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Dental modifications in a skeletal sample of enslaved Africans found at Lagos (Portugal)

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Abstract

An archaeological intervention in Valle da Gafaria (Lagos, Portugal) allowed the excavation of a deposit of waste dating from 15th-17th centuries. Among discarded objects, an important amount of human skeletal remains was exhumed (N=158 individuals). The archaeological and historical context, as well as the morphometric analysis of the skulls led us to attribute them an African origin. While historical sources document the trade of slaves by the Portuguese since the 15th century, so far no slave cemetery was excavated in Portugal. The study of their lives and deaths has been accomplished by historical documents. Therefore, this sample provides a unique opportunity to learn more about captive individuals who were brought to Portugal in the modern period. The present work focuses in the intentional dental modifications presented by several of these individuals. A total of 113 subjects have teeth that can be evaluated for the presence of intentional modifications. Of these, 55.8% individuals present dental modifications on their anterior dentition, 42.9% exhibiting modifications on both upper and lower teeth. The incisors were the most frequently modified teeth, followed by the canines. Both men and women as adults and sub-adults have dental intentional modifications. In most individuals dental modifications involved the removal of the mesial and distal angles, which is comparable to sub-Saharan African practices. However, we cannot infer a more specific origin for these slaves only based on dental modification's type and pattern because several ethnic groups modify teeth in the same way.

Key words: Dental modifications, Slavery, Africa, Portugal, 15th-17th centuries.

1. Introduction

In 2009, an archaeological excavation of an area projected for the construction of an underground car park in Valle da Gafaria, Lagos, Portugal (Figure 1) revealed several human occupations. More specifically, two places of burial were identified at this site, outside the city walls: one related to a leprosarium (Ferreira et al., 2013), and another associated with a deposit of urban waste, dating from the 15th-17th centuries. This paper will focus only on the deposit of urban disposal, with an area of about 4000 m^2 and a stratigraphic thickness exceeding 6 meters (Figure 2).

A geoarchaeological approach was applied in order to recover and interpret the archaeoestratigraphic complexity of the site (Neves et al., 2011). This careful approach proved to be particularly important, especially since severe damage occurred in the archaeological record before the fieldwork, causing great loss of skeletal remains and archaeological structures and levels. Unfortunately, in some cases, these damages have hindered our interpretation ability. The complete area of the deposit of urban waste is now unrecoverable.

The archaeological context of the findings reported here, namely the fact that human bodies were mixed with urban waste in a large pit, disrespecting the canonical burial traditions (Figure 3), the presence of African items (necklaces and ornaments in bone) associated with the skeletons (Figures 4 and 5), but also the morphometric analysis of the skulls (Coelho, 2012; Navega et al., 2014), and the presence of intentionally modified teeth (Figure 6) led us to think we are in the presence of African slaves (Neves et al., 2011).

A first AMS C14 date obtained for one of the earliest individuals buried in the deposit of waste resulted in 450 +/- 40 BP, Cal AD 1420-1480, Cal BP 540-470, Beta – 276508. This dating is consistent with the first historical accounts of caravels arriving at Lagos with enslaved Africans (Tinhorão, 1997; Henriques, 2009).

Several of the individuals exhumed from Valle da Gafaria present intentional dental modifications. Dental modification is a preferred term here in relation to dental mutilation because, as already mentioned by other researchers (Mower, 1999; Barnes, 2010; Cook et al., 2012), the

latter is inaccurate and ethnocentric. Africans have altered their anterior teeth through filing, drilling with inlays, staining, and ablation (Barnes, 2010). Filing corresponds to the filing away or chipping of specific teeth to create a pattern, such as the pointing of the ends of the teeth, or cutting out portions of the tooth so that it appears to be missing a piece. Teeth may also be drilled with inlays such as precious metals or gemstones. Staining of the teeth and/or surrounding soft tissues is another way in which human dentition can be modified. Finally, ablation, also known as dental evulsion, is the intentional removal of specific teeth (Inoue et al., 1995; Barnes, 2010).

Strongly related to culture (Milner and Larsen, 1991) this practice can translate some aspects of the enslaved Africans who were brought to Portugal in the modern period. Therefore, the aim of the present work is to describe the intentional dental modifications presented by several individuals exhumed from Valle da Gafaria, elucidate the variation with respect to this practice, and try to make inferences about the ethnic and geographical origin of the Lagos's slaves.

