

Talon cusp in a permanent tooth from Prehistoric Indonesia *

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Abstract

This paper describes a dental anomaly called talon cusp from Gilimanuk Prehistoric site. Indonesia. The dating of the site is between 750 BC to 900 AD. This anomaly located in lateral incisors of individual LVI. The individual described as a woman and her age at death were 35-40 years old. The first evidence of Talon cusp in a permanent tooth from the Indonesian archaeological context was never been reported before which makes this anomaly is unique. The etiology of talon cusp is still uncertain.

Keywords: talon cusp; prehistory; Gilimanuk; Indonesia

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Introduction

There are several anomalies in the teeth that we can find in human remains related to archeological sites. One of these anomalies is talon cusp. Talon cusp is an anomaly found in teeth, appearing from the cingulum, forming a cusp structure similar to eagle's talon. The height of this talon cusp is varied, it can be found in the maxilla or mandible and can occur in men or women (1).

Research on talon cusp related to archeological contexts has only been done by several studies before (2, 3, 4, 5, 6, 7, 8). Moreover, case reports from multiple regions discussed the evidence of

anterior dentition, such as incisors or canines and either labial or lingual surface (1, 19). However, talon cusp most likely can be found in anterior maxilla because the prevalence reached 95 percent (19).

Talon cusp is important because it was rarely found, its cause is unknown and there were questionable connections between the talon cusp with other syndromes or diseases. In the archeological context, talon cusp not only rare but also only one case reported ever been found in Southeast Asia (4).

This paper aims to present a case of talon cusp belongs to individual LVI from prehistoric

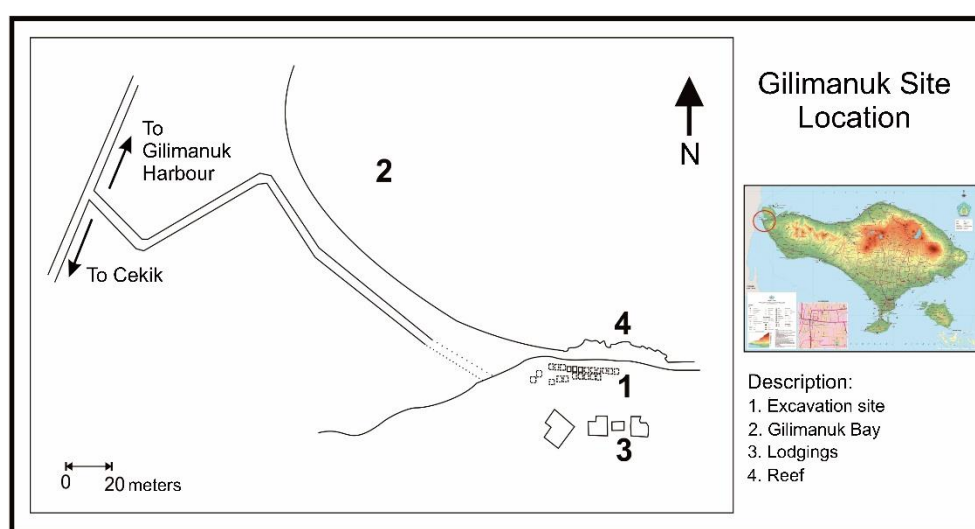


Figure 1 Location of Gilimanuk in Bali, Indonesia.

talon cusp in permanent teeth from modern cases (9, 10, 11, 12).

The existence percentage of talon cusp in modern humans is varied. Multiple locations, especially in Asia, show different results. Malaysia reached 5.2% (13), Jordanian 0.55% (14), Turkey 0.34% (15), India 0.58% (16), but in another study from different Indian region it reached only 0.02% (17), meanwhile, the northern region of India reached 0.65% (18). Moreover, the percentage of talon cusp in archeology tends to be as little as the modern ones.

The etiology of talon cusp is still unknown but talon cusp certainly has several causative factors including genetic and environmental and it is formed in morphodifferentiation phase when the tooth was created (19).

Morphological talon cusp was varied in shape, size, and structure. Its location usually in the

Gilimanuk, Bali, Indonesia.

Materials and methods

Material for this study belongs to individual number LVI from Gilimanuk, Bali, Indonesia. It is curated in the Laboratory of Bioanthropology and Paleoanthropology, Faculty of Medicine, Public Health, and Nursing, Gadjah Mada University, Yogyakarta, Indonesia.

The site itself is a prehistoric site located in Gilimanuk village, sub-district Gilimanuk, Jembrana District, Bali Province. Geographically, this site located in the western region of Gilimanuk Bay in western Bali. Astronomically, this site located in 8°9'36" and 8°12'59" South and between 114° 25' 57" and 114° 29' 10" East; Figure 1 (20).

This individual was achieved from sector XII in 1963, and there was no information regarding

stratigraphy and the exact date of excavation when this individual was discovered.

