Evidence for Labret Use in Prehistory *

• David W. Frayer (1,3), Alessia Nava (2,3,4), Gianna Tartaglia (5), Massimo Vidale (6), Alfredo Coppa (7), Luca Bondioli (3,6) •

1 – Department of Anthropology, University of Kansas, Lawrence, USA

2 – DANTE - Diet and ANcient TEchnology Laboratory, Department of Maxillo-Facial Sciences, Sapienza University of Rome, Rome, Italy

3 – Bioarchaeology Service, Museum of Civilization, Rome, Italy

4 – Skeletal Biology Research Centre, School of Anthropology and Conservation, University of Kent, Canterbury, UK

5 – Independent researcher, Rome, Italy

6 – Dipartimento dei beni Culturali, Università di Padova, Padua, Italy

7 – Dipartimento di Biologia Ambientale, Università "La Sapienza", Rome, Italy

Address for correspondence:

David W. Frayer
Department of Anthropology, University of Kansas, Lawrence, KS, 66045, USA
E- mail: frayer@ku.edu

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Abstract

Aims. Compared to occlusal dental wear, labial/buccal abrasion is seldom documented in prehistoric groups. This type of wear occurs in some ethnographic-present and living populations and leaves telltale facets on non-occlusal vestibular surfaces associated with labrets. Methods and materials. For detailed macroscopic, microscopic (binocular and SEM) and thin-sectioned analysis we focused on the early Neolithic site of Mehrgarh in Pakistan where labial/buccal wear is found in mostly older adult males. We studied 215 teeth from ten individuals from the site. From the literature and some personal observations, we review evidence from the Czech early Upper Paleolithic and many later sites in the Old and New Worlds. Results. For Mehrgarh macroscopic observations revealed numerous teeth with labial and buccal facets affecting nearly every

tooth class. Binocular and scanning electron microscopy and one thin-sectioned tooth provided detailed information about the wear characteristics on the facets. Comparisons. The most striking parallels to wear at Mehrgarh come from recent Inuit and Northwest Coast Native Americans where labret use was frequent in males and females. Vestibular wear occurs in a wide variety of specimens from the early Upper Paleolithic to modern patients. Unlike Mehrgarh and earlier prehistoric groups, in many cases Native American teeth are associated with the actual labrets in the graves. Conclusion. Occlusal wear or attrition caused by dental/oral manipulations where the teeth were used as tools is different, based on the resultant facets left on the teeth and micro-wear features. In prehistoric Europe, labret use extends back, at least, to the early Upper Paleolithic. As in recent humans, the use of labrets in prehistoric groups likely represents personal adornment tied to concepts of beauty and/or achieved/acquired status.

Keywords: lip/cheek plugs; non-occlusal wear; Mehrgarh; body decoration

** Authors are responsible for language correctness and content.*

Introduction

The practice of inserting lip and cheek plugs is an under-reported area in dental anthropology. In part this is because most dental anthropologists have focused on occlusal tooth wear and internal dental structure, but also because researchers tend to ignore or not look for vestibular wear on anterior and posterior teeth. In the samples we reviewed, these lesions represent well-defined, sometimes deep facets on the labial and buccal surfaces, which must have taken some time to develop during the lives of the affected individuals. A few studies have documented this type of non-occlusal wear in recent populations and the pattern seems to extend into the deep past. Wear on the labial/buccal faces was first described more than 100 years ago (1), which was attributed to abrasive tooth powders and excessive brushing, factors irrelevant to our work. For the fossil record, Matiegka (2) first noted buccal wear in some early Upper Paleolithic remains from the Czech early Gravettian site of Předmostí. Others have described similar wear for numerous early Upper Paleolithic specimens from Central Europe. Here, we focus on evidence for labret use in the Pakistani site of Mehrgarh (~9000-5000 BP) and extend this evidence for labret use to a wide variety of fossil populations ranging from hunter-gatherers to agriculturalists. Similar evidence continues into ethno-historic and contemporary groups and, in some cases, provides ethnographic-present explanations for examples in prehistoric samples. These appear to be nonfunctional body decorations and serve as markers of beauty and status, just as perceived in extant groups. Evidence for lip and cheek plugs merits future surveys of other populations for documentation.

Evidence for labrets in prehistory: South Asia

Our initial interest in labrets stems from the dental remains of some individuals from the early Neolithic period at Mehrgarh in Baluchistan, Pakistan (3). This site is an extensive, deeply stratified prehistoric village and cemetery. Located at the foot of the Hindu Kush on the east bank of the Bolan river in the northwestern extension of the Kacchi Plain, it is in a strategic area at the southwest access to the Bolan Pass, Figure 1a. Initial excavations began in 1974 by a French Archaeological Mission in Pakistan (with the collaboration of the Pakistani Department of Archaeology) when erosion exposed a deep stratigraphic sequence (4). Eleven subsequent field seasons (1977-1985 and 1997-2000) uncovered a large graveyard with skeletons dated as far back as 9000-5000 BP (4,5). Our focus here is on the earliest Neolithic, named MR3, dated to 9000-7800 BP. Burial grounds for this period extend over 12 hectares and the absence of breaks in the sequence suggests these Neolithic individuals were buried during a ~1500-year time span (5,6), Figure 1b.

Dental anthropology at Mehrgarh has been widely reported by Lukacs and colleagues documenting dental size, pathology, fluorosis, trauma and activity induced patterns of dental abrasion in the skeletal collection deriving from the 1977-1985 field campaigns (e.g., 7-12). More recently, tooth drilling as a form of prehistoric dentistry was reported on nine individuals (13). Our work here focuses on skeletons deriving mainly from the 1997-2000 excavations, which represent for the most part a different sample from Lukacs' earlier work at the site.

