Ancient Asia

Mahajan, S. 2019. Role of Human Tooth Wear Analysis in Archaeology: A Review. *Ancient Asia*, 10: 6, pp. 1–7. DOI: https://doi.org/10.5334/aa.181

SHORT REPORT

Role of Human Tooth Wear Analysis in Archaeology: A Review

Sangeeta Mahajan

The path of human evolution has always been a topic of contentious discussion for researchers worldwide. Many theories were proposed to explain the phenomenon based on meagre physical evidences available. Interpretations about subsistence strategies of hominins and their descendents had to be derived from scanty biological remains which mostly consisted of random presence of teeth and fragments of cranial and post-cranial skeleton. Due to better preservation and good resistance to diagenesis, owing to tough enamel covering, teeth have been exploited the most in archaeological studies. Tooth wear analysis is a powerful tool to understand the diet and life processes of ancient people. This paper reviews technical and interpretative development in the use of tooth wear analysis as powerful means to assess changes in masticatory and non-masticatory use of teeth in the process of human evolution. Apart from determination of type and form of diet consumed, tooth wear analysis has been used to estimate masticatory load and its relation to cranio-facial development, age of weaning, use of teeth as a 'third hand'. Though this method is widely adopted by researchers all over the globe, in the Indian archaeological context, such studies are few and far between. The potential of tooth wear analysis in Indian archaeological arena needs to be tapped for better understanding of ancient humans.

1. Introduction

The course of human evolution has always intrigued researchers worldwide. The changing ecology during the history of earth is thought to play a very crucial part in the way the earliest humans evolved. They adapted themselves to the changing environment in more ways than one. Selection of diet was one such critical way of surviving in the contemporaneous milieu. Most commonly the only remains of these earliest humans that survive the test of time are teeth. Consequently, with no other organic evidences in hand, human teeth are exploited the most by researchers to know the type and form of food they consumed. Looking at the limited number of teeth recovered non-invasive investigations have been performed on these teeth to get answers to the subsistence practices of the ancient humans. One of the most frequently used investigations is 'Tooth Wear Analysis' (Walker *et al* 1978; Gordon 1982; Teaford and Walker, 1984). Dental wear is found to be so important in archaeology that University of Indianapolis has launched a worldwide project DENTALWEAR. Under this project up till now around 1000 individuals ranging from hominins to modern day humans, adapting various food sustenance practices have been reported. In this paper we will discuss the different ways in which tooth wear analysis has been utilised to examine masticatory and non-masticatory use of teeth.

Deccan College Post-Graduate and Research Institute, Pune, IN

mahajansangeeta@yahoo.com

2. What is tooth wear?

Teeth are formed early in human life. Approximately six months after birth, the deciduous dentition serially appears in mouth. After the weaning, as the individual switches over to solid external food tooth wear and tear starts. At around 2½ years of age the first permanent molar takes its position behind the deciduous second molar. The last permanent tooth to erupt is the third molar at the age of 16-18 yrs. The dental wear and tear is a function of type of diet, masticatory forces and the non masticatory use of teeth. Enamel is made up of hydroxyl apatite crystals. Enamel has 96% inorganic and less than 1% organic material, rest being water (Hillson 2005). This makes enamel tough enough to resist the constant masticatory load. But constant use over many years causes enamel crystals to break and collapse. The tooth wear due to natural contact between upper and lower teeth is called 'attrition'. The wearing of tooth caused by contact with external objects is called 'abrasion'. The gastric acids or acids in ingested food dissolve enamel crystals causing 'erosion'. The non-carious cervical loss of tooth tissues by mechanical loading forces like tooth brushing is called 'abfraction' (Grippo *et al* 2004). All these processes occur as natural physical response towards oral environment as against dental caries which has an associated pathology. Tooth wear analyses include two aspects.

2.1. Dental Macro wear

Study of tooth wear as observed by naked eye is tooth macro wear study. Enamel macro wear is the result of attrition, abrasion and erosion. A mould of the sample is poured and the tooth surfaces are closely observed to study gross wear pattern.

Tooth macro wear can be studied in two ways. One is by comparing attrition of teeth in an individual with respect to first molar tooth in the same mouth. This is useful in age determination in cases where the sample is un-aged (age not determined) due to any reason. The pattern of attrition related to the first molar gives an indication to age at death. The second way is to compare amount of attrition between different individuals to know the differential use of teeth with respect to diet or that due to non masticatory purposes.