2. Material and Methods

In all, 158 individuals were exhumed from the deposit of urban waste in Valle da Gafaria (Lagos, Portugal). The skeletons were recovered in various states of preservation and completeness (Table S1). Unfortunately, some skeletons were partially destroyed by bulldozer action before the arrival of the archaeology team. Since the present work focuses in the intentional dental modifications presented by several individuals, only the skulls that had teeth that could be evaluated were considered in this study (N=113), constituting therefore the sample henceforth referred and described.

The adults' age-at-death estimate was made from the epiphyseal fusion of femoral head (Ferembach et al., 1980), the third molar eruption (Ozle et al., 2007), the spheno-occipital syncondrosis fusion (Shirley and Jantz, 2011) and the morphologic changes in the pubic symphysis and auricular surface of the *ilium* (Lovejoy et al., 1985; Brooks and Suchey, 1990). The sub-adults' age-at-death estimate was done following Scheuer and Black recommendations (2000). For sexual

diagnosis the metric and morphological analysis of the skull and hip bone (Uytterschaut, 1986; Ferembach et al., 1980; Buikstra e Ubelaker, 1994; Bruzek, 2002; Murail et al., 2005) was performed. The results for both sexual diagnosis and age-at-death estimation were then compared to those obtained by Furtado (2012). Adults ancestry was assessed through non metrical traits, more specifically the cranial morphological traits (Coelho, 2012) recommended by Rhine (1990), and the morphology of articular facets of the calcaneus (Bunning and Barnet, 1965).

Initially, teeth were examined for presence, post-mortem absence, ante-mortem loss, partial eruption (when crypt communicating with crest of alveolar process, or tooth not yet worn), anomalous eruption (when the tooth has not reached its normal position in the tooth row), or no eruption (as a result of young age, impaction or agenesis) (Hillson, 2001). The assessment of which teeth had been lost before death and which after death was done by considering the condition of the socket margins. The absence of a tooth prior to death may be caused by a variety of factors, namely impaction, agenesis, pathological or accidental loss or intentional removal (ablation). Differentiating between these causes requires a meticulous evaluation of the surrounding alveolar bone and teeth. The amount of space remaining and the presence or absence of distinct traces of approximal wear on remaining adjacent teeth were recorded in order to infer if a tooth had been present, allowing a differentiation between ante-mortem tooth loss and agenesis or impaction (Milner and Larsen, 1991). On the other hand, deliberate tooth removal is difficult to demonstrate undoubtedly with archaeological remains (Milner and Larsen, 1991). Following other researchers (Merbs, 1968; Mower, 1999, Domett et al., 2011), intentional ablation was considered only when there was no evidence of disease in the surrounding alveolar bone or teeth, symmetry or near symmetry of tooth loss was apparent, and the pattern of loss was repeated among individuals within the sample.

Differentiating between deliberate tooth modification and that caused by a wide variety of extra-masticatory functions (e.g. using teeth as tools or ‘third hand’, cultural habits such as pipe smoking, use of labrets or toothpicks, etc.) or accidents also involves careful observation of the

pattern and location of modifications, the symmetry of teeth affected and the general frequency in a population (Blakely and Beck, 1984; Domett et al., 2013). In passive or unintentional dental modifications, teeth usually display asymmetrical wear patterns, whereas intentional modifications are frequently symmetrical. Moreover, task-related activities tend to affect the occlusal or approximal surfaces of teeth, whereas intentional modifications are usually performed on crown edges or labial surfaces (Blakely and Beck, 1984; Domett et al., 2013). All teeth were examined under standardized lighting conditions by careful visual inspection, by the three authors at the same time, for the presence of intentional dental modifications. When present, these were categorized according to the number of removed incisal angles, their position, tooth type and affected jaw. Each tooth was also scored according to Almeida's tooth modification types (Almeida, 1953, 1957). Two new patterns (no. 3 and 5) were identified in the present sample and were added to this scoring scheme (Figure 7).

A second observation of the whole sample was performed by two authors (SW, MTF).

Chi-square test was used to determine the level of significance of the association between dental modification and tooth types or jaws. The significance level was set at a probability $P \leq 0.05$.

3. Results

Individuals' biological profile

The biological profile of the individuals exhumed from Valle da Gafaria urban waste deposit can be observed in Table S1. The sample is made of 107 adults and 49 sub-adults. In two cases, the poor state of preservation and the incompleteness of the skeletons made it impossible to infer if they were adults or sub-adults. Among adults, 56 are females (52.3%), 24 are males (22.4%), and 27 are individuals of unknown sex (25.2%). The ancestry could only be evaluated in 63 adult subjects. For all of them, African ancestry was confirmed (Coelho, 2012; Navega et al., 2014). As already mentioned above, for the purpose of this study are described only individuals who had teeth that could be evaluated for the presence or absence of dental modifications (N = 113). From these, 36

were sub-adults and 76 were adults (49 females, 18 males, and 9 individuals of unknown sex). In 26 adults and 5 sub-adults, the high degree of fragmentation impaired the age-at-death estimation.