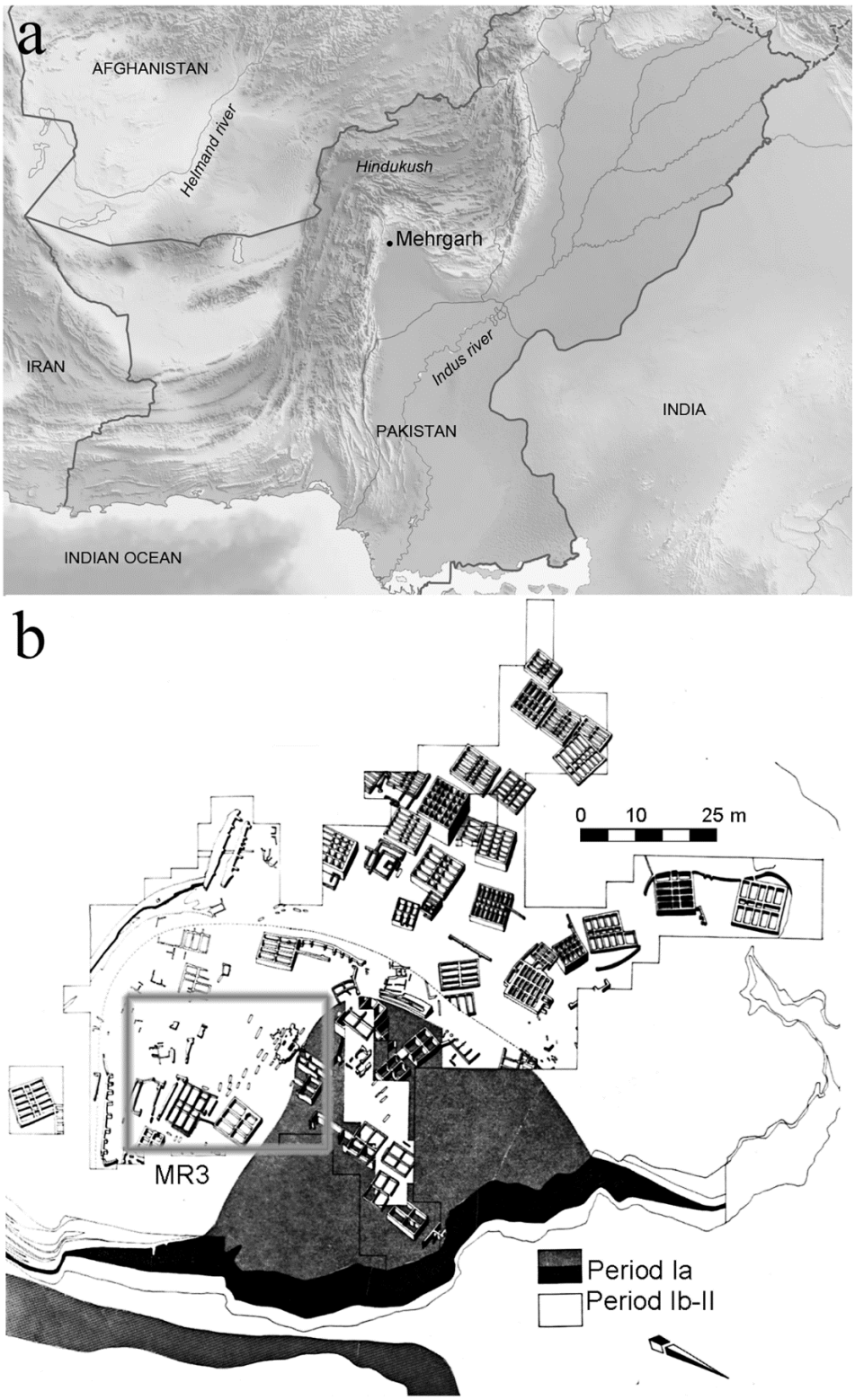

Figure 1 The Mehrgarh site. a) total excavations of MR3 in box; b) Mehrgarh 3. Graves are shown as rectangles (modified from 4).

Mehrgarh: materials and methods

Dentitions of 225 individuals from the early Neolithic at Mehrgarh were scored for the presence of non-carious tooth lesions on the labial/buccal/lingual surfaces of 3880 teeth, all initially recorded by one observer (GT), Figure 2. The sample is a mixture of primary and permanent teeth, but since vestibular facets were never found on deciduous teeth, the sample was reduced to 3577 permanent teeth. Many of these teeth were isolated in the graves and, as much as possible, age and sex was first determined in the field, then further assessed by one of us (AC) following standard techniques (14). Initially, all individuals were systematically analyzed macroscopically, then, for some, high-resolution replicas were prepared for scanning electron analysis (SEM). The aim of the SEM work was to determine details of the eroded surfaces and to document micro-striae. To further evaluate the morphology of the microstructure, a single tooth was thin sectioned according to the techniques outlined in Caropreso et al. (15). All teeth are located in the Servizio di Bioarcheologia, Museo delle Civiltà, Rome, Italy.

Figure 2 Mandible of MHR 554 showing ground pressure deformation of jaw and large buccal facets on the right C, P3, P4, M1 and M2. Arrow points to lingual facet on left M1.

Mehrgarh: labial/buccal facets

Table 1 reports the individuals and their teeth affected by labial/buccal lesions. At MR3 there are 76 adult males and 10 (including the probable male 9803 233) or 13.2% show these facets in 101 teeth. These account for a small proportion (2.8%) of the total permanent tooth sample in males. There are dentitions from 59 females (43.7%) at the site and none show labial/buccal face wear. This signals an important cultural factor where there is exclusive presence of these facets in males, especially older males. The only exception is possibly MR 9803 233, whose sex is uncertain because of its fragmentary condition; but all the others with facets are very likely males. These ten individuals were aged by decade and all but MR 9703 109 are older than 30. This younger male individual preserves only two teeth (left C1 and left P3), but both show lesions (Table 1). In the other specimens where more teeth are preserved, it is clear that older individuals have more facets. For the 20-40 age classes, three of four individuals (MR3 9793 109, MR3 169, MR 9803 229) have only 1-3 affected teeth. The exception is MR3 554 with his 19 faceted teeth, representing 65.5% of all his teeth. MR 3 579 has the most teeth with facets (23/29: 79.3%) with eleven faceted teeth in the maxilla and twelve in the mandible. Thus, while it seems clear that only males are wearing labrets, age among males may have had social implications for individuals to wear these ornaments. Yet, based on the severity of facet size, labret use must have begun early in the lives of these individuals with increasingly larger labrets inserted into the lips and cheeks as the individuals aged.

Table 2 summarizes these data for the sample. Although the maxilla shows a slightly higher number of these facets, the samples are too small to test for statistical differences. In the mandible there are more facets on the right side, but again the samples are small. In the maxilla, left and right sides are affected equally. All teeth in the maxilla, except the M3s, preserve at least one lesion. In the mandible the left I1, left M2 and both M3s lack a facet. In both jaws most teeth show three or more facets, with a maximum of six in the left C1. In many cases the teeth affected in one jaw are also affected in its opponent. Size of the resultant facets would seem to indicate that the labret increased in dimensions as individuals inserted larger and larger labrets in their lips/cheeks over their lifespan.

Figure 3 reviews facet height and width for the upper and lower jaws. There is no apparent pattern of the effect of labret use based on the dimensions of the resulting facets for left and right sides and upper and lower jaws. Whatever apparent differences shown in Table 2 and Figure 3 cannot be statistically tested due to the small sample sizes.

Figure 4 shows the maxillary left canine of MR 9903 265, which possesses the most spectacular facet at the site. This 40-49 year old male has a

complete dentition except for the left I2, right C1 and right P3.

root/tooth face occurred over the lifetime of the individual's C1 and are preserved as fine lines (only visible in the SEMs), running parallel to the crown. Five SEM images on the left show parallel

