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Fashion for a reason

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1 Fashion for a reason: Oral forms of jewellery to aid Forensic Dentistry

2 **Abstract:** Jewellery along with other personal effects have been used for human identification
 3 and acknowledged in the INTERPOL ([The International Criminal Police Organization](#)) DVI
 4 ([disaster victim identification](#)) forms. It is hypothesised that modified oral jewellery has scope
 5 haas a unique personal effect that can be used in combination with other identifiers. The main
 6 aim of this study was to investigate [the opinions on](#) the use of modified tooth/oral jewellery
 7 items among 90 subjects. The secondary aim was to create [and suggest](#) an elaborated oral
 8 charting system to document [oral](#) jewellery and [tooth](#) modifications and respective
 9 abbreviations. A number of 30 dental students, 30 dentists and 30 designers/tattoo & piercing
 10 artists (groups G1, G2 and G3) responded to [online](#) closed-ended [online](#) surveys (versions V1,
 11 V2 and V3). As results, G1 ~~related~~ [considered](#) jewellery to 'fashion/contemporary' (77%), ~~and~~
 12 ~~47% considered it 'unique'~~ [unique](#) and accepted the idea of wearing [a](#) customised oral
 13 jewellery ([equally 47%](#)). G2 considered oral jewellery as 'disgusting/vile fashion' (46.66%),
 14 [unique \(60%\) and](#) ~~and~~ 'unique to a person' (60%). 53% ~~of dentists~~ accepted the idea of
 15 presenting oral jewellery to their patients. G3 associated it to 'a sign of rebellion' (53.3%),
 16 [unique \(40%\)](#) and accepted the idea of making customised oral jewellery (50%), ~~considering~~
 17 ~~to be a 'unique mark' (40%)~~. Preferable designs were tooth jewel (G1), implant with Hallmark
 18 (G2) and fixed tooth ring (G3). As conclusions, oral jewellery and piercings are ~~considerably~~
 19 [highly](#) acceptable by the ~~public assessed~~ [dental students but the uniqueness of oral jewellery](#)
 20 [was more recognized by the dentists. Modified oral jewellery has been fairly accepted among](#)
 21 [all but the design varied. and can be distinctive by modification. A recording of those by the](#)
 22 [dentist could potentially aid in forensic dental identifications.](#) Therefore, an elaborated oral
 23 charting system to document oral jewellery and tooth modifications and respective
 24 abbreviations were also suggested to grant a useful reason to this fashion.

25 **Keywords:** forensic dentistry; oral jewellery; [tooth modification](#); dental chart; human
 26 identification.

27 **Introduction:** Forensic dentists are ~~mainly trained~~ [frequently requested](#) to assist in human
 28 identification, ~~and age estimation, sex and ancestry determination.~~ Human [identification by](#)
 29 [dental means](#) is performed by comparing ante-mortem (AM) and post-mortem (PM) dental
 30 records¹ [in order to establish a positive identity; and sometimes DNA must be analysed from](#)
 31 ~~extracted from teeth;~~ however, the comparison [of dental records](#) is not always possible
 32 because the AM dental records might be missing, inaccurate or very old. ~~Moreover, there is~~
 33 ~~a rising concern of people towards dental hygiene and~~ [Due to the improvement of oral](#)
 34 [hygiene](#), it is not rare to find ~~blank~~ dental records ~~where there is~~ [with](#) no dental work ~~carried~~
 35 ~~out/recorded. to compare to the PM findings in order to establish an a positive identity. On~~
 36 [the one hand](#), jewellery has been assessed [as an anthropological aspect of identity](#) in different
 37 fields of archaeology and anthropology in order to retrieve information of the socio-economic
 38 status, religious affiliations, ~~gender~~ [sex](#), ethnicity². ~~and sometimes the person itself. Tattoos,~~
 39 [piercing, and scarification are also not unusual among adolescents and young adults³ in the](#)
 40 [current society. On the other hand, jewellery can be used for human identification because](#)
 41 [they might be the only intact objects left after an air crash or natural disaster⁴. is also very](#)
 42 ~~commonly found evidence at crime scene or in a disaster scenario. Nowadays, ornamental~~

43 ~~piercing enjoys widespread popularity giving jewellery a more prominent position as evidence~~
44 ~~in identification process.~~ For instance, information about jewellery is requested ~~with other~~
45 ~~personal effects~~ in the INTERPOL ~~disaster victim identification (DVI) Post Mortem PM forms~~
46 ~~(pink) victim identification: unidentified human remains forms 300's form (section 310 is~~
47 ~~specified for watches and 335 for jewellery)~~⁵. In body description 400's form, sections 424,
48 432, 440, 444, 448 and 452 address distinctive features in the deceased ~~especially ear-lobe~~
49 ~~piercing.~~ ~~On other hand~~ **Moreover**, dental information 600's forms specify "jew" as an
50 abbreviation of 'tooth jewellery' and "tam" as an abbreviation of 'tooth modification'⁶; **in**
51 **general, dentists are not familiar with types of oral jewellery and classifications of tooth**
52 **modifications**; therefore, an elaborated system to record oral jewellery is needed by dentists
53 due to the great variety of piercing types and anatomical sites for insertion.