Dental modifications on a per individual basis

Of the 113 analyzed individuals, 63 (55.8%) presented dental modifications on their anterior dentition, from which 14 are sub-adults (22.2%) and 49 are adults (77.8%). The form and location (crown edges) of the modifications and the symmetrical nature of many cases revealed that these teeth were intentionally filed and were not related to task-related wear. The youngest individual with modified teeth (Individual no.30) was 3 years old (± 12 months). From this age onwards, dental modifications were present in several pre- and post-puberty individuals. For the same ages, there are many sub-adult individuals without any signs of this practice. Both women (30; 61.2%) and men (12; 66.7%) presented intentional dental modifications. Twenty seven individuals (42.9%) exhibited modifications on both upper and lower teeth.

Twenty three (46.9%) adult individuals presented removal of both mesial and distal incisal angles in all modified teeth, eight (34.8%) of which on both jaws. Twelve (24.5%) individuals showed removal of only one incisal edge and 14 (28.6%) individuals exhibited teeth with one incisal angle removed and teeth with two angles removed.

Regarding sub-adults, only three (21.4%) individuals presented removal of both mesial and distal incisal angles in all modified teeth, one of them on both jaws. Six (42.9%) individuals showed removal of only one incisal edge and five (35.7%) individuals exhibited teeth with one incisal angle removed and teeth with two angles removed.

Dental modifications on a per tooth basis

Adults

If only adults are considered, 1489 tooth positions and 1368 fully erupted teeth were examined. Of the observable sockets, 49 teeth were lost post-mortem (3.3%) and 55 (3.7%) were

lost before death. Partial eruption was observed in five teeth (only third molars) whereas anomalous eruption was found in four teeth (again, third molars only). Complete failure to erupt (as a result of young age, impaction or agenesis) was registered in eight tooth positions (mainly third molars, but also lateral incisors and second premolars). There was no ablation of teeth.

Since only anterior teeth were culturally modified these will be the ones considered hereinafter. Overall, 506 anterior teeth were present and fully erupted, from which 209 (41.3%) were modified. Upper teeth were more affected (57.9%) than lower (24.8%) (Chi-square = 57.281, df = 1, $P < 0.00$). Cultural modification was performed mainly in incisors (central incisors: 67.1%; lateral incisors: 47.4%) and, on a smaller percentage, canines (13.4%) (Chi-square = 101.902, df = 2, $P < 0.00$). Upper incisors, both central (93.6%) and lateral (69.4%), were the most affected teeth. Only seven individuals presented modified lower canines.

Most teeth (152; 72.7%) presented removal of both mesial and distal incisal angles. Thirty-eight teeth (18.2%) had only the mesial edge removed, and 19 (9.1%) showed only the distal angle modified. Removal of both angles was most common in upper lateral incisors (Table 1). Lower lateral incisors were the only teeth where removal of distal angle alone was never observed. Removal of both angles was not observed in lower canines.

Sub-adults

Regarding sub-adults, 495 tooth positions were examined, from which three teeth were lost post-mortem (0.6%) and one ante-mortem (0.2%). Partial eruption was observed in 29 teeth (including central and lateral incisors, canines, first premolars, and second and third molars) whereas anomalous eruption was found in two teeth (third molars only). Complete failure to erupt (as a result of young age, impaction or agenesis) was registered in 140 tooth positions (every tooth class). There was no ablation of teeth. In all, it has been possible to analyze 320 fully erupted teeth from which 140 were anterior. From these, 38 were deciduous and 102 were permanent.

Dental modification was observed in 58 anterior teeth, 37 deciduous and 21 permanent. When both deciduous and permanent teeth are combined together, upper teeth were slightly more affected (47.8%) than lower ones (35.6%), but this difference is not significant (Chi-square = 2.124 df = 1, $P = 0.145$). Regarding deciduous teeth, most canines (95.8%) and all incisors (100%) were modified. When only permanent teeth are analyzed, canines were more affected (25.9%) than incisors (18.7%). However, this difference was caused by lower incisors which were never found to be modified. In fact, upper central incisor was the most affected tooth (57.9%), followed by the lower canine (38.5%).