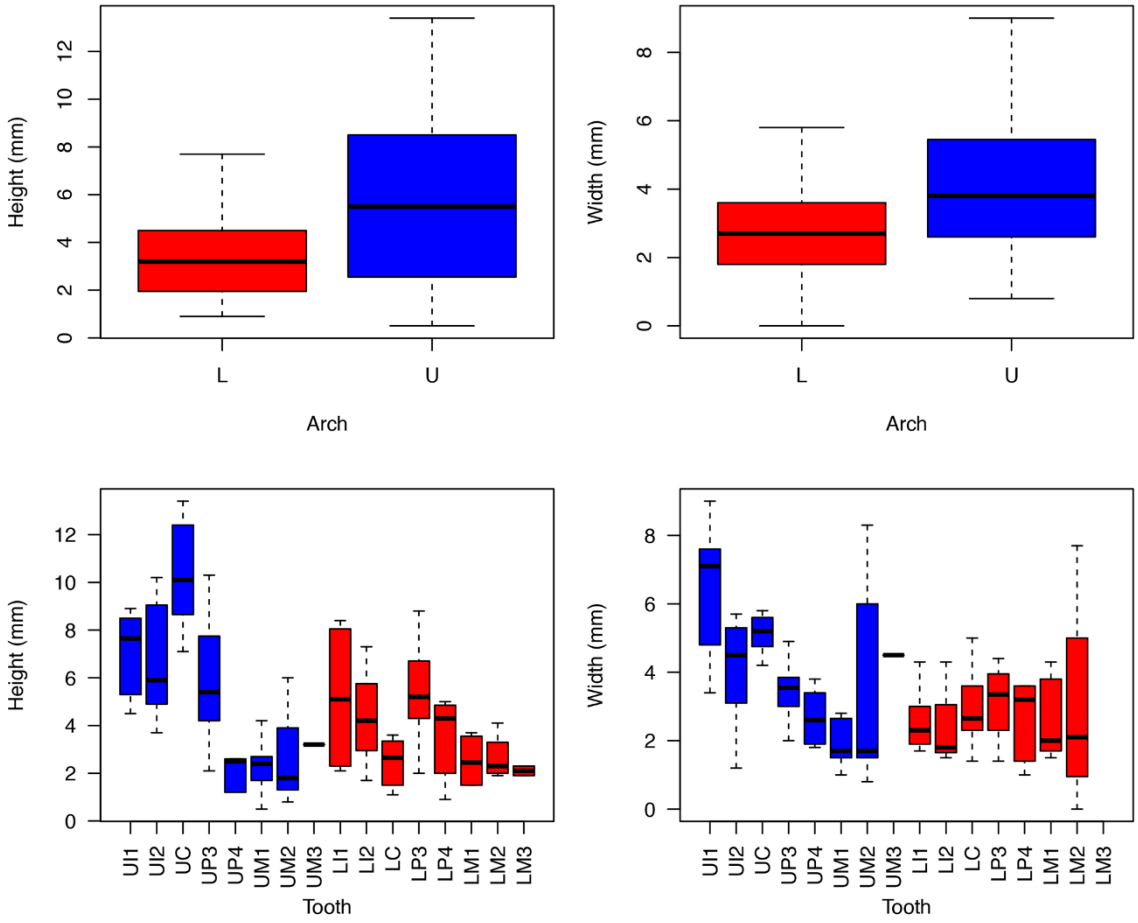

Figure 3 Plots of maxillary (U) and mandibular (L) facet size at Mehrgarh 3. Plots include labial/buccal and lingual facet dimensions.

All teeth exhibit heavy occlusal attrition with wear categories between 5-7 in the Smith (16) system. Of the 29 remaining teeth, 15 preserve a labial or buccal facet, some of which are very extensive. The most remarkable is on the right C1, which has an undulating lesion, running from the heavily worn crown's occlusal edge to the root tip. Given the extent of the highly polished facet, it is surprising that the tooth was still located in the alveolus. Heavy deposits of cementum at the root margins appear to have been sufficient to hold it in place. There is a large crack in the tooth's center (Figure 4), which is post-mortem based on the sharpness of its margin. Pre–break striations occur in area 'c' of the facet indicating stresses placed in this weak point during the individual's life, which ultimately resulted in the mesio-distal postmortem crack. Other micro-striations on the striations in "c", "d" and "e" in the middle and upper half of the tooth. In areas "a" and "b" closer to the crown the area is more polished with fewer parallel scratches. Some minor micro-chipping occurs along the mesial border at the middle of the facet, but the major feature of the tooth is its long labial facet, broken into two depressions above and below "c" in Figure 4.

The MR 554 upper left canine of a 30-39 year old male also illustrates the typical striation pattern seen in the facets at Mehrgarh. This tooth comes from a virtually complete dentition, missing only the right M3 and left I1 and I2. All the teeth show considerable wear ranging from 3-7 in the Smith scale (16) and there are 19 teeth with labial/buccal facets. Figure 5 depicts a thin section of the right C1 from MR 3 554. This facet has a very sharp margin where the dentin is

exposed without tissue reaction. Deposition of tertiary dentine along the margin of the pulp chamber is observable, with a thick dentine patch underlying the tubular dentine layer. This is evidence of the slow reaction of the tooth to the progression of the labret's effect. From the labial view (not shown) there is no evidence of stress related micro-fractures on the external layer. Micro-striae on the labial lesion clearly show consistent directionality with the striations running parallel to the occlusal plane and little (or negligible) involvement of other directions.

Mehrgarh: lingual facets

These enigmatic facets occur in five individuals and all, but MR3 554, are older than 40 years. Most of the facets involve posterior teeth (87.3%) and for the anterior teeth no mandibular canines or maxillary anterior teeth are involved. For the maxilla, the facets are found in only two teeth (left M2 and left M3) in two different individuals. For the mandible there are twenty facets affecting all teeth, except the lower canines and right P3. MR 9903 265 has the most numerous teeth with lingual facets, involving only the mandibular

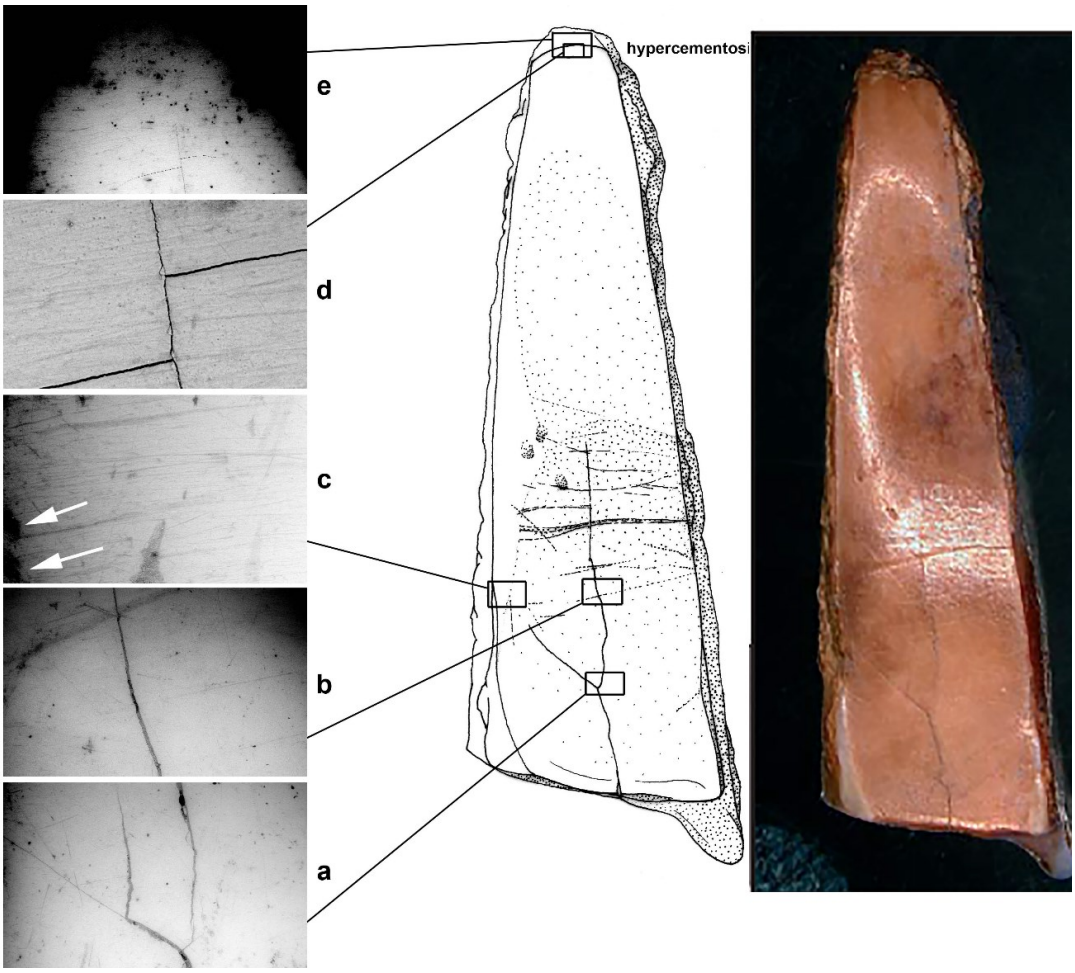

Figure 4 MR 9903 265, a right C1, with a wear facet running from crown tip to root tip. Inserts show micro-striations and other details of the facet.