Research at this site was started in 1963 by opening three sectors and continuing with another 16 sectors in 1964 (21)

The number of human skeletal findings on the Gilimanuk site has reached 152 individuals, but it is estimated that the actual number exceeded that number (22). At this site, there are several types of archeological findings obtained from excavation, including pottery, animal bone fragments, beads, pendants, and metal objects such as jewelry (earrings and bracelets) (23). Based on the metal artifacts founded on this site, it was concluded that this site had a dating relative from the early metal period (Paleometallic) (20). Meanwhile, the absolute radiocarbon dating carried out on 4 individuals shows that this site dates between 750 B.C to 900 AD (23).

The method used in this study is the macroscopic method and does not use radiography to reduce the possibility of exposure of the skeleton from unnecessary X-rays. The identification of the tooth and talon is done by morphology because abnormalities are already visible on the surface of the tooth and there is no need to use X-rays.

This tooth is in good condition and can be observed macroscopically. The incisors are in complete condition with very little post-mortem damage.

Burial description of LVI

Research on the LVI framework was carried out previously in 2018 with published results regarding osteoarchaeological examinations of the LVI framework carried out by the authors.

Research carried out at that time aimed to look at the influence of diseases and cultures on the skeletons. The results are the sex of the individual LVI were women 35-40 years when she died. The first metatarsal shows evidence of kneeling based on the osteophytes. Her index finger also shows osteophytes which indicate she uses her index finger often in the act like pulling the trigger.

Dental diseases that can be found in her teeth are dental calculus, caries, periodontal, and abscesses. In addition to diseases, the evidence of cultural influences can be seen in the form of betel chewing, which can be seen in maxillary incisors. Moreover, teeth modification present in the mandibular and maxilla incisors.

There is a possibility that she also used her teeth as tools because there is a concave basin in the

occlusal right mandibular molar and premolar ((23).

Talon cusp is not identified in previous research before because both of the authors had a very small knowledge of the talon cusp condition.

Results

A talon tooth in the LVI individual is in the right lateral maxilla incisor. Apart from this tooth, there is no evidence of talon cusp in another tooth.

Morphologically, the tooth looks like an ordinary shoveled tooth. The talon cusp anomaly in the right maxillary incisor arises from the cingulum and appears to be more than half the crown of a tooth. There are vertical grooves found on the left and right (mesial and distal) talon cusp, from the cingulum to the occlusal. When viewed from above (occlusal), this tooth appears to be shaped like the letter "T". (See Figure 2. Occlusal view).

From labial, the incisor tends to look normal and symmetrical. The talon cusp cannot be seen from labial, and it makes the talon cusp does not affect the appearances. Evidence of betel chewing consumption can be seen at the labial which is done by rubbing betel leaves onto the labial surface of the teeth. Also, there are a few traces of dental calculus.

From the mesial, it can be observed that the addition of cusps arises from the cingulum. This addition is not only in the form of a protrusion, but prominence and forming a new tooth.

There is something unique that can be observed from this individual. The maxillary and mandibular incisors show evidence of dental modification in form of dental filing. In mandible, the modification happened by making the occlusal to become flat. Meanwhile, in the maxilla, the modification also happens in occlusal part not to make it flat but to make it sharp like a chisel.

This modification which happens in incisors maxilla also affecting the talon cusp. From lingual, it can be observed that the protrusion almost as high as the occlusal surface of the incisor. However, some part of its top was trimmed and it hard to reconstruct how the original form of the talon cusp.

The size of the talon cusp tooth is 7 mm for length (height), 6 mm for width (mesiodistal), and 6 mm for thickness (buccolingual). In comparison with normal teeth from the same individual, the incisor of the two left maxillaries also has the same measurement with length (height) 7 mm, width (mesiodistal) 7 mm, and thickness (buccolingual) 6 mm. The size of talon cusp is difficult to measure because we cannot estimate its original

form. However, it can be measured that the cusp talon has a length (height) of 5 mm if measured from the cingulum, width (mesiodistal) widest 4 mm, and 3 mm for widest (buccolingual) thickness. Based on comparison with other teeth with talon cusp from modern dental cases, it can be seen that the talon cusp from Gilimanuk has quite a different size. However, some notes need to be taken, that most of the samples were still underage (See Table 1).

Based on these criteria, it can be seen that the type of talon cusp belonged to individual number LVI is the first type because it has a significant size and exceeds half the height of a dental crown.

Based on other researches, it can be concluded that talon cusp can be seen as a singular case or sometimes has connections with various dental anatomy variations. Some of the variations are supernumerary tooth, microdontic, peg-shaped tooth, hypodontia (missing tooth), dens invaginatus (25).

