NOTCHES IN ANIMAL TEETH: ARTIFICIAL OR NATURAL/PATHOLOGICAL?

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Summary
Animal teeth with notches at the root are sometimes found in archeological contexts. The notches are often considered to have been artificially engraved and the teeth regarded as artifacts of personal adornment. However, one has to differentiate between teeth with engravings at the apex or in the middle of the root, where cut marks are to be seen in the notches (these represent adornment) and those with notches at the collum of the tooth, where the dentine appears to be polished. The latter is a pathological phenomenon of natural origin called a “wedge-shaped defect.” Examples of these two distinct types of notches are given, and different theories for the development of wedge-shaped defects are discussed.

Key Words
Animal teeth, Engravings, Artifacts, Wedge-shaped defects, Pathological phenomena, Etiology.

Résumé
Les encoches observées sur les dents animales sont-elles artificielles ou naturelles/pathologiques ?
Des dents animales présentant des encoches sur la racine sont parfois découvertes en contexte archéologique. On considère souvent que les encoches ont été artificiellement faites, et que ces dents sont des objets de parure personnelle. Il faut cependant distinguer les dents présentant une rainure sur l’apex ou sur le milieu de la racine, où des traces de découpe sont observables dans l’encoche (il s’agit bien de parures), de celles présentant une encoche sur le collet de la dent, où la dentine semble être polie. Il s’agit dans ce cas d’un phénomène pathologique d’origine naturelle appelé “défaut en forme de coin”. Des exemples de ces deux types différents d’encoches sont présentés, et différentes théories sur le développement des défauts en forme de coin sont discutées.

Mots clés
Dent animale, Encoche, Artefacts, Défauts en forme de coin, Phénomène pathologique, Etiologie. 

Zusammenfassung
Kerben in Tierzähnen : Künstlich oder natürlich/pathologisch?
Gelegentlich werden in archäologischem Kontext Tierzähne gefunden, die im Wurzelbereich eine Kerbe aufweisen. Diese Kerben werden häufig als künstlich eingetieft und die Zähne somit als Schmuck betrachtet. Liegen die Kerben im Bereich des Apex oder der Mitte der Wurzel vor und zeigen sich hier Schnittspuren, so handelt es sich tatsächlich um Schmuckstücke. Liegen die Spuren aber am Collum des Zahnes und weist das Dentin hier eine regelrechte Politur auf, so handelt es sich um eine pathologische Bildungen natürlicher Herkunft, welche “keilförmige Defekte” genannt werden. Es werden Beispiele dieser zwei Typen von Einkerbungen vorgestellt und verschiedene Theorien für die Entstehung solcher Defekte diskutiert.

Schlüsselworte
Tierzähne, Einkerbungen, Artefakte, keilförmige Defekte, natürliche pathologische Bildungen, Ätiologie.

In archaeological material we sometimes find animal teeth with notches at the root. Often they are designated as adornment on the assumption that these notches are artificially engraved or ground in. However, one has to differentiate according to the position of the notches, because there are teeth with notches near the apex or in the middle of the root and others which have notches at the collum of the tooth, close to the crown. If the notches are near the apex, in an area which in the living animal is hidden in the alveolus, then there is no denying the fact that they are artificially engraved. Two examples are teeth from a bear and from a bovid, which were found at the French site of Arcy-sur-Cure (Leroi-Gourhan, 1961).

For the teeth with notches in the middle of the root, F. Poplin (1983) demonstrated that the notches are artificially engraved. They can be observed especially in the incisor teeth of ruminant animals. Even in the Paleolithic times, the custom existed of cutting the oral part of the

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mandible of a reindeer, a red deer or an aurochs so that the
crowns of the incisor teeth were held together by the dried
gum, they looked like a row of pearls. During this proce­
dure the roots of the teeth were either engraved or the apex
was cut away, as can be shown by the findings from Gön­
nersdorf (Bosinski, 1992).

Quite another situation occurs with teeth which have
notches at the collum of the tooth close to the crown.
Because it is possible that in consequence of a retraction of
the gingiva the collum of the tooth was uncovered, natural
influences on the hard tooth substance must also be consid­
ered. Within the notches the dentine is compact, hard and
appears to have been polished. Therefore it cannot be
caries, because in this case the dentine should be decayed,
fragile and in most cases stained brown. But we must also
take into consideration the so called “wedge-shaped
defects”, which are naturally developed losses of hard
tooth substance, especially in the region of the collum of
the tooth. However, several researchers have supposed that
these notches were ground in artificially. L. Zotz (1939)
maintained the proposition that the notches, which he had
observed in the incisors of cave bears, were artificial. But
the opinion that Paleolithic man was the originator of the
notches in the teeth of cave bears had already been
expressed by C. Struckmann (1884), then by M. Nähe (1937),
and more recently by Otte et al. (1985).

