranging between 18 and 83 years were studied (mean age = 39; standard deviation 17.1). One hundred and eighty six individuals were females (61.6%). An intra-oral examination of the anterior teeth was made to determine the existence of talon cusps.

The existence of talon cusps was recorded and classified according to Hattab *et al.*^[35] classification:

- Talon (type I): Additional cusp that prominently projects from the *cingulum* of an anterior tooth and extends at least half the distance from the cemento-enamel junction (CEJ) to the incisal edge.
- Semi-talon (type II): Additional cusp of one millimeter or more in length, extending less than one-half the distance from the CEJ to the incisal edge.
- Trace talon (type III): An enlarged and prominent *cingulum* and their variations.



Figure 1: Bilateral lingual talon cusp in upper lateral incisors

Statistical tests were carried out using Statistical Package for the Social Sciences (SPSS) 17 software (SPSS Inc., Chicago, IL, USA). Statistical analysis relied primarily on descriptive statistics and crosstabs, with Chi-square analysis. This investigation was approved by the main institution Ethics Committee (00681/22 June 2009).

RESULTS

Talon cusps were detected in 19 individuals (6.3%); and in seven individuals, the talon cusp was bilateral. The upper right lateral incisor was the most affected tooth, accounting for 50% of occurrences. The distribution of the talon cusp by tooth is described in Table 1.

Distribution of talon cusps according with sex, shows that there is a higher prevalence in males than in females (1.0% vs. 0.7%) [Table 2], with no statistically significant differences ($\chi^2 = 1.639$, $P > 0.05$). Trace talon cusp was the most frequent form of talon cusp, accounting for 50% of all the findings [Table 3].

DISCUSSION

In the present investigation, talon cusp was found in 6.3% of the individuals in the population under analysis. This prevalence was higher than that reported in other studies: For instance, in a sample of Jordanians^[36] the prevalence of talon cusp was only 2.4%; in a sample of Hungarians^[37] this prevalence was similar to the Jordanian at 2.5%, but still lower than in our Portuguese sample; in a sample of Indians,^[38] a prevalence of

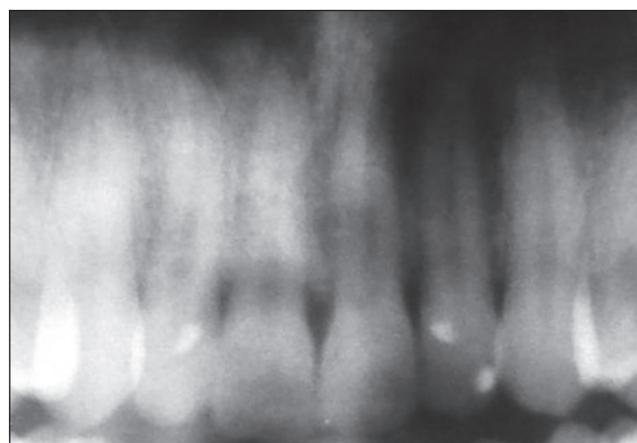


Figure 2: Radiographic image of bilateral lingual talon cusp in upper lateral incisors. Notice the distinct radiopaque image which can be identified on the crown of both teeth involved

Table 1: Talon cusps distribution by tooth

Arch	Teeth	Examined teeth (n)	Talon cusps (n)	Prevalence (%)
Maxilla	Right central incisors	283	0	0.0
	Left central incisors	279	0	0.0
	Right lateral incisors	259	14	50.0
	Left lateral incisors	266	9	32.1
	Right canine	286	1	3.5
	Left canine	281	4	14.3
	Total	1654	28	100.0
Mandible	Total	1735	0	0.0
Total	—	3417	28	100.0

Table 2: Talon cusps distribution according with sex in the maxilla, n (%)

Sex	Arch	Incisors				Canines	
		Right central	Left central	Right lateral	Left lateral	Right	Left
Females	Maxilla	0 (36)	0 (36)	8 (53.3)	5 (33.3)	0 (36)	2 (13.3)
Males	Maxilla	0 (0.0)	0 (0.0)	6 (46.1)	4 (30.8)	1 (7.7)	2 (15.4)

Table 3: Prevalence of different types of talon cusp

Teeth	Trace talon (%)	Semi-talon (%)	Talon (%)
Right canine	0 (0.0)	1 (3.6)	0 (0.0)
Right lateral incisor	10 (35.2)	3 (10.7)	2 (7.1)
Left lateral incisor	3 (10.7)	4 (14.3)	2 (7.1)
Left canine	1 (3.6)	2 (7.1)	0 (0.0)
Total (%)	14 (50.0)	10 (35.7)	4 (14.3)

4.28% was reported, and in a sample of Malaysians, a lower frequency was observed as well, 5.2%.^[39] These differences reflect geographical variation in the expression of this dental feature, and a study involving Western Europe populations would, perhaps, be of great interest, since it can be helpful in determining geographic variation in frequency for this trait.

In human identification, a dental feature presenting a 6.3% prevalence value can be very discriminative, since it is fairly uncommon. As the prevalence of given trait raises in a specific population, its discriminative value reduces. For instances, in Caucasians, the overall prevalence of Carabelli’s trait was 63%;^[40] this higher prevalence represents a far lesser discriminative value of this trait, in this population. The prevalence of

maxillary premolar accessory ridges in Indo-European samples was reported to vary between 23.4% and 33.0%, indicating a lesser discriminative value for this trait.^[41] The discriminative power of a certain trait will depend on its prevalence, and the lower the prevalence the more useful the trait will be in establishing a positive identification, particularly, if it is used together with other dental changes.

The presence of bilateral talon cusps is, yet more interesting since its prevalence is lower (2.3%), which is consistent with other studies.^[31,36] However, this sort of traits have little significance if antemortem records are not available, or whether they are not recorded in the dental chart by the attending dentist. Anatomical variations have a great potential for identification because they can provide the basis for a quick identification. Due to its rarity, talon cusp is a powerful identification factor and together with other dental traits or changes, can contribute definitely to a positive identification.

In the present investigation, talon cusps were more frequent in the upper lateral incisor, followed by the maxillary canine. Overall, most studies agree with these data.^[7,31,37,42,43] Talon cusps were more frequently classified as trace talon, followed by semi-talon and finally talon. These findings were, again, consistent with those reported by other authors.^[37,43] No sexual dimorphism was found, which, again, agree with other investigations.^[7,31,37,42,43]

CONCLUSION

Talon cusps are a rare trait in this sample of the Portuguese population, in particular if observed bilateral, and as such have a great potential as identification factors in comparative identifications. Consequently, it is also fundamental that such traits are properly recorded in antemortem dental charts. Compared to other studies, these traits seem to have a higher prevalence in our population sample than that reported for other samples, which may be explained by population variation.

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