54 A number of case reports or review articles on immediate or long-term complications of
55 ornamental oral piercing have been published but not a single one has reckoned on the
56 significance of ~~ornamental piercings in oral cavity~~ **oral forms of jewellery** for human
57 identification. The main aim of this study was to investigate the **opinions on** the use of
58 modified tooth/oral jewellery items among dental students, dentists, designers/tattoo &
59 piercing artists. The secondary aim was to create **and suggest** an elaborated oral charting
60 system to document oral jewellery and tooth modifications and respective abbreviations.

61 **Literature Review**

62 **Aesthetic Dentistry**

63 **Aesthetics in dentistry serves as a major reason for seeking dental treatment. Since the**
64 **introduction of orthodontics to the most current visual perceptions of the facial aesthetics**
65 **(botulinum toxin injection, lip fillers, etc)**⁷. The dental appearance of a person is frequently
66 used to evaluate the social status, the personal and intellectual characteristics and the
67 employment prospects; it also can play a critical role in a person's self-image, self-esteem and
68 oral and psychological health⁸. Moreover, people with highly aesthetic dentitions are more
69 prone to value dental health⁹.

70 **It is important to note that the facial aesthetic perception differs among individuals and is**
71 **often affected by their own experiences, and the influence from society and culture**¹⁰. Also,
72 **the amount of change can be so extreme that people would desire a body different from the**
73 **conventional human body. Nowadays, oral jewellery is mainly used as a style statement and**
74 **the psychological effects are not as important as the facial aesthetics.**

75 **Tooth modifications**

76 ~~Throughout the long history of mankind, healthy teeth have always represented a symbol of~~
77 ~~youth and health. Tooth modifications can also represent the passing of status from one~~
78 ~~phase of life to the next such as the change from adolescence to adulthood.~~ **Tooth**
79 **modifications are forms of cultural expression**¹¹ related to the rite of passage, religious ritual
80 **purposes**¹² or performed entirely for aesthetic reasons¹³. Modifications include filling,
81 notching, drilling, grooving, grinding, chipping, breaking, extracting, inlaying or cutting away
82 the crown of the teeth (or just part of it), sharpening to a point, lacquering or staining, affixing

83 the crown with gems or precious metals¹⁴. ~~Teeth mutilation practices have been noticed in~~
84 ~~inhabitants of the developed and under developed world regions and similar rituals have~~
85 ~~been preserved until nowadays in form of personal statement or as a ritual.~~ Moreover, these
86 dental modifications can also be a means to achieve self-identity¹² and, eventually, this
87 physical change could be used for human identification.

88 **Oral soft tissue modification**

89 Perforation of the lower lip (or less often the upper) for insertion of a decorative plug or other
90 ornament was once widespread among Africans, including the women of *Mursi*. Insertion of
91 decorative objects through the nose, perforation of the septum or of one or both of the wings,
92 or alae (or both procedures combined) is still common in India¹⁴. Gum tattooing or **dying**
93 (black gums) is a popular practice among women in West African countries ~~like~~ **such as**
94 Senegal as a sign of beauty¹⁵. ~~however, intra-oral tattoos are practised worldwide but are not~~
95 ~~very common;~~ **Intra oral tattoos such as the inner lip inking is on the rise as a latest trend in**
96 **body art with the lower labial mucosa being tattooed because of its uniqueness and it is not**
97 **readily visible**¹⁶. Amalgam tattoo which is an iatrogenic lesion, caused by accidental/traumatic
98 entry of dental amalgam into the soft tissues¹⁷, is suggestive of a previous amalgam tooth
99 filling that has been replaced. ~~By the end of the 20th century, piercing of the ears, tongue,~~
100 ~~nose, lips, and other parts of the head had become a social marker within some Western~~
101 ~~cultural groups.~~ **Another pigmented oral lesion of exogenous origin is the graphite tattoo. It**
102 **mainly results from accidental injury in which graphite from the tip of the pencil is inserted**
103 **into the oral mucosa, but case reports are rare**¹⁸.

104 **Scope of Forensic Jewellery**

105 ~~The ability of gemstones and precious metals to withstand high temperatures and extreme~~
106 ~~impacts, as well as immersion in water, means they are sometimes the only intact objects left~~
107 ~~after an air crash or natural disaster. According to a survey carried out in 2016, 21% of the~~
108 ~~American adults have a tattoo and 49% have ear piercings as the most popular body~~
109 ~~modification. Also piercing is accepted at a much younger age whereas 84% of people believe~~
110 ~~that a person aged 18 to 21 should get have a tattoo without parental consent~~⁷. ~~A single~~
111 ~~unidentified body can be examined for any unique marks by visual appearance or~~
112 ~~radiographically. For instance, full length radiographs are taken through body bags just to~~
113 ~~investigate unusual findings for future comparison with AM medical records. Jewellery has~~
114 ~~the potential to be compared with AM records in case of any specificity in design, location or~~
115 ~~material noted in the records.~~

116 **Diamonds and gemstones are effective at collecting DNA and skin cells that can help identify**
117 **their wearer**⁴. Moreover, gemstones and precious metals have the ability to withstand high
118 temperatures and extreme impacts⁴. Oral jewellery has the potential to assist as auxiliary
119 evidence because it is personal and protected inside the oral cavity in different possible forms:
120 cemented to the tooth (tooth rings and tattooed crowns), pierced in oral soft tissues (tongue
121 or lip piercings) or even embedded in the bone or tooth (implants and pin/post). A studied
122 showed that dental implants are used as an essential aid in forensic dental identification
123 because of its ability to resist higher temperature even after incineration¹⁹. A suggested

124 anatomical chart especially designed for oral jewellery/piercing or tattoos and a system of
125 hallmarking would contribute as additional AM information.