We have also surveyed teeth from upper levels at Mehrgarh and labret use seems to have ceased with these later groups. Thus, no non-occlusal facets are present in any other skeletons following the early Neolithic period. So for whatever reasons, the wearing of labrets ceased.

posterior teeth. For this specimen in only two cases (right P4 and right M1) are the lingual facets matched by labial or buccal facets. In the other individuals matching teeth with lingual and labial/buccal facets occur in about a quarter of the cases, but most teeth with labial/buccal facets do not have a matching lingual facet. Lingual facets never connect with a vestibular facet in the few

cases where lingual, labial or buccal facets occur on the same tooth. Overall, these facets are not as extensive nor as numerous as the labial/buccal facets and are clearly anomalous.

specimens, which resembles fiber processing based on the direction of the occlusal/lingual grooves and not the kind of rounded facets found exclusively on the teeth in the MR 3 sample. It seems possible that the lingual facets are caused

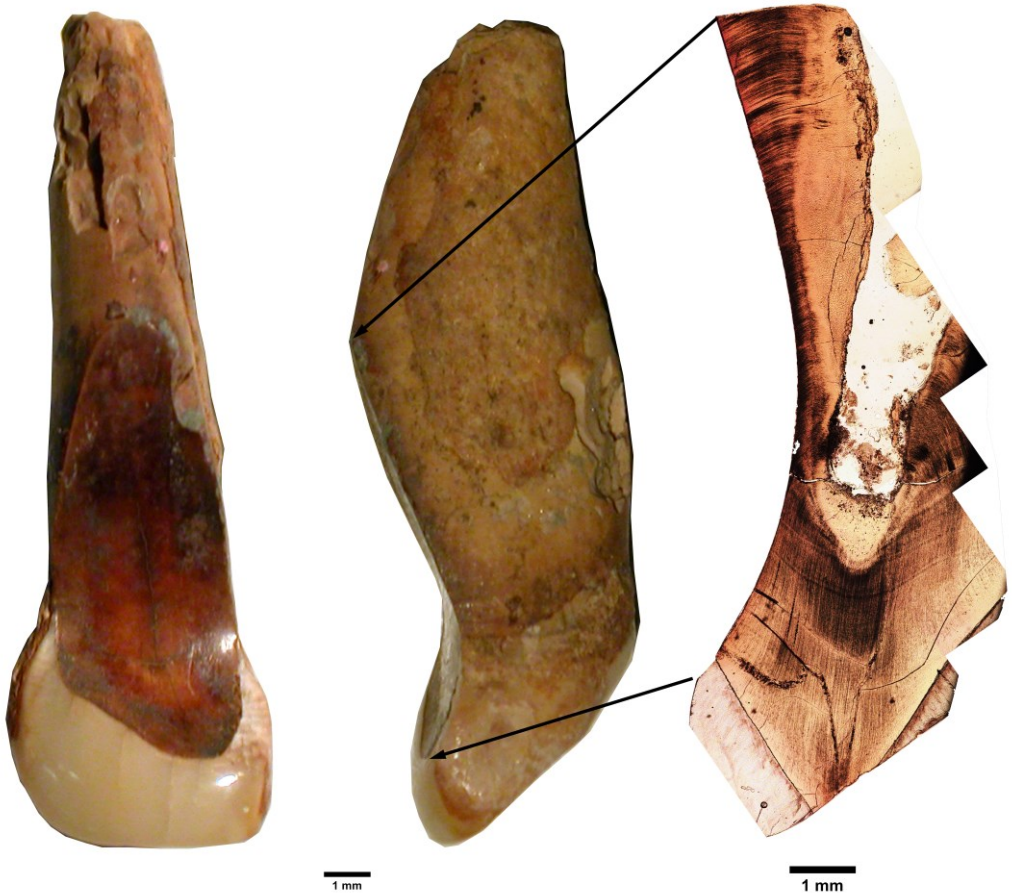

Figure 5 MR3 554, a left C1, showing the original tooth in labial (left) and distal profile (middle) and the histological thin section (right).

Figure 6 shows two SEM images of the lingual wear facets on a right M1 from MR 9903 265. Microstriations are clearly apparent and their directionality indicates they cannot be due to fiber processing or some other kind of oral processing. Figure 6a is the superior portion of the facet with primarily vertical micro-facets, while the inferior portion of the facet is dominated by oblique striations (Figure 6b). These differ from the primarily horizontal striations in the labial facet of MR3 554 as shown in Figure 5. For other levels at Mehrgarh Lukacs and Pastor (12) interpreted lingual wear in some specimens as evidence of fiber processing, but these facets are different from the ones we describe for MR 3. For example, they illustrate lingual wear on several

by some foreign object hitting and rubbing against the lingual surface.

In modern groups tongue posts can cause tooth damage (17-19), but in living cases these generally involve fractures to the crowns and lingual, gingival recession, not lingual wear facets. Anterior and posterior teeth of both jaws can be affected, but the most common effect is crown fracture. For Mehrgarh, 17 of the 22 affected teeth are premolars and molars (77.3%) and none show lingual crown fractures. Given their location in the jaw these posterior teeth would be less likely to be involved in tongue post damage, but we have no other explanation for their presence. As far as we know, lingual facets in posterior teeth have never been documented

in other prehistoric samples and appear to be quite rare.

Figure 6 Lingual SEMs of the Rt M1 from MHR 9903 265. a) occlusal at the top; b) root at the bottom.

Other areas in Middle and South Asia and the Near East

One of problems we have in attributing, especially the labial/buccal facets, to labret use is that no labrets have been found in the archaeological collections from Mehrgarh. However, as documented in the ethnographic-present samples discussed below, labrets were sometimes made of wood or other perishable materials, which may have been the case at Mehrgarh. As far as the Near East, Middle and South Asia are concerned, there is some evidence for labrets in other contexts and reflected in different materials. Bocquentin et al. (20) report on two Natufian central incisors with extensive labial flattening of the incisor faces. SEM analysis revealed numerous, parallel vertical striations running up the abraded facets, which are flat, not concave like found in labret wear. Although the potentiality of wearing a lip plug was considered, Bocquentin et al. (20) argued the wear was more likely caused by some kind of repetitive action from a tool.

The earliest and most convincing material evidence for the use of lip plugs comes from the Deh Luran plains of south-western Iran, specifically from the site of Ali Kosh, where in a graveyard dated to the early 6th millennium BC one individual was buried with a bitumen plug found in place on the lower jaw, with corresponding wear marks on teeth (21: p. 236-237, 253; 22). Objects possibly identified as labrets or lip plugs, but only on morphological grounds, have been reported with variable degrees of plausibility from the early 6th millennium Neolithic site of Tol-e Nurabad (23: p. 64-65) and from the early-mid 6th millennium BC site of Tall-e Mushki (24: p. 43) in the Marv Dasht plateau, both from south-western Iran and again from other southern Iranian sites in Fars (25: p. 19). Labrets have also been identified from mid-late 6th millennium BC site of Sabi Abyad in Syria (26), in sites of the Kuwaiti coast of the Persian Gulf (27). In these and other cases of morphological identification, there is little chance of distinguishing labrets exclusively from tokens used in quite different ways. Statements by Pollock and Bernbeck (28) concerning finds from Mondjukli Tepe, Turkmenistan express doubts about labrets. Similar questions for Tol-e Nurabad are reviewed in length in (23).

In the Near Eastern societies of the late 6th-5th millennium BC and in the so-called sphere of the Ubaid period, objects interpreted as labrets (or as possibly ear spools) become quite common based identifications at the sites of 'Oueili, Tell Abada, Tepe Gawra, Ra's al-Amiya, Choga Sefid (29). Actually these objects, whatever their ancient function, are considered "significant and easily recognized markers of Ubaid personal identity" (29: p. 31). Afterwards, the use of labrets

expanded geographically with the Ubaid culture and remained in use through the beginning of the 4th millennium BC (for example at Choga Mish in Susiana, Iran, (30: plate 25). After about 3500 BC the ornaments seem to disappear at the onset of the Uruk period.