Masticatory tooth micro wear and macro wear takes place during the chewing cycle. During Phase I, the mandible moves laterally and the food is 'puncture-crushed' to reduce it into smaller pieces and there is practically no contact between upper and lower teeth. In Phase II, The lower buccal cusps guide upper lingual cusps to approximate with force to direct the jaws in centric occlusion. This is called 'Power Stroke' and is mainly responsible for tooth wear. It is sub-divided into two phases. Phase I occurs when opposing molar crests shear past one another until the food is crushed between basins and cusps upon reaching centric occlusion; phase II consists of an anterior-medial movement of the lower molars on the chewing side until they move out of centric occlusion and the food is processed by grinding. The chewing cycle terminates with jaw opening. Microscopically, it is observed that heavy force while masticating food causes more pit formation on tooth surface, but is not necessarily associated with macro wear. Whereas, it is observed that wide scratches on tooth surface are associated with macro wear.

For years, researchers have tried to formulate ways to measure tooth wear, called 'Tooth Wear Indices'. These are either qualitative or quantitative. The qualitative indices mark tooth wear as mild, moderate and severe. Therefore, it is a subjective method. The quantitative methods on the other hand give scores to tooth wear depending upon degree of tooth loss. This is objective in nature. No index is perfect and there is no standardisation of the scores (López-Frías *et al* 2012).

2.2. Dental Micro wear

Tooth wear study as seen under microscope is called micro wear study. An impression of a tooth is made in epoxy resin and studied under microscope. The basic idea is that hard-brittle items crushed between lower and upper teeth should create pits, whereas tough foods sheared as opposing surfaces slide past one another should result in scratches (Ungar 2012). Pits and scratches are the two major characteristic microscopic features of enamel wear which have been studied extensively. They are counted on a micrograph of pre-decided area on the tooth surface.

Though micro wear studies give clues to the subsistence pattern of the individual, it is indication of food consumption strategies of the individual only few weeks or few months before death. The occlusal surface of the tooth is divided according to positions of facets on the tooth (**Figure 1**). It is the facet number 9, which is most commonly studied. A 3D analysis (**Figure 3**) is performed (dental micro wear texture analysis DMTA) to study surface texture variables like anisotropy, complexity and texture fill (**Figure 4**). Anisotropy is the direction and orientation of surface features. It is related to hardness of diet and inclusion of plants in diet. Complexity indicates variation in surface features. It is known to be a function of inclusion of foodstuffs with different abrasiveness. Texture fill is the total depth of the features. It is an indication of hard food in diet (Scott *et al* 2005).

3. Discussion

3.1. Technical considerations

2D microwear analyses were being exercised from 1950's (Butler 1952; Dahlberg 1960; Mills 1955). Frequency, size and orientation were measured in such microwear analysis under scanning electron microscope (SEM). It had its own limitations. SEM depicts striations oriented in line with the electron source less visible and those perpendicular

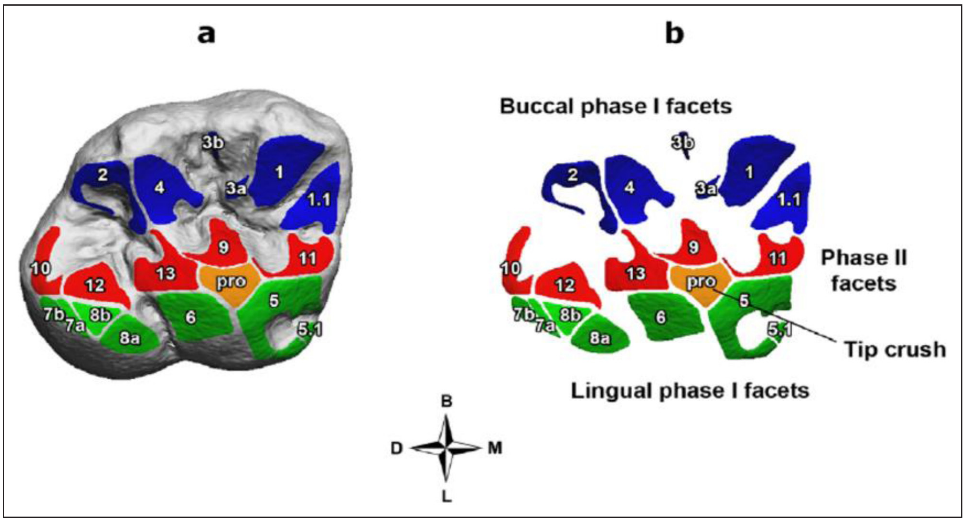

Figure 1: Occlusal wear pattern of first maxillary molars in Neanderthals. 3D polygonal tooth model **(a)** and wear facets virtually detached **(b)**, divided into buccal phase I facets (blue), lingual phase I facets (green), phase II facets (red) and tip crush areas (orange). Source: DOI: 10.1371/journal.pone.0014769.g001.