126 **Effects of intraoral jewellery and piercings**

127 According to the American Academy of Paediatric Dentistry (AAPD), oral jewellery may lead
128 to increased plaque levels, gingival inflammation and/or recession, caries, diminished
129 articulation, metal allergy pain, infection, scar formation, tooth fractures, metal
130 hypersensitivity reactions, localized periodontal disease, speech impediment, Ludwig's
131 angina, hepatitis, and nerve damage²⁰; however, there is a limited literature related to the
132 effects. The scientific articles are mainly related to case reports with a low number of patients
133 and ~~two~~ review articles. Findings show that the most commonly described oral consequences
134 are damage to the teeth and periodontal alterations caused by tongue piercing²⁰⁻²². Tongue
135 jewellery worn over a long period of time may result in the colonisation of perio-donto-
136 pathogenic bacteria at the piercing site, especially if the subject does not carry out
137 appropriate oral hygiene practices²¹.

138 **Piercing types and anatomical location**

139 Different forms of oral and perioral piercings can be placed almost everywhere in oral cavity
140 as follows: lip piercings [Monroe (left side of upper lip), Madonna (right side of upper lip),
141 medusa (centre of upper lip), labret piercing (single lower lip piercing at centre or off- centre),
142 vertical labret (top of the lower lip to bottom of the lower lip), vertical low Bert (lower
143 vestibular sulcus to jawline), horizontal lip (lower lip pierced horizontally), angel bite
144 (contralateral piercings on upper lip), snake bite (contralateral piercings on lower lip), spider
145 bite (unilateral lower lip dual piercing closed together), vampire bite (unilateral lower lip dual
146 piercing separated by space), canine bite (quadrilateral upper and lower lip piercings in front
147 of four canines), cyber bite (upper and lower lips pierced separately at centres)]; tongue
148 piercings [classic (dorsoventral tongue piercing at centre or sides), venom piercing (the
149 barbell is placed dorsally, curves down toward the ventral side of the tongue, and resurfaces
150 at the dorsal aspect), web piercing (lingual fraenum piercing), horizontal tongue piercing (side
151 to side piercing through body of the tongue), tip piercing (tip of the tongue), dimple piercing
152 (unilateral or bilateral cheek piercing)]; uvula piercing; labial fraenum piercing and buccal
153 fraenum piercing²³.

154 **Hallmarking and tracking**

155 A hallmark is a government seal that is stamped onto precious metal objects to certify their
156 metal purity, such as jewellery or silverware. The purpose of a hallmark is to certify the metal
157 purity of the item. Only a UK Government Assay Office can apply a hallmark. Testing precious
158 metals for purity is called "assaying"¹². In the UK, all jewellery that have been made with gold,
159 silver, platinum or palladium, must be hallmarked according to the Hallmarking Act 1973²⁴.
160 The existing concept of personal identification from dental prostheses, either by surface
161 marking or inclusion techniques, has been facilitating the identification of living people (cases
162 of unconsciousness or loss of memory) or for forensic purposes²⁵. The denture markers
163 should be biologically inert, inexpensive, easy to inscribe, possible to retrieve after an
164 accident, and survive elevated temperatures. Although the frequency of edentulousness has

165 decreased in recent years due to the improvement in oral health, this concept is still useful²⁶;
 166 however, new ideas such as a hallmark of pin/post, a piercing with hallmarked jewellery could
 167 contribute to a wider possibility of markers to aid in forensic dental identification. An
 168 advantage of a hallmark of fixed posts or piercings is the permanence in the oral cavity whilst
 169 dentures can be easily lost or misplaced.

170 Methodology

171 School of Nursing and Health sciences and Dental Research Ethics Committee (SREC) of the
 172 University of Dundee, Scotland, UK has reviewed and approved the study under application
 173 number 2018005_Farrukh. The first part of this research was to investigate the opinions of
 174 three distinctive populations. The young generation (dental students), the qualified dentists
 175 and the artists who would design the oral jewellery. The sample size was comprised of an
 176 equal number of 30 dental students (group G1), 30 dentists (group G2) of the University of
 177 Dundee (Scotland, UK) and the University of Health sciences (Lahore, Pakistan) and 30
 178 designers/tattoo & piercing artists (group G3) of the city of Dundee (UK).

179 The anonymous subjects were of minimum age of 18 years old ~~were~~, but sex and age were
 180 requested. Three closed-ended surveys (V1, V2 and V3) ~~were~~ created via google forms (©
 181 2015 Google Inc.) and comprised of four questions (Q1 and Q2). Each version briefly explored
 182 opinions on different values of the oral jewellery /piercings as follows: V1 explored the
 183 cultural value; V2 explored the hygienic value and V3 explored the creational value. The first
 184 two questions were ~~similar to all~~ used for the three groups. Q1 explored an overall opinion
 185 about oral jewellery/piercing and Q2 explore the opinion about the uniqueness. ~~and the~~ The
 186 last two questions (Q3 and Q4) ~~were different~~ examined the opinions on designs (custom-
 187 made and type) specifically for each group as shown in table 1.