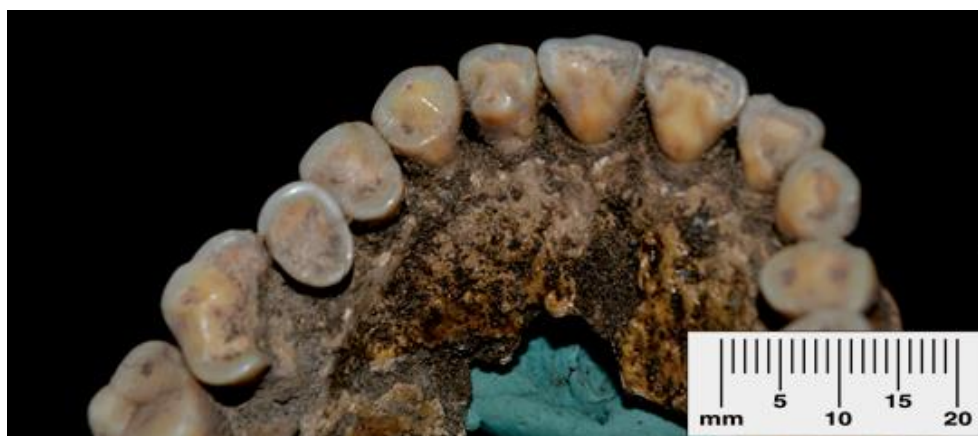


Figure 2 Talon cusp in second right incisor maxilla.

Discussion

Talon cusp in archaeological context was scarce compared to contemporary cases. However, in Asia, especially Southeast Asia, Talon Cusp was only reported once in one child (4). It shows that the frequency of talon cusp in Southeast Asian community quite low (See Table 2.). A question arises whether the osteoarchaeologists who did the identification can identify and distinct talon cusp because of its rarity.

There are three classifications to identify talon cusp from Hattab et al (1996) based on size and morphology. The first type (talon) is a cusp that can be seen morphologically and it can be deciduous or permanent teeth. The projection height should be at least half its length from the cemento-enamel junction to the occlusal end. The second type is semi talon. An additional cusp with a height of 1 mm or more which has height up to half of the length between the cemento-enamel junction and the occlusal end. The third type is trace talon. This type is almost invisible because it is only a thickening (enlarged) cingula that begins to form in one-third of the cervical root. Morphologically, the third type is only in the form of a bulge on the inside of the tooth (19).

Moreover, several disorders can be associated with talon cusps such as Rubinstein-Taybi syndrome (26, 27, 28), Mohr syndrome (29), Sturge-Weber syndrome (12), Incontinentia pigmenti achromians (30), Ellis-van Creveld syndrome (31, 32), Alagille syndrome (33), and Berardinelli-Seip syndrome (34). However, none of these diseases can be connected with talon cusp from individual number LVI from Gilimanuk because to identify those diseases from the remains, we need more symptoms that can be traced from the bones.

Conclusion

This paper reported the first talon cusp in permanent teeth ever recorded in Southeast Asian archaeology context.

A talon cusp in permanent tooth form archaeological context especially Southeast Asian archaeology is a rare case to be found. The findings of a talon cusp from Individual LVI incisor show that there are possibilities that this case is not as rare as it previously thought. More and more reports about talon's cusp in Asia provides information that this occurrence also happens in Asian, and also in past populations.

Moreover, the cause of talon cusp and also its correlation with other conditions need to be researched more.

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Table 1. Talon cusp at maxillary permanent incisors.

Reported cases	Sex	Age	Location in maxilla	Mesiodistal	Length	Buccolingual	Associated condition
LVI	F	35-40	right lateral	7	7	6	Shovel shaped
Hattab <i>et al.</i> (1995)	M	11	Left lateral	5	8	3	Shovel shaped, Carabelli (molar)
	F	11	Left lateral	4	6	3	-
	F	35	left lateral	4,5	5,5		Shovel shaped
	F	23	left lateral	3-4	3-4,5		Shovel shaped
Hattab <i>et al.</i> (1996)	M	17	right lateral	4,5	7	2	-
	M	16	Left lateral	4	6	2	Shovel shaped
	F	9	Right lateral	4,5	7,5	2,5	Agenesis left canine
	M	9	Left lateral	3,5	5	2	Shovel shaped
	F	12	Left lateral	4	5	2	Carabelli (molar)
	F	11	Right lateral	3	4	3	Shovel shaped
	M	18	Left lateral	-	-	-	Shovel shaped, Carabelli (molar)
Segura and Jimenez-Rubio (1999)	F	16	Right Left Lateral	4,5	3,5	2,5	Carabelli (molar)
	M	11	Right lateral	4	4,5	3,5	-

Table 2. Some talon cusps at archaeological context in previous research.

Location	Dating	Total individual from the site	Talon cusp individual (percentage)	Permanent/Deciduous	Author (year)
Wharram Percy, North Yorkshire, UK	Medieval (930-1350 AD)	687	1 (0.15%)	Deciduous	Mays (2005)
Borgatta, Salta province, Argentina	1000-1450 AD	8	1 (12.5%)	Deciduous	Pomeroy (2009)
Jersey County, Illinois, United States of America	300-800 AD	301	5 (2%)	Permanent*	Mayes (2007)
Gobero site, Central Sahara Desert, Niger	9500 BP	80	1 (1.25%)	Permanent	Stojanowski and Johnson (2011)
Ban Non Wat, Thailand	3800-1500 BP	660	1 (0.15%)	Deciduous	Halcrow and Tayles (2010)

*Not every individuals were described in the paper. Only two individuals were confirmed adults. However, it is presumed that all of the talon cusp were located in permanent dentition.