to the source more pronounced (**Figure 2**). Subsequently, methodical developments gave rise to Dental Microwear Texture Analysis (DMTA). It is automated quantification of microwear in three dimensions (Scott *et al* 2005). The principle of this analysis studies enamel surface at different scales. White light confocal profilometry and scale-sensitive fractal analysis are used in combination to quantify texture of enamel surface in three dimensions (Ungar *et al* 2003; Scott *et al* 2006). It can detect remarkably small differences in relief (0.005 μm). Also, it is economical and easy to use and demands less time. It needs no specific requirements like vacuum, special mounting or coating of specimens as in case of SEM. Since no observer is involved, there is no intra and inter-observer error. This is a method in which observations are repeatable and not dependent on observer. Area scale fractal complexity (Asfc) and Exact proportion length-scale anisotropy (epLsar) (Scott *et al* 2005) were initially used to analyse dental microwear. Scott *et al* (2006) added heterogeneity, scale of maximal complexity and texture fill volume to the aforementioned two parameters. Complexity refers to surface relief at a greater multiplicity of scales e.g. pits and scratches of different sizes overlaying each other. Anisotropy is many parallel striations in similar directions. In a heterogenous surface occurrence of features differs from place to place across a surface. Textural fill volume takes the shape of the surface and texture of the surface into consideration. Tooth wear analysis has been used in a plethora of aspects and situations in archaeology.

3.2. Past studies based on Tooth Wear Analyses

As far back as 1986, Grine was one of the pioneers in studying tooth wear with the purpose of diet determination. He studied the protoconal facets of maxillary permanent

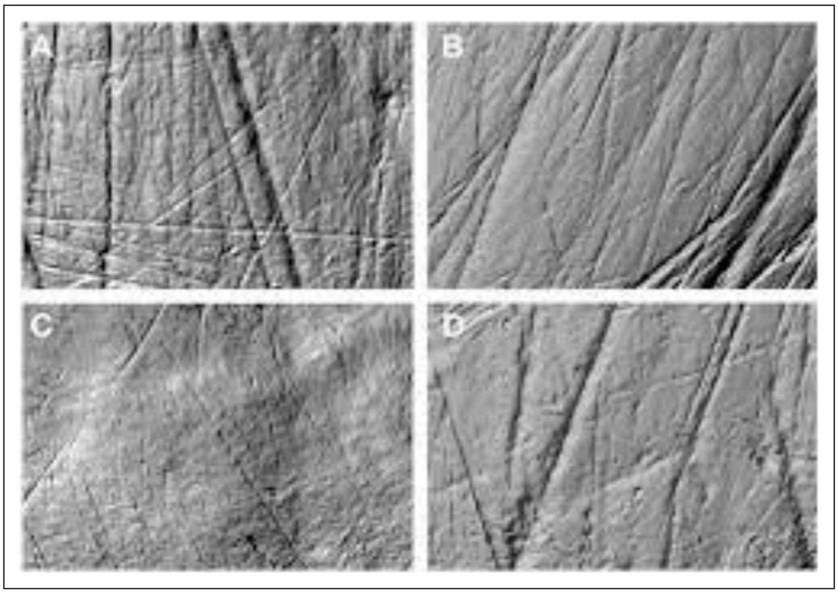

Figure 2: Photo simulations of buccal microwear surfaces. Source: DOI: 10.1002/ajpa.23219.