188 Table 1 – Description of questions and respective options in the surveys.

189 The nine different oral jewellery design proposed in question 4 were: removable tooth ring,
 190 fixed tooth ring, tattooed crown, tooth tattoo, invisibly engraved crown, hallmarked pin/post,
 191 implant with hallmark (all dental origin), tooth jewel (dental and body art origin) and piercing
 192 with hallmarked jewelery (body art origin). Data collected from all groups was analysed and
 193 compared using descriptive graphs. The second part of this research was to design an oral
 194 charting system to document oral jewellery and tooth modifications with respective
 195 abbreviations based on available literature.

196 Analysis of Results

197 Results for question 1, showed that 50 out of 90 (56%) pooled responses related oral
 198 jewellery/piercings to “Fashion/contemporary”, followed by 24% as “A sign of rebellion” and
 199 20% as “disgusting/vile”. “Fashion/contemporary” was the first choice for G1 (77%), and G2
 200 responded equally to “fashion/contemporary” and “disgusting/vile” (46.5%) whilst “A sign of
 201 rebellion” was popular for G3 (53%) as seen in figure 1. Female participants on average ~~were~~
 202 ~~very clearly~~ related oral jewellery/piercings to “Fashion/contemporary” whereas male
 203 participants ~~had quite mixed opinion whether~~ ~~considered~~ oral jewellery ~~is as~~
 204 “Fashion/contemporary” or “A sign of rebellion”. Results for question 2, showed that 47% of

205 G1 considered 'yes' to tooth jewellery/modification as a unique mark, 60% of G2 responded
206 "maybe" and G3 responded equally to "Yes" and "maybe" (40% each).

207 Figure 1 - Relation of oral jewellery to given expressions, comparison amongst survey groups.

208 ~~Considering question 3,~~ Results for question 3 showed that overall 50% of the pooled
209 participants considered the idea of wearing customised oral jewellery by choosing the
210 "unusual but acceptable" option, followed by 36% of responses "interesting & strange" and
211 14% of responses of "never". G1 responded equally to "interesting & strange" and "unusual
212 but acceptable" by 47% each whereas G2 considered "unusual but acceptable" by 53% as
213 shown in figure 2.

214

215 Figure 2 - Group's opinions on wearing/presenting/making customised oral jewellery.

216 The suggestion of a customised oral jewellery requested in question 4 was widely accepted
217 amongst all three groups. The favourite options ranged from "Tooth jewel" (43%), "Implant
218 with hallmark" (38%) to "Invisibly engraved crown" (23%) of responses. The overall popularity
219 of oral jewellery designs is shown in table 2.

220 Table 2 - Popularity of different jewellery designs amongst groups.

221 Discussion

222 ~~The advancement of forensic field has moved from a time where dental prostheses were~~
223 ~~visually identified by the makers to the interpretation of AM dental records and comparison~~
224 ~~to the PM dental findings by the forensic dentist. Nowadays, dental identification assumes a~~
225 ~~primary role in the identification of human remains specially when PM body changes and~~
226 ~~traumatic tissue injury occurs. The INTERPOL DVI guideline acknowledges three primary~~
227 ~~identifiers as the most reliable means of identification: friction ridge analysis, comparative~~
228 ~~dental analysis and DNA analysis. Secondary identifiers include personal description, medical~~
229 ~~findings/ records as well as personal effects⁵. The search for any unique marks and particular~~
230 ~~details about a pace maker, hip replacement, spinal fusion, healed fracture, pinned or wire~~
231 ~~placement old shrapnel wounds or other unusual findings is in practice during human~~
232 ~~identification either for a single body or multiple ones. For instance, the only possibility that~~
233 ~~make these findings a reliable evidence for comparison against the PM findings is the~~
234 ~~availability of recorded AM records. For instance, a pace maker with a serial number encoded~~
235 ~~on itself can be used to trace the manufacturer, country and specific surgeon. Challenges can~~
236 ~~be found in the comparative dental analysis due to the improvements in oral care and~~
237 ~~associated reduction of restorations available for comparison concomitantly with the usual~~
238 ~~problem of poor or absent AM dental records²⁷; therefore dentists should appreciate and~~
239 ~~record the various anatomical traits (dental and non-dental)²⁸ and other features present in~~
240 ~~the oral cavity. Forensic dentists should explore new ways of establishing dental identity~~
241 ~~because the rising concern of people for perfect teeth and Hollywood smile reflects the~~
242 ~~decrease in the number of dental restorative work for future comparison. It is not impossible~~
243 ~~to find people with sound teeth or inexistent AM dental information and, in such situations,~~
244 ~~there is a need to rethink approaches to identify a victim by dental means.~~