The iconographic evidence of the use of labrets in the Near Eastern and Middle Asian regions is quite limited. A terracotta head of a human figurine found at Choga Mish (Khuzistan, Iran), dates back to the early 5th millennium BC. A round plug is clearly represented as a button-like relief, protruding from the lower lip (30: plate 234A). The small balafré (scarred men) statues, reportedly from southwestern Iran (31), but most likely coming from the Oxus region in northern Afghanistan (32) are much later, tentatively dated to the late 3rd millennium BC. These still mysterious images (none were found in a scientific excavation) appear to have pierced upper and lower lips in the region of the central incisors (Figure 7). Yet, no figurine or statue of the same description has been found at Mehrgarh. Moreover, no other statues or carved heads from the Oxus region have lip piercings. Vidale suspects that the holes represent openings for the insertion of piercing plugs (32: p. 200). In such a case, the lip holes should be considered as archaic or exotic representations. Except for these, in the Near Eastern and Middle Asian regions there are no depictions of presumable lip plugs in statues.

Evidence for labrets in prehistory: Europe

Vanhaeren and d'Errico (33: p. 1108) report the presence of an Aurignacian, ivory labret from Spy Belgium. No lip plugs, but similar buccal lesions to those at Mehrgarh have been documented for various Gravettian sites in Central Europe. Matiegka (2), Vlček (34) and Drozdová (35) reviewed evidence for buccal facets from Předmostí (Fig. 8), Pavlov and Dolní Vestonice involving mandibular and maxillary teeth. All these authors attributed the buccal wear to carrying stones in the mouth to ward off thirst. Trefný (37) and Hillson (38) made a similar argument, although Hillson (38) maintained "the cheeks might, for example, have been used to hold an implement or in the processing of a food or material" (Hillson 38: p. 221). To produce this kind of buccal wear, the stones or activity must have had sustained use and targeted in just a small area of the mouth. Willman (39) opposed these arguments, suggesting lip and cheek plugs were more likely. We agree and labret usage can better account for the buccal tooth wear in the

Figure 7 Balafré (split lip) figure from prehistoric Iran c. 2300-1800 BC. (32: fig. 168).

Czech Gravettian, although like Mehrgarh, no labrets have been found in any of these sites. There are a series of pendants and other small objects at Dolní Vestonice (40), but these have never been considered as lip or cheek plugs.

Labial/buccal lesions have not been documented in the European Mesolithic or Neolithic, but they also have not been systematically studied. Aubry et al. (41) found no cases of this type of wear in a small sample from the French Chalcolithic, but they focused on abfractions, which are clearly different from labial/buccal abrasive wear. In a Bronze Age burial in southeastern Great Britain, Sheridan et al. (42) describe wooden cheek plugs associated with a cremated burial of a young male, but due to burial practices human remains were very fragmentary. Likely there are more cases in prehistoric Europe awaiting description.

Evidence for labrets in prehistoric Africa, East Asia and Australia

Compared to Europe, labrets are infrequently reported for prehistoric dentitions from Africa and East Asia, despite the fact they occur in several native people in Africa and Asia. For Africa, the

earliest example comes from Olduvai hominid 1, a Tanzanian specimen probably from the Late Pleistocene/Later Stone Age based on associated microlithic tools (43). It shows extensive lingual erosions on its anterior teeth (44), which resemble the effect of wearing a labret. Parsche identified the facets as 'lingual,' but from our direct observation of OH1 and his Figure 1, the facets are clearly labial. This identification is confirmed by Willman et al. (43). Originally, these facets were interpreted to be the result of sandstone filing (45) and later as the result of fiber processing (44). Both of these explanations have been rejected by Willman et al. (43). They found labial flattening on a maxillary canine, buccal flattening on other mandibular and maxillary posterior teeth. Based on microscopic work, they concluded all these flattened surfaces were due to labret abrasion. Later Mesolithic examples come from central Sudan, where lip plugs are found, dating to ~8000 – 7500 BP (46). Honegger (46) also documents lip plugs in early Neolithic graves of northern Sudan (6605-6960 BP), but did not describe dental evidence. Labrets were found in Neolithic graves in Mali (47), Sudan (48) and Chad (49). Keddie (50) notes that labrets are found in the central Sudan and their popularity spread with population movements and along trade lines.

The most stunning example of labret use in Africa comes from Jebel Moya in southern Sudan. Here, Addison (51) documented 28,000 labrets in the large cemetery excavated between 1910-1914. The cemetery is composed of members of a pastoral group associated with the Meroitic state and is dated between 200 BC and 400 AD (52). Addison claims that labrets were almost as common as potsherds (51: p. 127). Unfortunately much of this skeletal material was destroyed in flooding at Oxford and the most of the artifacts appear to be missing. However, MacDonald documented a few of the dentitions, which show labial wear on the anterior teeth. According to her survey, "47% of all the females examined had direct evidence for the wearing of labrets in the form of labial wear facets" (53: p. 148). Besides labrets, it is probable some of these items were used in ear piercings, as they greatly vary in size and shape. Elsewhere Santoni et al. (54) describe evidence of the use of labial lip plug in a mandible dating to the 14th Century from the Cameroon. These are different from the others observed here in that the facets are confined to the mesial aspects of the canines and barely extend to the canine crowns. They seem to relate to a flat lip plug, but these were not found in the grave and the attribution is not clear.

There is some prehistoric evidence for the Near East where Bocquentin et al. (20) report on two Natufian central incisors with extensive labial flattening of the incisor faces. SEM analysis revealed numerous, parallel vertical striations running up the abraded facets, which are flat, not concave like found in the labret wear described above. Although the potentiality of wearing a lip plug was considered, Bocquentin et al. (20) argued the wear was more likely caused by some kind of repetitive action. Lip plugs and associated tooth wear are infrequent in the prehistory of northeast Asia (55). There are no documented cases of prehistoric or recent labret use in native Australians.

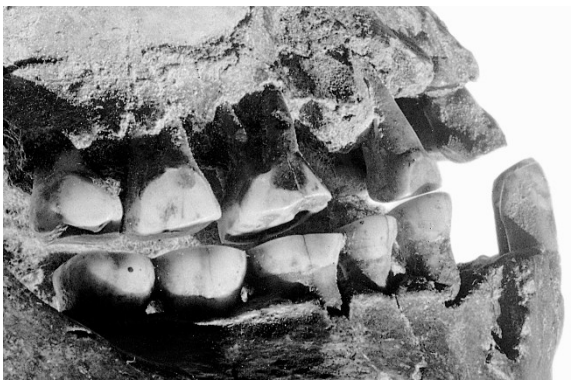

Figure 8 Předmostí 4 showing facets on the P4-M2 from Velemínská, Brůzek (36).

Labrets in prehistory and the ethnographic-present in the Americas

a) Prehistoric evidence for labret use

Various authors have mentioned or described actual labrets and, sometimes, dental evidence for labret use in late prehistoric groups in North, Central and South America. Among the Aztecs and Incas labrets served as status markers and were made from a variety of materials from leather to lead. Pollard (56: p. 744) describing their use in pre-Hispanic Tarascan (Aztec) groups, notes that "[m]ale members of the elite wore gold ear and lip plugs to signal their status, and at death were buried with these status markers." Otis Charlton (57) records that lip plugs were sometimes made of chert and obsidian among the Aztecs of Otumba. Further south in Peru, Cordy-Collins (58) documents lip plugs from her study of pottery vessels. These depicted only females and, given the absence of lip plugs in early Moche periods, Cordy-Collins maintains

these females are from outside the Moche area. Very few studies have described dental complications from these marks. An exception is the study by Torres-Rouff (59) who reports an edentulous individual, associated with a labret. She argues anterior tooth loss in this male likely was caused by labret use, given that a large labret was found in the tomb. She describes a second case from prehistoric Chile, dated 400-900 BP (60). This male was buried with two small, quartz labrets, which were found in place. Both canines preserved large labial wear facets, extending from the crown to each tooth's root. These facets correspond closely to the position where the labrets were found in the skeletal remains. Torres-Rouff (60: p. 166) reports that 'evidence for male use of labret is pervasive in prehistoric Chile." Reviewing evidence from the El Torín graveyard (2200 BP – 1000 BP), she records polishing of the labial faces of incisors and canines, gingival recession in four males and in all four cases ante mortem tooth loss (60: p. 172).