Removal of the mesial edge alone was never observed in the deciduous teeth. Twenty deciduous teeth (54.1%) had only the distal edge removed and 17 (45.9%) showed both angles modified. Removal of both angles was most common in deciduous canines (Table 2). Lower deciduous incisors and upper deciduous central incisors had only the distal edge removed.

Regarding permanent teeth, all upper lateral incisors and upper canines presented removal of both mesial and distal incisal angles (Table 2). In opposition, the lower canines had only the distal edge removed. Upper central incisors showed modification of the mesial edge (54.5%), of the distal edge (9.1%), and of both edges (36.4%).

Patterns of dental modification

In the Lagos's sample there is no evidence of drilling with inlays, staining, or ablation. All alterations are consistent with filing. Figure 7 shows examples of how dental modifications appeared as an end-product in the Lagos' sample. It is worthwhile to notice that two new patterns of dental modification (no. 3 and 5) were identified in the present sample.

Adults

In adults, the most common pattern was no. 2, seen in 20 individuals (40.8%). In some cases (N = 15), this pattern was observed only in the upper teeth, and in other cases (N = 5) it was seen in

both jaws. The pattern no. 1 was identified in eight adult individuals (16.3%), six of which only in the upper dentition, and two in both jaws. The pattern no. 3 (pointed teeth) was identified in five adult individuals (10.2%), four of which only in the upper teeth and one in both jaws. The pattern no. 5 was observed in three adult individuals (6.1%), always in the upper teeth. There was no specific pattern that was exclusive of a particular sex. In one individual (2.0%) the upper teeth were modified according to pattern no 2. and the lower teeth following pattern no. 3. The opposite (i.e. upper teeth with pattern no. 3 and lower teeth with pattern no. 2) was observed in three adults (6.1%). Two adult individuals (4.1%) presented their upper teeth modified according to pattern no. 2 and their lower teeth following pattern no. 5. One adult individual (2.0%) showed upper teeth modified according to pattern no. 3 and lower teeth following pattern no. 5. The combination of pattern no. 4 in the upper teeth with pattern no. 5 in the lower was observed in only one adult (2.0%). In fact, this was the only time pattern no. 4 was observed in an adult individual. In five individuals (10.2%), it was not possible to establish any pattern, because each of the modified teeth presented a distinct alteration.

In ten adult jaws, it was not possible to assess the symmetry of the dental modifications because the antimeres teeth were not present or they were damaged post-mortem. When this parameter was evaluated, symmetrical patterns were found for the majority of both upper dentitions (84.6%; 33/39) and lower (68.4%; 13/19).

Sub-adults

In sub-adults, the most common pattern was no. 5, seen in four individuals (28.6%). In two cases, this pattern was observed only in the lower teeth, and in the other two cases it was seen in both jaws. The pattern no. 3 (pointed teeth) was identified in two sub-adults (14.3%), always in the upper dentition. Patterns no. 1 and 2 were only observed in one individual each. Two sub-adult individuals (14.3%) presented their upper teeth modified according to pattern no. 2 and their lower teeth following pattern no. 5. One individual (7.1%) showed upper teeth modified according to

pattern no. 1 and lower teeth following pattern no. 5. The combination of pattern no. 4 in the upper teeth with pattern no. 5 in the lower was observed in only one sub-adult (7.1%). This was the only time pattern no. 4 was observed in a sub-adult individual. In two individuals (14.3%), it was not possible to establish any pattern, because each of the modified teeth presented a distinct alteration. The distinct patterns of dental modifications could not be related to any specific age of the sub-adults.

As observed in adults, the sub-adults also exhibit mostly symmetrical patterns, both in the maxilla (80.0%; 8/10) and in the mandible (77.8%; 7/9). The symmetry of the dental modifications could not be assessed (because the antimeres teeth were not present or were damaged post-mortem) in only three jaws.