It is not only from Palaeolithic times, however, that
such animal teeth with notches at the collum are known
and considered as adornments. S. Sievers (1992) described,
together with the bone tools of the La Tène-Oppidum
Manching, an incisor of a cow which is deeply worn down
beneath the enamel of the crown, and M. Verhagen (1993)
published a very worn incisor of a cow with a heavily pol­
ished indentation on the transition of enamel and root,
which was found in Roman Valkenburg. Also C. Becker
(1991) mentions the notched incisor of a cow which was
found amongst the animal bones from the Early Bronze
Age site of Platia Magoula Zarkou (Greece), and was con­
sidered to be an adornment which was supposedly fastened
on clothes.

Of course, since I have not been able to examine these
published teeth I cannot prove that they have no artificial
indentations, but I can express my doubts. This scepticism
is so much more legitimate because I have found some ani­
mal teeth which were fastened in the jaw, and which
showed such notches at the collum. Those teeth could not
have any function of adornment. But one also has to take
into consideration the fact that notches at the collum of
teeth are particularly found in teeth which are heavily
worn. Should these teeth have been objects of adornment,
their value of adornment could have only been low because
of the decreased crown. Wedge-shaped defects are, howev­
er, normally found in heavily worn teeth, therefore the
interpretation of the notches at the collum of teeth as a nat­
ural, pathological structure has more probability than as an
artificial indentation.

We must now discuss the question of how the notches
could have developed when they are not artificially indent­
ed. As mentioned above, it cannot be caries at the collum
of the tooth, because in this case the dentine would be
decayed, fragile and stained brown. The dentine under dis­
ussion here, however, is hard and has the colour of ivory.
To stomatologists, wedge-shaped defects in teeth are well
known, but very different opinions exist about their etiolo­
gy. Most dentists think that wedge-shaped defects are
caused by too vigorous a tooth brushing (e.g. Mierau, 1992).
According to another theory, abnormal occlusion
causes tensions within the dentine which lead to wedge­
shaped defects (e.g. Ott and Prüscher, 1985). But chemical
influences within the cavity of the mouth are only rarely
considered to be the reason for the development of wedge­
shaped defects, although G. Preiswerk had already pointed
towards that factor (Baštyr, 1903: 138).

From the tooth-brushing theory a thesis was derived by R. Breuer (1933) for the development of the notches in
the teeth of cave bears. R. Breuer suggested that when cave
bears ingested vegetable food culms of grass with adhesive
dust and other abrasive material lodged between the front
teeth and rubbed against the collum, slowly grinding in the
furrows. This thesis was accepted by many archaeologists
(i.e. Poplin, 1983). A. Gautier (1986) also interpreted the
development of the notches in the teeth of cave bears found
in the cave at Sclayn, Belgium, in this way. However, this
thesis cannot explain the development of notches in the
collum on the palatal surface of the third molar in the upper
jaw of a pig found in medieval bone material from Haina
(district of Gotha/Germany), because no rubbing effect of
a culm of grass could occur there. Furthermore, a heavily
worn deciduous cow incisor found in 13th century layers in
the town of Freyenstein (district of Wittstock/Germany)
shows beneath the crown a horizontal furrow with lacune­
like indentations proceeding vertically from it. These can
not be explained by rubbing effect of culms of grass
between the teeth (Müller, 1990).

A necessary precondition for the formation of wedge­
shaped defects is, in my opinion, the retraction of the gingi­
va, which in humans is supposedly connected with tooth
brushing (Mierau, 1992). This is also significant for ani­
mals, although the specific causes for the retraction are dif­
ferent. According to K. H. Habermehl (1961) the collum of
cattle incisors is visible at an age of 7 to 8 years. That means that at the collum of the teeth the cementum, and perhaps also the dentine if there is a gap between the covers of enamel and cementum at the root of the tooth, are directly exposed to chemical influences in the cavity of the mouth. It is believed that organic acids in particular have an effect on the hard substance of the teeth, but their influence is directed above all to the enamel (Mierau, 1992). According to Barnicoat and Hall (1960), proteolytic enzymes in the juices of plants have an etching effect on the dentine by a decomposition of the organic matrix. This facilitates an easy abrasion of the loosened inorganic component of the dentin by rubbing with the tongue or with the moved chyme in the mouth.

Our experiments with recent cattle-teeth, testing the influence of various agents on the dentine, showed that over a period of three weeks at a temperature of 37°C, neither a 1.5 percent acetic acid with a pH-value of 2.5, nor a fresh juice of green apples with a pH-value of 2.5, nor a fresh grass juice with a pH-value of 6.0 had an etching effect on the dentine, but the fluidic component of the content of the rumen of a cow with a pH-value of 8.5 did show an etching on the dentine. Therefore I propose that the proteolytic enzymes in the food, which act in the alkaline sphere, are most significant for the origin and development of wedge-shaped defects. However, the retraction of the gingiva and consequent exposure of the collum of the tooth is an important precondition for their genesis.

Conclusion
In conclusion, animal teeth with notches at the root, found in archaeological material, can be considered as artifacts if the notches are situated in that part of the root normally hidden in the alveolus and if cut marks are to be seen in the engravings. However, if the notches are found at the collum of tooth, and if the dentine is hard and appears to be polished, we have to take wedge-shaped defects into consideration, which are pathological phenomena of natural origin.

Bibliography