Much farther north, the use of labrets is well documented by various authors for prehistoric Inuit, Athabascan and Northwest Coast groups. Rorabaugh and Shantry (61) report multiple types of large and small labrets in Salish archaeological deposits from 30+ sites dated from 3200 – 1000 BP. There are some cases of dental involvement, but mostly the labrets are isolated from skele
tal material. Rorabaugh and Shantry (61; p. 2) maintain that males and females wore labrets and that they served as "credibility enhancing displays" marking the special status of the wearer.

b) Labret use in the ethnographic-present

Using reports by explorers Hrdlička (62) documented Inuits from Kodiak Island, Alaska wearing labrets made from a variety of stone, bone and ivory. A more recent study by Ray (63: p. 91) writes that

"[m]en of the entire area [Bering Strait Eskimos] wore labrets, and it is interesting that many wore extremely large ones made of trade beads or jade, probably as a status symbol, since these huge things must have been very uncomfortable".

Pedersen (64) published an extensive survey of 802 Inuits and found evidence of buccal wear ("abnutzungsfacetten") in 4.5% of the skulls in collections at the Smithsonian Institution (Washington D. C.), the American Museum of Natural History (New York City) and the Anthropologicum Laboratorium (Copenhagen). He also published various lip and cheek labrets (Fig. 9a) and a large labret in a burial affecting four mandibular teeth (Fig. 9b). These produced buccal abrasions similar to those seen in Mehrgarh and the other prehistoric samples. Labret use among the western Inuits was common and spread all the way to the Aleutian Islands, but was not circumpolar since labrets are not seen in the Inuit eastern range. They also did not extend far northwest into eastern Siberia, but as documented by Keddie (65) labrets are found in the Kamchatka Peninsula natives and in far northern Japan.

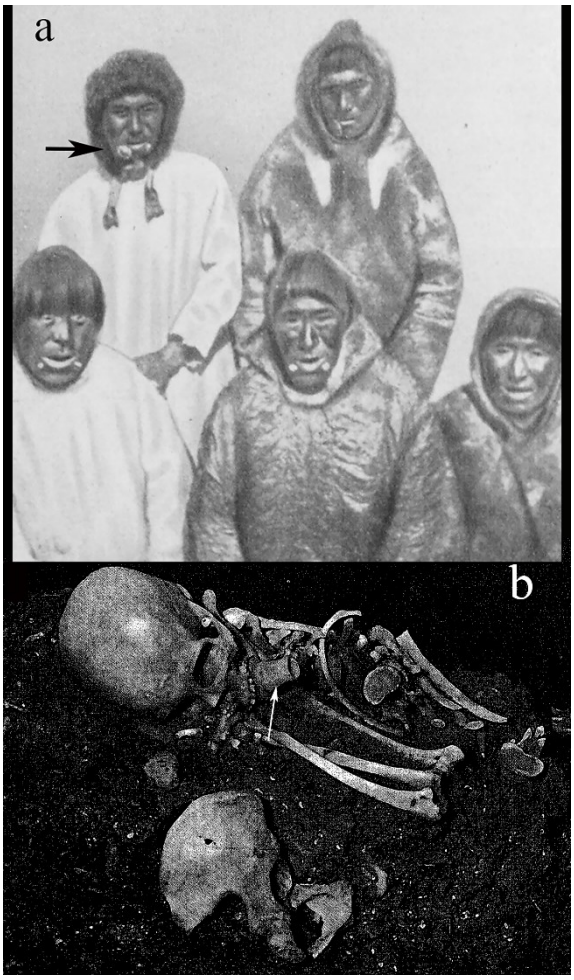

Figure 9 a) Inuits with lip and cheek plugs, arrow marks one in the right cheek (64); b) Inuit grave with large labret (marked by arrow) in cheek region (64).

Cybulski (66,67) analyzed skeletal material from recent Northwest Coast groups and found evidence of labret use in mandibles of adult males and females. He records a burial preserving a large labret associated with mandibular teeth and documented a frequency of 16% of adult individuals with labrets, all involving

anterior teeth. For Northwest Coast groups, La Salle (68, 69: p. 139) records a wide variety of labret raw materials including "antler, basalt, bone, shell, coal, horn, ivory, quartz, quartzite, sandstone, siltstone, slate, soapstone, steatite, clay, limestone, mudstone, serpentine, talc, wood, and copper." She also reviews ethno-historic sources for Northwest Coast groups and found that:

"The older the woman the larger is the ornament, and young girls have only a needle in the lower lip, the married women alone have the right to the bowls". Dall (70: p. 81-82) describes the labret, worn by all women but slaves, as a symbol of vigor, fortitude, and mature development, of sexual freedom, of maturity only, and, of power, privileges, and respect. (69: p. 125)

Moss (71) found evidence for lip and cheek labrets in Catlin's portraits of Native Americans, which he contended generally signified a higher status of the wearer in both males and females.

Evidence for labrets in contemporary Africa

Modern African populations wear lip plugs as documented by Kabiru (72) for Kenyan groups, although this often involved a flat lip plate and avulsion of the upper and/or lower incisors. Turton (73) lists the Mursi of the Omo River area in southern Ethiopia/northern Kenya as lip plate wearers. These are often made of wood, which would never preserve in archaeological contexts. They seem to be confined to stretching the upper and lower lips and do not involve the posterior teeth, so their relevance to other areas described here (except for the wooden plugs) is questionable. Garve et al. (74: p. 235) describe lip plugs and lip plates made from "wood, bones, animal teeth, ivory, quartz crystals, feathers, snail shells, thorns, spines and horn" in a variety of African and Native American populations and contend they represented symbols of status and authority. Hand (75) has a comprehensive collection of these plugs in African groups and they mainly involve plates in the upper and lower lips. It seems that with the influence of Western culture wearing of lip plugs and lip plates is declining. Ironically it is now that the people in Western cultures that are using lip plugs, but so far, not lip plates.

Labrets in modern dentistry

Today, labrets are varied and easily available worldwide (e.g., https://www.tulsabodyjewelry.com, where hundreds are offered, ranging from simple dots to claws to skulls). Body piercing involves more than just lip or buccal plugs and for a sense of their extent and popularity, type in "body piercing books and periodicals" in Google and be prepared for surprises. With trends of body modifications in today's young, the effect of lip and lateral plugs has become an issue of concern in modern dentistry (76). Studies include Escudero-Castaño et al. (77) who surveyed the literature between 1997-2007 and found numerous examples where lip plugs affected the dental enamel, alveolar bony structure and the soft tissue. Hennequin-Hoenderdos et al. (78-79) report dental damages caused by lip (and tongue) plugs with a 50% incidence of gingival recession and tooth enamel damage in 26% of the cases. Similar damage to the gingiva is documented by Leichter and Monteith (80: p. 7), who reported a "7.5 times greater [frequency of gingival recession] in a pierced individual wearing a labret than an unpierced individual." Uppal et al. (81), in an article titled "a deleterious vogue," listed 20 different risks and complications from oral piercings (including tongue and the lingual frenulum) ranging from pain to gingival recession to dental trauma. King, Brewer and Brown (82) report a teenager's death from septicemia, resulting from an infected lip plug. They also summarize data from Wales, where: "[i]n 16–24-year-olds, 50.1% who had tongue piercings and 20.5% who had lip piercings experienced complications" (82: p. 889).