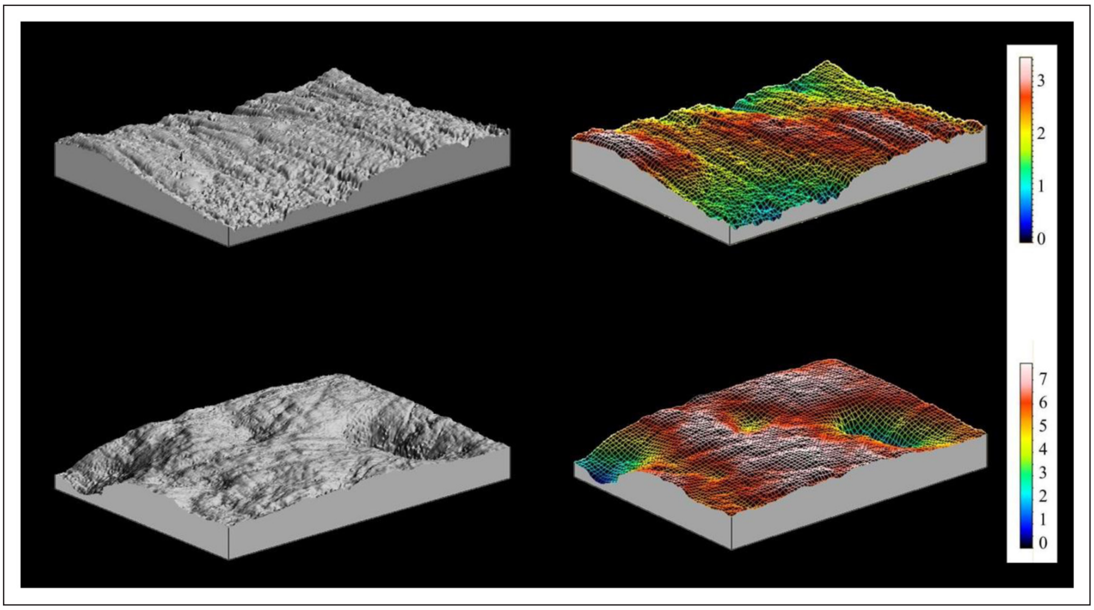

Figure 3: Dental microwear texture analysis (DMTA). Source: DOI: 10.1016/j.jhevol.2006.04.006.

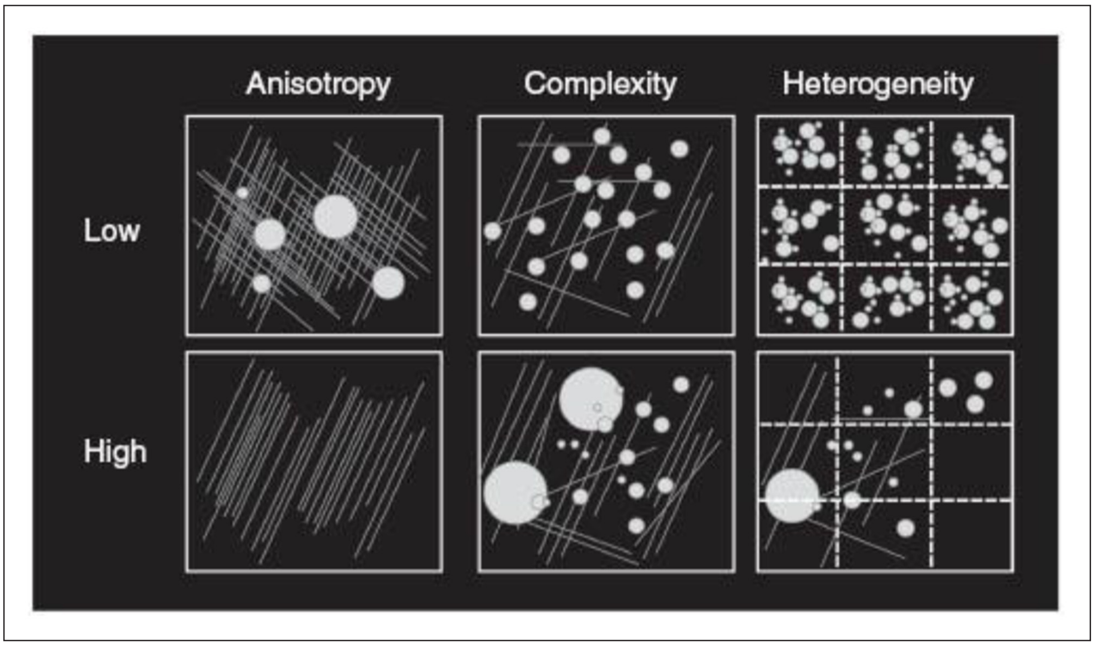

Figure 4: Microwear texture showing high and low anisotropy, complexity and heterogeneity. Source: DOI: 10.1515/mammalia-2014-0023.