245 Oral jewellery has the potential to assist as auxiliary evidence because it is personal, intimate
246 to an individual and protected inside the oral cavity in different possible forms: (most of oral
247 piercings and all of other designs), cemented to the tooth (tooth rings and tattooed crowns),
248 worn in a piercing pierced in oral soft tissues (tongue or lip piercings) or even embeddedness
249 embedded in the bone or tooth (implants and pin/post). and there is no chance of losing it or
250 changing it that frequently as easy as other costume jewellery. Whereas other body or
251 costume jewellery items are more easily changed, stolen, lost or being worn by another
252 person and can mislead investigations. Moreover, gemstones and precious metals have the
253 ability to withstand high temperatures and extreme impacts⁴. A studied showed that dental
254 implants are used as an essential aid in forensic dental identification because of its ability to
255 resist higher temperature even after incineration¹⁹. The concern of recording and the
256 distinctiveness of the design could be resolved by introducing an A suggested anatomical
257 chart especially designed for oral jewellery/piercing or tattoos and a system of hallmarking
258 respectively would guide the dentist. The idea of hallmarking or giving a serial number to oral
259 jewels/fashion prostheses came from one notorious case of a partially decomposed body that
260 was pulled from the sea and was identified by the Rolex found on the wrist in 1996. High-end
261 timepieces have serial numbers, allowing them to be traced even if they are damaged¹³.

262 Oral jewellery a major concern to dentists because of undeniable complications due to wrong
263 piercing sites, piercing artist's lack of knowledge about anatomy and oral structure in function
264 from the piercing artist end, unawareness of maintaining and poor patient's oral hygiene, and
265 aftercare from patient/wearer side. In contrary, for wearer it's a way of personal statement
266 that makes oral jewellery unique to a personality¹⁰⁻¹¹. Oral jewellery is basically an amalgam
267 of body modification and jewellery, where Jewellery has extensive personal, cultural and
268 religious associations with identity back from ancient times it's considered to be as very
269 unique and personal to a tribe, nation or even to an individual and modifications have
270 generally been used to mark the social position of an individual in a manner visible to and
271 recognized by other members of the society for reasons like ritual and aesthetics⁵. This was
272 first mixed together in ancient Egypt as a symbol of royalty created in figure of dog in form of
273 oral piercing in 1500BC.

274 Forensic oral jewellery is truly based on art and science nature of dentistry where author is
275 joining art of body/dental modifications to the science of forensic dental identification. Over
276 the years jewellery has multiplied until it included ornaments for every part of the body from
277 teeth to toes. Same as jewellery now a days almost any part of the body may be pierced⁷. The
278 most recent trend which is replacing "engagement rings" to "engagement piercing" is an
279 indication that how people are evolving with time and how their needs are changing from
280 wearable jewellery to ornamental piercings. Both men and women have more than 50
281 different types of piercings from which they can choose, and some piercings offer almost
282 limitless placement options. Oral region is not an exception in booming trend of piercings
283 almost 9.5% female Americans have tongue piercing that is 4th popular type of piercing in
284 female and lip piercing is at 7th position with 4% of female population have it done. An
285 estimated 16% of pierced American men have tongue piercings, making them the fourth most
286 popular piercing type for men¹⁴.

287 According to the results, the three groups have different opinions on the uniqueness of oral
 288 jewellery and tooth modification. Dentists considered unique (60%) whilst not even half of
 289 the dental students and the tattoo artists are aware of the potential identificatory value.
 290 Analysis of the cultural value based on the dental students' opinions showed that 77% of the
 291 dental students accepted those oral modifications as contemporary but a designed piece of
 292 jewellery was not preferable (only 47% of sample). Tooth jewellery was the elected design,
 293 probably because of the visual appeal. Current studies on the impact of social media proved
 294 that young people often show narcissistic tendencies²⁹ but other reasons should be factored
 295 into this chosen option. Cultural values are the core principles of a community and the
 296 customs are part of it. In this respect, it is important to note that the dental students (and
 297 respective low number and locations) are representative of a fraction of the young
 298 generation. Moreover, the analysis of a behaviour that defines the way of life for a group is
 299 beyond the scope of this project.

300 The dentists might have expressed opinion on the hygienic value of oral jewellery and tooth
 301 modification when they suggested the implant with hallmark followed by hallmarked
 302 pin/post. An educated guess could be that dentists prefer internal marking to avoid more
 303 plaque retention on teeth or they are aware that the chamber of some implants have laser
 304 etched batch numbers³⁰. Oral jewellery is a major concern to dentists because oral
 305 accessories may lead to increased plaque levels, gingival inflammation and/or recession,
 306 caries, diminished articulation, and metal allergy²⁰. Similarly, a study proved that patients
 307 wearing orthodontic appliances presented changes in the status of the oral environment after
 308 bracket placement. More noticeable in the lingual appliance than the labial one³¹. ~~Until
 309 now Up to date, no case control or longitudinal studies have been available in which have
 310 proved a clear correlation between oral piercings and long-term oral damage has been
 311 established³². Need was there to analyse the reason behind piercings and to find out how
 312 people react to new design so idea of shifting oral piercing and ornamentation under dental
 313 profession or regulating and educating currently present tattoo and piercing parlours can be
 314 carried out. It can be beneficial for people, to dentistry itself and mainly for forensic dentistry
 315 by not neglecting side effects and giving a reason to fashion. Unregulated piercing parlours
 316 and techniques have been identified by the National Institutes of Health as a possible vector
 317 for disease transmission (e.g., hepatitis, tetanus, tuberculosis) reason why these
 318 complications are encountering is and the reasons unknown whether it is might vary from an
 319 inadequate wrong piercing site, a faulty jewellery design or bad poor oral hygiene^{33,34}.~~