Thus, there is now an ever-widening dental literature on the long-lasting, detrimental effects of lip, cheek and tongue plugs. Given the extent of lip and cheek plug use in prehistoric groups, one wonders what medical consequences these people suffered. Certainly the damage caused by vestibular and lingual plugs in the Mehrgarh people must have been painful and eventually caused them eventual functional loss of the affected teeth and severe health problems. Unfortunately, many of the teeth are isolated or associated with very fragmentary jaws, so it is nearly impossible to assess the state of alveolar damage or resorption. We have not found evidence of caries in any of the faceted areas.

Other factors can affect the enamel and root surfaces. For example, abfractions are lesions located mostly at the mesial or distal cervical borders (83-85). Because of their limited extent and locations and apparent recent appearance as a dental problem, they are an unlikely explanation for the facets discussed here. Similarly, citric corrosion has widespread enamel loss (86), but these have different expressions on dental enamel than the localized facets produced

by labrets or tongue posts. For example, Robb, Cruwys and Smith (87) describe erosion deriving from the gastric acid of bulimics and these lesions only affected the lingual surfaces of anterior teeth, not the posterior teeth and no teeth in the mandible. Given that the lingual facets at Mehrgarh primarily affected the posterior teeth, erosion caused by internal or external citric acids seems only a remote possibility.

Discussion and conclusions

Analysis of labret use in prehistoric skeletal samples suggests a nonmasticatory effect involving abrasion of the labial/buccal tooth faces. A process of elimination leads to the conclusion that lip or cheek plugs were responsible for producing these facets. With the exception of Olduvai hominid 1, no micro-wear data exists for the earlier fossil samples. Evidence from micro-striae at Mehrgarh points to a process of tooth abrasion mainly oriented parallel to the occlusal plane. This indicates that oral manipulations involving tool use or oral processing of items are unlikely explanations for the facets. The fact that many posterior teeth show facets so far back in the jaws further rules out manipulative actions. At Mehrgarh, some micro-chipping occurs on both the medial and distal margins of some facets, suggesting the impact of a hard instrument rather than processing of much softer vegetable fibers, sinew and/or leather. From the extent of the facets, especially in Mehrgarh, the plugs were worn for a long time producing more and more extensive wear and polishing of the labial/buccal surfaces as larger and larger labrets and check plugs were inserted. These must have caused oral discomfort, mastication problems and exposed the males who wore them to infectious diseases and other health issues. More difficult to explain are the lingual facets where the effect of labrets is not valid and remains puzzling. We suspect that they were wearing tongue posts, following examples of this habit in extant dental patients. Based on their position in the mouth we can eliminate abrasion caused by some kind of dental corrosion or chewing stress.

Retrodicting wear like this is difficult since any diagnosis of prehistoric examples suffers from only seeing the end result of the process. This compounds problems associated with identifying the ultimate cause(s), which began and continued the process over time. It is equally problematic that until recent times in all geographic areas labrets are relatively rare in archaeological contexts. Jebel Moya in the Sudan is a major exception, but most of these labrets were apparently not found in association with skeletal material. Given evidence for labrets in ethnographic-present populations, some of the prehistoric labrets likely were made of ivory, bone or some other non-perishable material and it is odd they are not preserved, especially at Mehrgarh. Their absence may be due to collection bias by the archaeologists, but it also hard to imagine that archaeologists neglected to preserve labrets or did not recognize them in the graves. It is possible labrets do exist in the archaeological collections, but have not been identified. However, one of us (MV) searched the Mehrgarh archaeological materials and did not find labrets. For the argument that carrying stones in the mouth produced these facets, it is noteworthy that pebbles also have not been found in any of the Paleolithic graves. But here, since they were likely unmodified rocks, they could have been easily overlooked. A possible explanation for the lack of labrets in our prehistoric samples is that the labrets were made of wood or some other perishable items and did not preserve. There is always the possibility that what caused the buccal facets in the Upper Paleolithic and Mehrgarh teeth was different than the evidence preserved in the later and ethnographic-present populations. Nonetheless, there is no other likely explanation for the widespread occurrence of these labial and buccal facets in the prehistoric samples. Clearly more work needs to be done to document and describe these non-occlusal facets and to determine the presumed consequence of labret use in prehistoric groups.

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Table 1 List of specimens from Mehrgarh with non-occlusal wear facets

Specimen**	sex	age (years)	number of teeth	affected teeth*	
				labial/buccal facets	lingual facets
MR 9703 109	male	20-29	2	LtC_1, LtP_3	
MR3 169	male	30-39	16	LtC^1, LtC_1, RtC_1	
MR 9803 229	male	30-39	28	LtM^1	
MR3 554	male	30-39	29	LtI^1, LtI^2, LtC^1, LtP^3, LtM^1, LtM^2, RtI^1, RtI^2, RtC^1, RtP^3, RtP^4, RtM^1, RtM^2, RtI_1, RtI_2, RtC_1, RtP_3, RtP_4, RtM_1	LtI_2, LtM_1, RtI_1, RtI_2,
MR 9803 228	male	40-49	23	LtI^2, LtP^3, LtP^4, LtM^1, RtI^1, RtC^1, LtC_1, LtP_3, LtP_4	LtM^3, LtI_1, RtI_2
MR 9803 233	male?	40-49	11	LtC^1, LtP^3, LtM^2, RtI^2, RtC^1, RtP^3 RtP^4, RtM^1, RtM_2	LtM^2, RtM_2
MR 9903 265	male	40-49	29	LtI^1, LtI^2, LtC^1, LtP^3, LtM^1, RtI^1, RtI^2, RtC^1, RtP^3, RtM^1, LtC_1, RtI_1, RtC_1, RtP_4, RtM_1	LtP_3, LtP_4, LtM_1, LtM_2, LtM_3, RtP_4, RtM_1, RtM_2, RtM_3,
MR3 579	male	40-49	29	LtI^1, LtI^2, LtC^1, LtP^3, LtP^4, RtI^1, RtI^2, RtC^1, RtP^3, RtP^4, RtM^1, LtI_2, LtC_1, LtP_3, LtP_4, LtM_1, RtI_1, RtI_2, RtC_1, RtP_3, RtP_4, RtM_1, RtM_2	
MR3 F 32	male	>50	29	LtP^4, LtM^1, LtM^2, RtM^1, LtP_3, LtM_1, RtM_1	
MR3 577	male	>50	19	LtI^1, LtI^2, RtI^1, RtI^2, LtC_1, LtP_3, LtP_4, LtM_1, RtC_1, RtP_3, RtP_4, RtM_1, RtM_2,	LtM_1, LtM_3, RtM_1, RtM_2

* a few teeth show lesions on both the labial/buccal and lingual aspects.

** for some specimens, Jarrige *et al* (4) did not use MR3, only MR. But all these specimens come from the MR3 graveyard

Table 2 Summary of teeth with facets

	Labial/buccal facets						Lingual facets					
	Maxilla			Mandible			Maxilla			Mandible		
I^1	lt	4		I_1	lt	-	I^1	lt	-	I_1	lt	1
	rt	5			rt	3		rt	-		rt	1
I^2	lt	5		I_2	lt	1	I^2	lt	-	I_2	lt	1
	rt	5			rt	2		rt	-		rt	2
C^1	lt	5		C_1	lt	6	C^1	lt	-	C_1	lt	-
	rt	5			rt	5		rt	-		rt	-
P^3	lt	5		P_3	lt	5	P^3	lt	-	P_3	lt	1
	rt	4			rt	3		rt	-		rt	-
P^4	lt	3		P_4	lt	3	P^4	lt	-	P_4	lt	1
	rt	3			rt	4		rt	-		rt	1
M^1	lt	5		M_1	lt	3	M^1	lt	-	M_1	lt	3
	rt	5			rt	5		rt	-		rt	2
M^2	lt	3		M_2	lt	-	M^2	lt	1	M_2	lt	1
	rt	1			rt	3		rt	-		rt	3
M^3	lt	-		M_3	lt	-	M^3	lt	1	M_3	lt	2
	rt	-			rt	-		rt	-		rt	1
totals		58				43			2			20
left		30				18			2			10
right		28				25			-			10