4. Discussion

Historical sources document the capture and trade of slaves by the Portuguese since the 15th century (Henriques, 2009; Fonseca, 2010; Caldeira, 2013). Until the end of this century, Lagos (the origin of the present archaeological series) was the harbor where slaves arrived from Africa and from which were redistributed to the Kingdom of Portugal, the Mediterranean Sea, and Northern Europe. While this trade has expanded over time, so far no slave cemetery was excavated in Portugal. The study of their lives and deaths has been documented primarily by historical sources documenting the high rates of mortality related to the difficult living conditions, and dispose of their bodies. Because at this time period slaves had no social status (especially the newcomers to the kingdom), after death, their bodies were dropped anywhere without having a proper burial. The attacks by stray dogs were inevitable and this began to bother the population. At some point, the disposal of the slaves' corpses in places that would not disturb the citizens was ordered by a royal decree issued in 1515 by the king of Portugal Manuel I (1495-1521), saying: «Make a well as deep as possible, at the most convenient and less inconvenient place, to which throw the bodies» (Castilho, 1893). This kind of bodies' disposal was quite evident in the Lagos site. Not only were

the individuals mixed with urban waste in positions that disrespected the canonical traditions, but also in some cases the position of their arms and legs suggested that they were tied, both front and back.

The Lagos sample provides a unique opportunity to learn more about captive individuals who were brought to Portugal in modern period. In fact, it is the first time an African slaves' osteological sample is reported in the Old World. Even globally there are few known cemeteries of slaves that have been excavated and studied, all of them located in the New World and with later chronologies, as the cemetery of Pretos Novos in Brazil (Pereira, 2008; Cook et al., 2012), the slave burial population in Barbados (Corruccini et al., 1982; Handler et al., 1982), the black slave cemetery from Montserrat, West Indies (Mann et al., 1987), the cemetery of the "Waterloo" plantation in Suriname (Khudabux, 1991), the cemetery in Campeche in Mexico (Tiesler, 2006), and the African Burial Ground in the city of New York (Blakey, 2001). It is worthwhile to note that in some of these examples the slave status interpretation is not consensual. There is considerable discussion on how researchers can identify slavery in the archaeological record. Even when human skeletal remains are present, this task is usually difficult if not impossible. Too often, the archaeological data *per si*, without the support of historical records, do not reflect the slave status. On the other hand, historical documents also have limitations, being frequently fragmentary and biased (for further discussion, see Handler and Lange, 2006; Okumura, 2011). The Lagos's individuals contrast with these cases in the sense that they were not properly inhumed in a cemetery, but discarded with garbage. In the present case, the archaeological evidences strongly suggest that these individuals were enslaved. Historical records support that.

Regarding intentional dental modifications, although there are archaeological and ethnohistorical evidences for such practice amongst African slaves in the New World during the colonial era, namely in the individuals recovered from the Barbados and Brazil cemeteries (Handler, 1994; Handler et al., 1982; Líryo et al., 2001), so far there is no archaeological evidence for such practice in Portugal during this time period.

Intentional dental modification among historical and pre-historical African populations is well-attested (Almeida, 1953; Santos, 1962; Dias and Dias, 1964; Pindborg, 1969; Redinha, 1974; Inoue et al., 1995; Finucane et al., 2008; Reichart et al., 2008, among others). It is usually done to certain types of teeth, mainly the anterior ones, sometimes by a specific sex, and there is age specificity regarding the time at which is carried out (Jones, 1992). Among various cultural groups, it may signify a rite of passage, group identity, the mourning of a loved one, or be a means of enhancing beauty (Milner and Larsen, 1991; Finucane et al., 2008; Barnes, 2010). While the intention behind this cultural practice is difficult to discern from archaeological evidence alone, the form and location of dental modifications vary geographically and with ethnicity (Mower, 1999; Finucane et al., 2008), which can give clues into the individuals who presented them. As Milner and Larsen (1991: 357) already emphasized 'These aspects of the dentition reflect a diverse array of cultural practices, so they are of special significance in the reconstruction and broader understanding of past human behavior'.

The most relevant observed features of the present sample are that only anterior teeth had been modified, being upper teeth more affected than lower. In most individuals dental modifications involved the removal of the mesial and distal angles of the teeth, which is comparable to practices observed in sub-Saharan Africa. Skulls from the early 20th century Cameroon show filing of their anterior upper teeth, resulting in pointed teeth (Reichart et al., 2008). The same kind of alteration has also been documented among several ethnic groups from Mali, Nigeria, the Central African Republic, the Democratic Republic of Congo, Angola, Mozambique, Zambia and Zimbabwe (Almeida, 1953; Santos, 1962; Dias and Dias, 1964; Gould et al., 1984; Jones, 1992; Fabian and Mumghamba, 2007; Finucane et al., 2008). Extraction seems to have been less frequent in the Central and Western Africa although it may have been more common in other regions, namely the south of Africa (Handler, 1994). In the present sample, no evidences of ablation were found.

The obtained results are in general accordance with the historical sources. In fact, the slave trade by the Portuguese in the West African coast was based on an existing trafficking network.