320 The creational value of tooth jewellery has not been appraised by the designers/tattoo &
 321 piercing artists. Only 53% of sample would suggest or create a specific design and the reasons
 322 have not been explored. The fixed tooth ring was selected as the most practical and durable
 323 one. ~~As discussed before most of the designs are dental in origin with fashion modification
 324 the methods of application are not new to dental professionals. The way of hallmarking the
 325 jewellery has 100 years old history and that's not alien concept either. All suggested designs,
 326 method of applications and respective forensic value have been summarized in table 3.~~

327 Table 3 - Most and least popular oral jewellery designs in order and specific methods of
 328 application and forensic value

329 **Recording modified dental jewellery**

330 Based on the existing dental codes from Plassdata⁶ (primary code), the main author suggested
331 secondary codes according to the type of oral jewellery or tooth modification as seen in table
332 4. An anatomical chart to record oral jewellery/piercings or tattoos is suggested in figure 3 (a
333 & b). Finally, the types of dental modification found in literature were transformed in
334 abbreviations for their record in dental charts as seen in table 5.

335

336 Table 4 - Modified abbreviations to record dental jewellery.

337 **Recording oral piercings and tattoos**

338 Among different types of dental charts, Anatomical charting system is most suitable to record
339 soft tissue piercing as anatomical charts represent the anatomy of teeth and adjacent soft
340 tissues¹⁸. In this case a detailed sketch/drawing of oral cavity will help to locate the piercing
341 in a subject and just mark it down on the drawing as suggest in figure 3 (a & b)

342

343 Fig 3 (a) - Nomenclature for oral piercing sites/types and (b) - Anatomical chart to record
344 oral jewellery/piercings or tattoos.

345 **Recording other dental modification**

346 According to documented types of dental modification found in literature following
347 abbreviations can be used to record in dental charts as seen in table 5.

348 Table 5 - Suggested abbreviations to record dental modifications.

349 **Limitations**

350 Literature available on oral jewellery is almost non-existing, pro's and con's of latest fashion
351 trends involving such a functional place like oral cavity must be studied. The exact number of
352 British people with oral piercings, tattoos or other modifications is unknown at present.
353 Longitudinal studies are required to explore long term effects of oral piercings especially
354 tongue piercing. General dentists should be trained at undergraduate level to be familiar with
355 different kind of piercings and modifications along with special emphasis to use suggestive
356 anatomical charts to mark unique findings.

357 **Conclusion**

358 The concept of modified oral jewellery/piercings has been accepted by all three groups where
359 people are willing to wear/present or make customised oral jewellery. It is not merely a
360 unique mark, a fashion or personal statement to an individual, but of particular importance
361 as the only representation left for families of the deceased if there are no physical remains
362 for them to bury (in DVI). With the booming trend of ornamental oral piercings at the right
363 time when forensic odontologists have the responsibility to flourish forensic dentistry and are
364 in quest of an innovative approach to establish identity where traditional dental comparison
365 fails, modified oral jewellery/piercings could stand out by receiving a reason and not only as
366 a fashion. Suggested abbreviations to record oral jewellery, dental modifications and
367 suggested anatomical charts to record oral ornamental piercings/tattoos can be utilised in

368 ~~general dentistry (AM) and forensic dentistry (PM) as a combined effort to spot every~~
 369 ~~exceptional finding that can be used as evidence.~~

370 As conclusions, oral jewellery and piercings are highly acceptable by the dental students but
 371 the uniqueness of oral jewellery was more recognized by the dentists. Modified oral jewellery
 372 has been fairly accepted among all but the design varied. A recording of those by the dentist
 373 could potentially aid in forensic dental identifications. General dentists should be trained at
 374 undergraduate level to be familiar with different kind of piercings and modifications.
 375 Therefore, an elaborated oral charting system to document oral jewellery and tooth
 376 modifications and respective abbreviations were also suggested to grant a useful reason to
 377 this fashion.