Supplementary Table 1 Dimensions of labial/buccal/lingual facets for Mehrgarh 3. In some cases, the facet has post mortem break, allowing a maximum height (or maximum breadth) measurement, but not both. In these cases a nd. is given in the table. In other cases the facet is present, but too damaged for any measurements, which is designated as nd* in the table.

individual	age at death	tooth	aspect	ht (mm)	br (mm)
labial and buccal facets MR3 F32	>50	MxRtM1	buccal	2.9	2.5
	>50	MxLtP4	buccal	1.2	1.8
	>50	MxLtM1	buccal	2.4	2.8
	>50	MxLtM2	buccal	0.8	0.8
MR9703 109	20-29	MnLtC	labial	3.2	3.6
	20-29	MnLtP3	buccal	nd	4.0
MR3 169	30-39	MxLtC	labial	nd	nd
	30-39	MnRtC	labial	1.1	2.0
	30-39	MnLtC	labial	3.5	2.6
MR9803 228	40-49	MxRtI1	labial	nd	7.0
	40-49	MxRtC	labial	11.4	5.1
	40-49	MxLtI2	labial	nd*	nd*
	40-49	MxLtP3	buccal	6.7	3.8
	40-49	MxLtP4	buccal	2.6	2.6
	40-49	MnLtC	labial	nd	5.0
	40-49	MnLtP3	buccal	5.7	3.9
MR9803 229	30-39	MxLtM1	buccal	1.4	1.7
MR9803 233	40-49	MxRtI2	labial	nd	5.6
	40-49	MxRtC	labial	nd*	nd*
	40-49	MxRtP4	buccal	4.7	3.4
	40-49	MxRtP4	buccal	nd	3.4
	40-49	MxRtM1	buccal	nd	7.9
	40-49	MxLtC	labial	8.8	4.4
	40-49	MxLtP4	buccal	5.7	3.8

	40-49	MxLtM2	buccal	6.0	8.3
	40-49	MxRtM2	buccal	4.1	7.7
MR9903 265	40-49	MxLtI1	labial	7.0	7.4
	40-49	MxLtI2	labial	10.2	4.9
	40-49	MxLtC	labial	19.8	5.6
	40-49	MxLtP3	buccal	5.7	3.4
	40-49	MxLtM1	buccal	2.5	1.6
	40-49	MxRtI1	labial	nd	7.8
	40-49	MxRtI2	labial	5.8	4.5
	40-49	MxRtC	labial	10.1	5.8
	40-49	MxRtP3	buccal	8.8	3.9
	40-49	MxRtM1	buccal	4.2	nd
	40-49	MnRtI1	labial	7.7	3.0
	40-49	MnRtC	labial	1.8	1.4
	40-49	MnRtP4	buccal	2.3	3.1
	40-49	MnRtM1	buccal	3.4	3.8
	40-49	MnLtC	labial	2.8	2.6
	40-49	MnLtP4	buccal	5.0	3.6
	40-49	MnLtM1	buccal	1.5	1.5
MR3 554	30-39	MxRtI1	labial	8.9	7.2
	30-39	MxRtI2	labial	10.1	5.7
	30-39	MxRtC	labial	13.4	5.6
	30-39	MxRtP3	buccal	10.3	4.9
	30-39	MxRtP4	buccal	2.5	2.6
	30-39	MxRtM1	buccal	nd*	nd*
	30-39	MxRtM2	buccal	1.8	1.5
	30-39	MxLtI1	labial	8.5	9.0
	30-39	MxLtI2	labial	8.0	5.3
	30-39	MxLtC	labial	8.5	5.2

	30-39	MxLtP3	buccal	5.1	3.7
	30-39	MxLtM1	buccal	0.5	1.0
	30-39	MxLtM2	buccal	nd	1.7
	30-39	MnRtI1	labial	8.4	4.3
	30-39	MnLtI2	labial	7.3	4.3
	30-39	MnRtC	labial	nd	5.8
	30-39	MnRtP3	buccal	8.8	4.4
	30-39	MnRtP4	buccal	4.7	3.6
	30-39	MnRtM1	buccal	nd*	nd*
MR3 577	>50	MxRtI1	labial	4.5	4.5
	>50	MxRtI2	labial	nd	1.2
	>50	MxLtI1	labial	nd*	nd*
	>50	MxLtI2	labial	3.7	3.2
	>50	MnRtC	labial	3.6	3.6
	>50	MnRtP3	buccal	4.3	2.8
	>50	MnRtP4	buccal	4.3	3.3
	>50	MnRtM1	buccal	nd	4.3
	>50	MnRtM2	buccal	2.3	nd
	>50	MnLtC	labial	2.5	2.7
	>50	MnLtP3	buccal	4.7	3.3
	>50	MnLtP4	buccal	0.9	1.0
	>50	MnLtM1	buccal	3.7	2.0
MR3 579	40-49	MxRtI1	labial	8.3	5.1
	40-49	MxRtI2	labial	4.0	2.8
	40-49	MxRtC	labial	7.1	4.2
	40-49	MxRtP3	buccal	2.1	2.0
	40-49	MxRtP4	buccal	1.2	1.9
	40-49	MxLtI1	labial	5.3	3.4
	40-49	MxLtI2	labial	5.9	3.1

	40-49	MxLtC	labial	nd*	nd*
	40-49	MxLtP3	buccal	3.7	2.6
	40-49	MxLtP4	buccal	nd*	nd*
	40-49	MnRtI1	labial	nd*	nd*
	40-49	MnLtI2	labial	nd*	nd*
	40-49	MnRtC	labial	nd*	nd*
	40-49	MnRtP3	buccal	2.0	1.8
	40-49	MnRtP4	buccal	nd	1.1
	40-49	MnRtM1	buccal	nd*	nd*
	40-49	MnLtC	labial	1.2	2.3
	40-49	MnLtP3	buccal	nd	1.4
	40-49	MnLtP4	buccal	nd*	nd*
	40-49	MnLtM1	buccal	nd	nd
lingual facets					
MR9803 228	40-49	MxLtM3	lingual	3.2	4.5
	40-49	MnLtI1	lingual	nd	1.9
	40-49	MnLtP4	lingual	nd*	nd*
	40-49	MnLtI2	lingual	4.2	1.5
MR9803 229	30-39	MnLtI1	lingual	2.1	1.7
	30-39	MnRtI1	lingual	2.5	2.3
	30-39	MnLtI2	lingual	1.7	1.8
MR9803 233	40-49	MxLtM2	lingual	nd	6.0
	40-49	MnRtM2	lingual	2.0	2.3
MR9903 265	40-49	MxLtM1	lingual	2.0	1.4
	40-49	MnRtP4	lingual	1.7	1.7
	40-49	MnRtM1	lingual	nd*	nd*
	40-49	MnRtM2	lingual	3.3	nd

	40-49	MnRtM3	lingual	1.9	nd
	40-49	MnLtP3	lingual	6.7	3.4
	40-49	MnLtP4	lingual	5.0	3.6
	40-49	MnLtM1	lingual	nd*	nd*
	40-49	MnLtM2	lingual	nd*	nd*
	40-49	MnLtM3	lingual	2.3	nd
MR3 577	>50	MnLtM1	lingual	nd*	nd*
	>50	MnLtM3	lingual	nd*	nd*
	>50	MnRtM1	lingual	1.5	1.7
	>50	MnRtM2	lingual	1.9	1.9

ht = height; br = breadth; Mx – maxillary; Mn – mandibular; Lt – left; Rt – right; nd = no data;

nd* = facet present, but cannot be measured