

NOTCHES IN ANIMAL TEETH: ARTIFICIAL OR NATURAL/PATHOLOGICAL?

Hanns-Hermann MÜLLER*

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.

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.

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 Defekten" genannt werden. Es werden Beispiele dieser zwei Typen von Einkerbungen vorgestellt und verschiedene Theorien für die Entstehung solcher Defekte diskutiert.

Key Words

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

Mots clés

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

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 alveo-

lus, 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. Poplín (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

* Sensburger Ring 11 A, D-31141 Hildesheim, Germany.

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 procedure the roots of the teeth were either engraved or the apex was cut away, as can be shown by the findings from Gönnersdorf (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 considered. 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. Näbe (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 polished 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 considered 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 animal 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, however, normally found in heavily worn teeth, therefore the interpretation of the notches at the collum of teeth as a natural, 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 indented. 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 discussion 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 etiology. 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 Pröschel, 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 (Baštýř, 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 gingiva, which in humans is supposedly connected with tooth brushing (Mierau, 1992). This is also significant for animals, although the specific causes for the retraction are different. 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

- BARNICOAT C. R. and HALL D. M., 1960.— Attrition of incisors of grazing sheep. *Nature*, 185 (4707) : 179.
- BAŠTÝR A., 1903.— Die erworbenen Defecte der harten Zahnschubstanzen (Defecte ohne Erweichung), In : J. Scheff ed., *Handbuch der Zahnheilkunde*. Wien : Alfred Hölder, p. 127-175.
- BECKER C., 1991.— Die Tierknochenfunde von der Platia Magoula Zarkou - neue Untersuchungen zu Haustierhaltung, Jagd und Rohstoffverwendung im neolithisch-bronzezeitlichen Thessalien. *Praehistorische Zeitschrift*, 66 : 14-78.
- BOSINSKI G., 1992.— *Eiszeitjäger im Neuwieder Becken*. Koblenz. Archäologische Denkmalpflege, Amt Koblenz.
- BREUER R., 1933.— Über das Vorkommen sogenannter keilförmiger Defekte an den Zähnen von *Ursus spelaeus* und deren Bedeutung für die Paläobiologie. *Paläobiologica*, 5 : 103-114.
- GAUTIER A., 1986.— Une histoire de dents : les soi-disant incisives travaillées du Paléolithique moyen de Sclayn. *Helinium*, 26 : 177-181.
- HABERMEHL K. H., 1961.— *Die Altersbestimmung bei Haustieren, Pelztieren und beim jagdbaren Wild*. Berlin/Hamburg : Paul Parey.
- LEROI-GOURHAN A., 1961.— Les fouilles d'Arcy-sur-Cure (Yonne). *Gallia Préhistoire*, 4 : 3-16.
- MIERAU H.-D., 1992.— Der freiliegende Zahnhals. *Deutsche Zahnärztliche Zeitschrift*, 47 : 643-653.
- MÜLLER H.-H., 1990.— Keilförmige Defekte an fossilen und subfossilen Tierzähnen und ihre Bedeutung für die archäologische Forschung. In : J. Schibler, J. Sedlmeier, H. Spycher eds., *Festschrift für H.R. Stampfli*. Basel : Helbing & Lichtenhahn, p. 147-152.
- NÄBE M., 1937.— Zur paläolithischen Knochenkultur. 1. Bearbeitete Höhlenbärenknochen aus dem Zahnloch bei Steifling (Fränkische Schweiz). *Bayerische Vorgeschichtsblätter*, 14 : 1-8.
- OTT R. W. and PRÖSCHEL P., 1985.— Zur Ätiologie des keilförmigen Defektes. *Deutsche Zahnärztliche Zeitschrift*, 40 : 1223-1227.
- OTTE M., CORDY J.-M. and MANGON D., 1985.— Dents incisées du Paléolithique moyen. *Cahiers Préhistoire liégeoise 1*, Rapport d'activité 1985 : 80-84.

- POPLIN F., 1983.– Incisives de renne sciées du Magdalénien d'Europe occidentale. *Mémoires de la Société Préhistorique Française*, 16 : 55-67.
- SIEVERS S., 1992.– Die Kleinfunde. In : Die Ausgrabungen in Manching, Bd. 15 : Ergebnisse der Ausgrabungen 1984-1987 in Manching. Stuttgart : Steiner, p. 137 - 213.
- STRUCKMANN C., 1884.– Die Einhornhöhle bei Scharzfeld am Harz. *Archiv für Anthropologie*, 15 : 399-415.
- VERHAGEN M., 1993.– Bone and Antler Artefacts. In : R. M. van Dierendonck *et al.* eds., *The Valkenburg. Excavations 1985-1988*. Amersfoort : ROB, p. 339-416.
- ZOTZ L., 1939.– *Die Altsteinzeit in Niederschlesien*. Leipzig : Johann Ambrosius Barth - Verlag.
-