378 **References{ADDIN EN.REFLIST}**

- 379 1. Bowers CM, Bowers CM. *Forensic dental evidence an investigator's handbook*. Amsterdam;
 380 Boston: Amsterdam; Boston: Academic Press; 2004.
- 381 2. Catherine H, Katharina G. *Jewellery: The Archaeological Evidence*. Oxford: Oxford University Press;
 382 2010.
- 383 3. Interpol.[Internet] [cited 2018 July 07] Available from: <https://www.interpol.int/>
- 384 4. Plassdata. Available from: [http://www.plassdata.com/news/dvi-system-international-v5-now-](http://www.plassdata.com/news/dvi-system-international-v5-now-available.html)
 385 [available.html](http://www.plassdata.com/news/dvi-system-international-v5-now-available.html)
- 386 5. Kaeppler A. *Marks of Civilization: Artistic Transformations of the Human Body*. California:
 387 University of California; 1995.
- 388 6. Patidar KA, Parwani R, Wanjari S. Effects of high temperature on different restorations in forensic
 389 identification: Dental samples and mandible. *J Forensic Dent Sci*. Jan-Jun 2010;2(1):37-43.
- 390 7. Burgemeester A. Psychology of Tattoos, Body Piercings and Sexual Activity. *The Harris Poll 2012*;
 391 Available from: <https://theharrispoll.com/>.
- 392 8. Association. AD. ADA statement on intraoral/perioral piercings and tongue splitting, Amended
 393 October, 2012. Accessed June 14, 2016.
- 394 9. Berenguer G FA, Horning GM, Towle HJ, K. k, . Localized periodontitis as a longterm effect of oral
 395 piercing: A case report. *Compened Contin Edu Dent 2006*; 27(1): 24-27.
- 396 10. Peticolas T TT, Cross Poline GN.f. Oral and Perioral piercing: A unique form of self-expression.
 397 *Journal of Contemporary Dentistry*. June 2012
- 398 11. Featherstone M, Featherstone M. *Body modification*. London: Sage; 2000
- 399 12. The GoldSmith's Company since 1300. In: Hallmarks U, ed.
- 400 13. How a Rolex Helped to Solve a Murder Case. *GQ* April 2013.
- 401 14. Laumann AE, Derick AJ. Tattoos and body piercings in the United States: a national data set. *J Am*
 402 *Acad Dermatol*. Sep 2006;55(3):413-421.
- 403 15. Hennequin-Hoenderdos NL SD, Van der Weijden, J GI. The incidence of complications associated
 404 with lip and/or tongue piercings: A systematic review. *Dent Hyg 2016* 14(1); 62-73. —
- 405 16. Gill J, Karp JM, Kopycka-Kedzierawski DT. Oral piercing injuries treated in United States emergency
 406 departments, 2002-2008. *Pediatr Dent 2012* 34(1): 56-60.
- 407 17. Ziebolz D SC, Nüss K, Hornecker E, Mausberg RF. Complications of tongue piercing: a review of the
 408 literature and three case reports. *J Contemp Dent Pract*. 2009 10(6): E065-E071. —
- 409 18. Graff JJ. *Dental Charting Astandar Approach*. London: Delmar; 1980.

410
 411

- 412 1 Bowers, C. M. *Forensic Dental Evidence: An Investigator's Handbook*. (Elsevier
413 Academic Press, 2004).
- 414 2 Hezser, C. & Galor, K. *Jewellery: The Archaeological Evidence*. (Oxford University
415 Press, 2012).
- 416 3 Breuner CC & DA, L. Adolescent and Young Adult Tattooing, Piercing, and Scarification.
417 e20171962 (AAP Committee on Adolescent, 2018).
- 418 4 Maclennan, M. in *Financial times, Special Report, Science* (ed Siona Jenkins) (2018).
- 419 5 INTERPOL. *Disaster victim identification guide*
420 <[https://scholar.google.com/scholar_lookup?title=Disaster%20Victim%20Identificati](https://scholar.google.com/scholar_lookup?title=Disaster%20Victim%20Identification%20Guide&author=INTERPOL&publication_year=2009)
421 [on%20Guide&author=INTERPOL&publication_year=2009](https://scholar.google.com/scholar_lookup?title=Disaster%20Victim%20Identification%20Guide&author=INTERPOL&publication_year=2009)> (2018).
- 422 6 Plassdata. *DVI System International*, < [http://www.plassdata.com/news/dvi-system-](http://www.plassdata.com/news/dvi-system-international-v5-now-available.html)
423 [international-v5-now-available.html](http://www.plassdata.com/news/dvi-system-international-v5-now-available.html)> (2018).
- 424 7 Thomas, M. Orthodontics in the "Art" of Aesthetics. *International journal of*
425 *orthodontics (Milwaukee, Wis.)* **26**, 23-28 (2015).
- 426 8 Meng, X., Gilbert, G. H. & Litaker, M. S. Dynamics of satisfaction with dental
427 appearance among dentate adults: 24-month incidence. *Community Dentistry and*
428 *Oral Epidemiology* **36**, 370-381, doi:10.1111/j.1600-0528.2007.00409.x (2008).
- 429 9 Klages, U. & Zentner, A. Dentofacial Aesthetics and Quality of Life. *Seminars in*
430 *Orthodontics* **13**, 104-115, doi:<https://doi.org/10.1053/j.sodo.2007.03.006> (2007).
- 431 10 Anari, S. Aesthetic dentistry: Changing public perceptions. *Bdj* **223**, 390,
432 doi:10.1038/sj.bdj.2017.791 (2017).
- 433 11 Schroeder, H., Havisser, J. B. & Price, T. D. The Zoutsteeg Three: Three New Cases of
434 African Types of Dental Modification from Saint Martin, Dutch Caribbean.
435 *International Journal of Osteoarchaeology* **24**, 688-696, doi:10.1002/oa.2253 (2014).
- 436 12 Pinchi, V. *et al.* Dental Ritual Mutilations and Forensic Odontologist Practice: a Review
437 of the Literature. *Acta stomatologica Croatica* **49**, 3-13, doi:10.15644/asc49/1/1
438 (2015).
- 439 13 Handler, J. S. Determining African birth from skeletal remains: A note on tooth
440 mutilation. *Historical Archaeology* **28**, 113-119, doi:10.1007/bf03374193 (1994).
- 441 14 Rubin, A. *Marks of Civilization: Artistic Transformations of the Human Body*.
442 (University of California, 1995).
- 443 15 Haselmann, A. "All Women Talk" - A Study of Beauty and Female Identity in Senegalese
444 Culture" *Independent Study Project (ISP) Collection*. 1913. (2014).
- 445 16 Telang, L. A. Body art: Intraoral tattoos. *Bdj* **218**, 212, doi:10.1038/sj.bdj.2015.109
446 (2015).
- 447 17 Buchner, A. Amalgam tattoo (amalgam pigmentation) of the oral mucosa: clinical
448 manifestations, diagnosis and treatment. *Refu'at ha-peh veba-shinayim (1993)* **21**, 19-
449 22, 96 (2004).
- 450 18 Kuzman, A., Pavone, M., Blanas, N. & Bradley, G. Pigmented lesions of the oral cavity:
451 review, differential diagnosis, and case presentations. *Journal (Canadian Dental*
452 *Association)* **70**, 682-683 (2004).
- 453 19 Berketa, J., James, H. & Marino, V. A pilot study in the recovery and recognition of
454 non-osseointegrated dental implants following cremation. *J Forensic Odontostomatol*
455 **29**, 38-44 (2011).
- 456 20 ADA. *American Dental Association (ADA) statement on intraoral/perioral piercings and*
457 *tongue splitting*, <[http://www.ada.org/en/member-center/oral-health-topics/oral-](http://www.ada.org/en/member-center/oral-health-topics/oral-piercing)
458 [piercing](http://www.ada.org/en/member-center/oral-health-topics/oral-piercing)> (2012).