These slaves were captured in the inland areas of sub-Saharan Africa being probably of different ethnicities, bought by the Portuguese in the West African coast (mainly from the current Mauritania to the Gulf of Guinea), shipped in several locations and brought to the Lagos harbor (Fonseca, 2010; Caldeira, 2013). Recently, random short autosomal sequence reads from some Lagos individuals, using them to call SNP identities and estimate ancestral affinities with modern reference data were obtained (Martiniano et al., 2014). African affinity signals were identified and further refined toward modern West African or Bantu genotyped samples, as expected from the above mentioned historical sources.

However, at this moment, we cannot infer a more specific origin for these slaves only based on the type and pattern of dental modifications because several ethnic groups modify their teeth in the same way. According to Van Reenen (1978) a certain type of modification was originally characteristic of a certain tribe. However, with time a simplification of old styles and/or adaptation to types of dental modification of neighboring tribes occurred mainly due to the moving away of a group from a particular area. Furthermore, as already explained above, it is highly probable that the Lagos slaves are from different African regions and ethnicities. Consideration of sex- or age-based differences could give clues about these individuals' ethnic identities or about the motivation behind such adornment. Sex-linked dental modification has been associated with rites of passage and childbearing among some groups in Central and West Africa (Goose, 1963; Pinborg, 1969). In some regions, dental modification also served as a marker of group affiliation, indicating one's membership in a tribe, clan or lineage (Jones, 1992). However, in the present sample there was no specific pattern that was exclusive of a particular sex or age-group, turning it difficult to infer a specific origin for these slaves or the motivation/function behind this cultural practice. This lack of pattern regarding dental modifications was also noted by Almeida (1953). In an ethnographic revision made among ten groups from Angola, this author did not found a specific pattern, exclusive of a particular sex or age-group. The only pattern noted was that the incisors were the only modified teeth. Besides, very rarely were the lower incisors the only teeth modified. In fact,

based on oral reports, Almeida (1953: 3636) states that the dental modifications affecting exclusively the lower incisors were mainly due to the escape of the 'patient' during the procedure. Among one ethnic group of Mozambique, although Dias and Dias (1964) have reported that intentional dental modifications were made by boys during their rite of passage, they also mention that girls and women were advised to do so. Therefore, a specific pattern by sex or age was not observed. Unfortunately, in several studies, ethnographic and archaeological (e.g., Paúl and Fragoso, 1938; Santos, 1962; Reichart et al., 2008), information on possible relations between the types of modification, age, and sex are frequently missing. In other instances, the nature of the available osteological material constrains any consideration of sex- or age-based differences (Finucane et al., 2008).

In order to achieve more information about the ethnicity of the Lagos's slaves, ancient DNA studies and isotopic analyses should be performed in the future. Furthermore, to clarify if Lagos sample includes recently arrived slaves strontium isotope ratios should be also investigated.

5. Conclusion

The Lagos's sample provides the first opportunity to learn more about captive individuals who were brought to Portugal in the 15th-17th centuries. Not only are there few cemeteries of enslaved people in the world, as well as until now Lagos is the only sample to be discovered and studied in the Old World. Despite the impossibility to infer a specific origin for these slaves or the motivation/function behind this cultural practice, the detailed study of intentional dental modifications of the individuals who make up this sample is extremely important for a better understanding of dental practices among African people from the 15th-17th centuries, and more specifically in enslaved groups. Hence, we believe this study enriches the scanty osteoarchaeological documentation of both slavery and intentional dental modifications, and it can contribute to reduce the discrepancy between historical and biological evidences of cultural practices.

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Supporting Information

Supporting tables: Table S1.

Table S1. Biological profile of the individuals exhumed from the deposit of urban waste in Valle da Gafaria (Lagos, Portugal).

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Table 1. Tooth angles removed by tooth type in the adult individuals exhumed from the deposit of urban waste in Valle da Gafaria (Lagos, Portugal).

Tooth type	Tooth angles removed						Total
	Mesial		Distal		Both		
	N	%	N	%	N	%	N
Upper central incisor	17	23.3	3	4.1	53	72.6	73
Upper lateral incisor	5	8.5	4	6.8	50	84.7	59
Upper canine	5	35.7	1	7.1	8	57.1	14
Lower central incisor	5	17.2	3	10.3	21	72.4	29
Lower lateral incisor	4	16.7	0	0	20	83.3	24
Lower canine	2	20.0	8	80.0	0	0	10
Total	38	18.2	19	9.1	152	72.7	209

Table 2. Tooth angles removed by tooth type in the sub-adult individuals exhumed from the deposit of urban waste in Valle da Gafaria (Lagos, Portugal).

Tooth type	Tooth angles removed						Total
	Mesial		Distal		Both		
	N	%	N	%	N	%	N
Deciduous teeth							
Upper central incisor	0	0	1	100	0	0	1
Upper lateral incisor	0	0	3	60.0	2	40.0	5
Upper canine	0	0	1	10.0	9	90.0	10
Lower central incisor	0	0	1	100	0	0	1
Lower lateral incisor	0	0	7	100	0	0	7
Lower canine	0	0	7	53.8	6	46.2	13
Permanent teeth							
Upper central incisor	6	54.5	1	9.1	4	36.4	11
Upper lateral incisor	0	0	0	0	3	100	3
Upper canine	0	0	0	0	2	100	2
Lower central incisor	0	0	0	0	0	0	0
Lower lateral incisor	0	0	0	0	0	0	0
Lower canine	0	0	5	100	0	0	5
Total	6	10.3	26	44.8	26	44.8	58

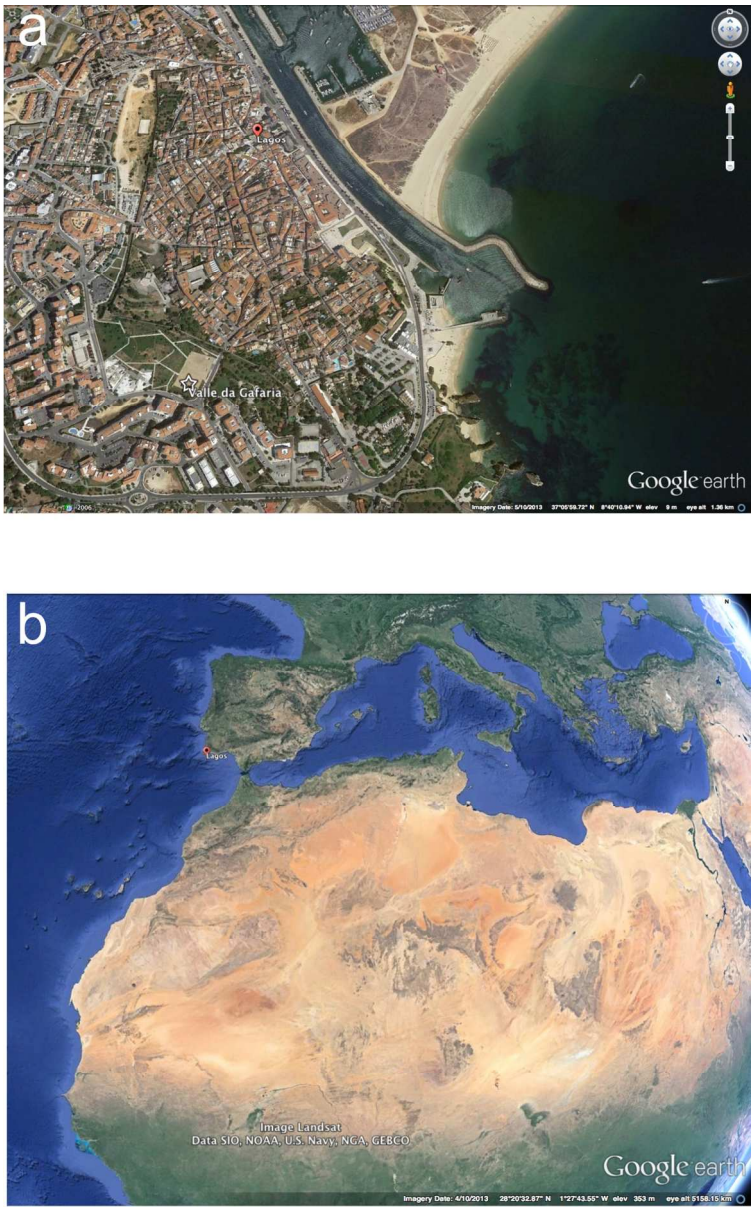

Figure 1. a) Location of the Valle da Gafaria site in Lagos. b) Location of Lagos in Portugal.
164x263mm (200 x 200 DPI)

Figure 2. View of one of the individuals buried in the deposit of urban waste of the Valle da Gafaria (Lagos, Portugal). In the stratigraphic column that appears behind the individual can be seen the successive layers of garbage dumps.
914x1371mm (72 x 72 DPI)