- 459 21 Berenguer, G., Forrest, A., Horning, G. M., Towle, H. J. & Karpinia, K. Localized
460 periodontitis as a long-term effect of oral piercing: a case report. *Compendium of*
461 *continuing education in dentistry (Jamesburg, N.J. : 1995)* **27**, 24-27; quiz 28, 36 (2006).
- 462 22 Peticolas, T., Tilliss, T. S. & Cross-Poline, G. N. Oral and perioral piercing: a unique form
463 of self-expression. *The journal of contemporary dental practice* **1**, 30-46 (2000).
- 464 23 Featherstone, M. Body Modification: An Introduction. *Body & Society* **5**, 1-13,
465 doi:10.1177/1357034x99005002001 (1999).
- 466 24 Legislation.Gov.UK. *Hallmarking Act 1973, Chapter 43, arrangement of sections*
467 <<https://www.legislation.gov.uk/ukpga/1973/43/contents>> (1973).
- 468 25 Richmond, R. & Pretty, I. A. Contemporary methods of labeling dental prostheses--a
469 review of the literature. *J Forensic Sci* **51**, 1120-1126 (2006).
- 470 26 Borrman, H. I., DiZinno, J. A., Wasen, J. & Rene, N. On denture marking. *J Forensic*
471 *Odontostomatol* **17**, 20-26 (1999).
- 472 27 Mânica, S. & Gorza, L. Forensic odontology in the 21st century – Identifying the
473 opinions of those behind the teaching. *Journal of Forensic and Legal Medicine* **64**, 7-
474 13, doi:<https://doi.org/10.1016/j.iflm.2019.03.006> (2019).
- 475 28 Gorza, L. & Manica, S. Accuracy of dental identification of individuals with unrestored
476 permanent teeth by visual comparison with radiographs of mixed dentition. *Forensic*
477 *Sci Int* **289**, 337-343, doi:10.1016/j.forsciint.2018.06.004 (2018).
- 478 29 Richards, D., Caldwell, P. H. & Go, H. Impact of social media on the health of children
479 and young people. *Journal of Paediatrics and Child Health* **51**, 1152-1157,
480 doi:10.1111/jpc.13023 (2015).
- 481 30 Berketa, J., James, H. & Marino, V. Survival of batch numbers within dental implants
482 following incineration as an aid to identification. *J Forensic Odontostomatol* **28**, 1-4
483 (2010).
- 484 31 Lombardo, L. *et al.* Changes in the oral environment after placement of lingual and
485 labial orthodontic appliances. *Progress in orthodontics* **14**, 28, doi:10.1186/2196-
486 1042-14-28 (2013).
- 487 32 Hennequin-Hoenderdos, N. L., Slot, D. E. & Van der Weijden, G. A. The incidence of
488 complications associated with lip and/or tongue piercings: a systematic review.
489 *International journal of dental hygiene* **14**, 62-73, doi:10.1111/idh.12118 (2016).
- 490 33 Gill, J. B., Karp, J. M. & Kopycka-Kedzierawski, D. T. Oral piercing injuries treated in
491 United States emergency departments, 2002-2008. *Pediatr Dent* **34**, 56-60 (2012).
- 492 34 Ziebolz, D., Stuehmer, C., van Nuss, K., Hornecker, E. & Mausberg, R. F. Complications
493 of tongue piercing: a review of the literature and three case reports. *The journal of*
494 *contemporary dental practice* **10**, E065-071 (2009).
- 495