Figure 3. View of the large pit of the deposit of urban waste of the Valle da Gafaria (Lagos, Portugal). Note the fact that human bodies disrespect the canonical burial traditions.
1108x745mm (72 x 72 DPI)

Figure 4. Fragment of an African bone carving representing a woman, associated with the individual no.136 from the deposit of urban waste of the Valle da Gafaria (Lagos, Portugal).
423x1105mm (72 x 72 DPI)

Figure 5. Individual no. 166 from the deposit of urban waste of the Valle da Gafaria (Lagos, Portugal) where it is possible to visualize beads around the neck.
1371x914mm (72 x 72 DPI)

Figure 6. Skull (anterior view) of the individual no.81 from the deposit of urban waste of the Valle da Gafaria (Lagos, Portugal), with all upper incisors intentionally modified.
135x169mm (300 x 300 DPI)

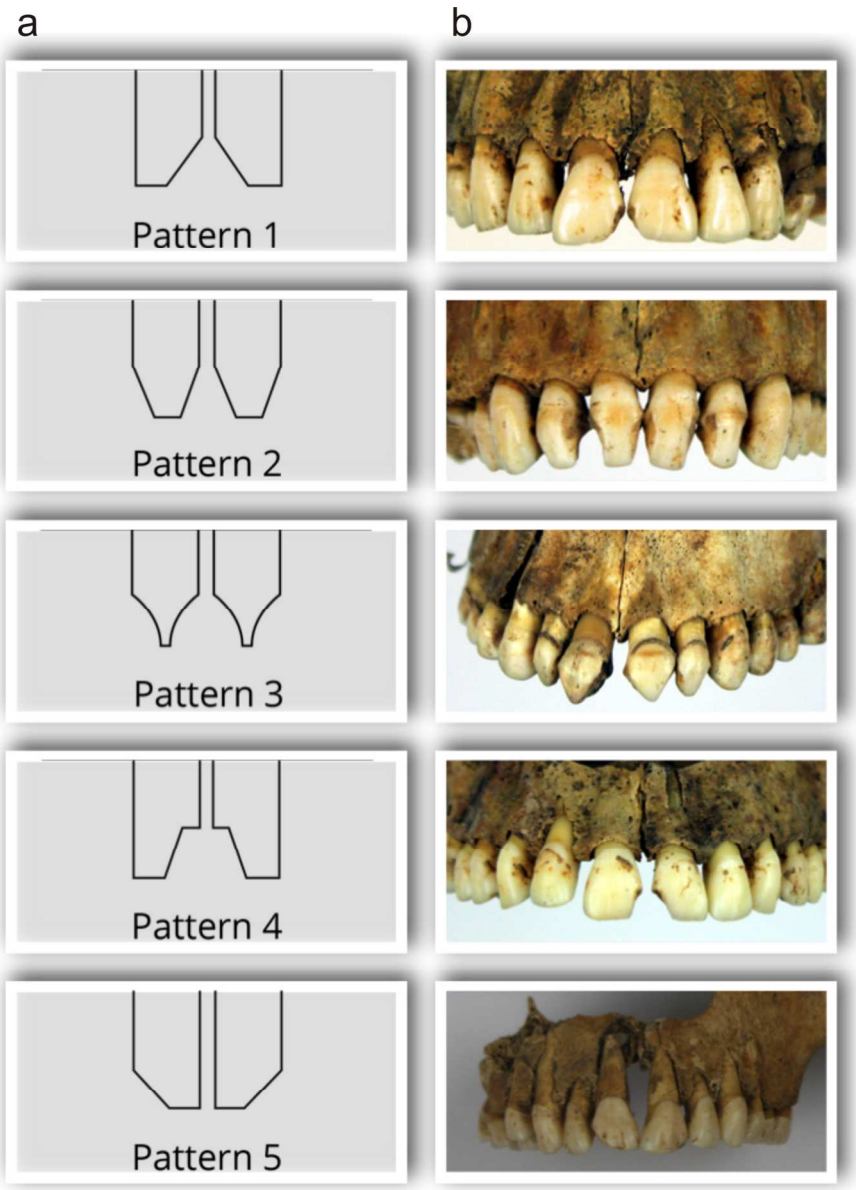

Figure 7. a) Classification of dental modifications adapted from Almeida (1953, 1957). b) Examples of how dental modifications appeared as an end-product in the Lagos' sample. Two new patterns of dental modification (no. 3 and 5) were identified in the present sample.
188x256mm (200 x 200 DPI)