second molars of Southern African Australopithecus and Paranthropus. Greater numbers of micro wear features and also significantly higher percentage of pitting on both Phase I and Phase II facets and wide and short scratches on Paranthropus teeth led Grine to believe that they included more of hard food in their diets. Since little was known about the food practices of hominins, the correlation between relative abundance of individual tooth wear features and their causative diets was difficult to interpret. Researchers therefore resorted to the study of tooth wear in primates and modern human populations with known food habits. To analyse the effects of hard v/s soft diet on tooth wear, multiple controlled in vitro studies were carried out. One of the first longitudinal, quantitative studies of tooth wear that used a non-human primate model was designed by Teaford and Oyen (1989) on growing vervet monkeys. Monkeys on hard diet exhibited more rapid tooth wear. The comparison between soft v/s hard food eaters opened up a horizon in the way tooth wear was interpreted (Teaford and Oyen 1989; Aliaga- Martinez *et al* 2017; Daegling *et al* 2016). The analysis of tooth wear of multiple taxa having known food intake of varied toughness shows that food less tough than enamel is also capable of causing tooth wear. Hardness of food is only one of the factors causing tooth wear. Substances with high elastic modulus cause extensive and larger wear. However, the relationship between type of food and micro wear is complex (Daegling *et al* 2016). Occlusal tooth wear is not always necessarily caused by mastication. Bruxism, malocclusion of teeth, use of teeth as a 'third hand' and inclusion of excessive grit in food is also known to cause extensive wear. The grit included naturally in the diet associated with the use of stone querns or due to eating unwashed fruits and vegetables or exposure to a sandy desert environment causes much attrition of teeth (Ungar *et al* 2015). This led researchers to inspect surfaces other than occlusal for wear analysis (Martinez *et al* 2016). The buccal micro wear of teeth under white light confocal microscope to record micro wear variables viz. complexity, anisotropy, heterogeneity, and textural fill volume in extant African catarrhine taxa with known diets exhibited that taxa which consume hard brittle food show high buccal enamel complexity and low anisotropy values while folivorous species consuming tough food show low buccal enamel complexity and high anisotropy (Aliaga- Martinez *et al* 2017). Study of modern ethnographic populations to find an analogue has been another way of inferring ancient diet (Fiorenza *et al* 2011). Tooth microwear analysis in four hunter-gatherer groups from four different regions of Murray River, Australia has shown that though the overall severity of wear was uniform, there were differential wear patterns in different teeth in different groups and many were gender-specific. They were non-masticatory in nature (Littleton *et al* 2013). Though, ethnographic studies give important insights into the masticatory and non-masticatory use of teeth, the ecological, cultural and behavioural context of ancient humans is far removed from the current context to yield much information by direct comparison. The tooth wear studies of modern living human populations also provide little clues to the diets in the past. Availability of variety of foods, personal choice to partake a particular kind of food and advanced food processing technologies take the natural ecological wear signatures away from the teeth and render any comparison with ancient samples worthless. Despite these facts, combination of stable isotope analysis, trace element analysis and tooth wear analysis proves to be a major tool to interpret ancient diets. Recent decade saw a plethora of tooth wear studies on ancient humans using advanced technical and statistical innovations (Ungar *et al* 2015; Scott *et al* 2005; Zaatari *et al* 2014; Mahoney 2006; Martinez *et al* 2016; Pérez-Pérez *et al* 2017). For long the relationship of diet micro wear to macro wear has been debated by researchers. Study of microwear and macrowear on mandibular second molars from 60 prehistoric adult Native Americans representing three dietary regimes (foraging, mixed economy, and agriculture) exhibited that a significant positive relationship was found between dental macrowear and scratch width and a significant negative relationship between macrowear and the total number of scratches. Presence of number of pits does not lead to macro wear (Schmidt 2010). In a given ecology, the tooth wear is a function of food preferences of individual species from the total food available. The change in environment does not necessarily change the food strategies (Scott *et al* 2005; Zaatari *et al* 2014). Sometimes, the interpretations of tooth wear analysis do not match the stable isotope data (Martinez *et al* 2016) and in such cases interpretations of tooth wear analysis need to be derived from different perspective. There have been studies to explore the relationship between tooth wear and mandibular morphology and a correlation is observable (Mahoney 2006). Masticatory movements of a breast feeding infant are distinctly different than those of adults. As the infant shifts from breast feeding to solid diet, deciduous tooth wear starts. Analysis of deciduous tooth wear can provide us the age of weaning (Scott and Halcrow 2017).

There have been attempts to evaluate tooth macro wear to determine difference in social status of children and the results were unyielding (Dawson and Brown 2013). Studies show that multiple taxa eating similar food show similar tooth wear pattern and individuals of same species consuming different diets show different wear pattern. Macrowear patterns are found to be geo-specific rather than taxa-specific (Fiorenza *et al* 2011). Macro wear in the form of para facet is known to be caused by extra masticatory use of teeth (Fiorenza *et al* 2013). As humans transitioned from food gathering to food processing, new food processing technologies got incorporated in food preparation. This resulted in considerable reduction in the occlusal load. This can physically be seen in the form of narrower proximal facets (Hinton 1982). It is seen that soft food consumed by agriculturist population allowed more direct tooth contact resulting in more angled occlusal wear rate and increased occlusal plane (Watson 2008). Use of anterior teeth as a tool, clamp or third hand to different degrees can be observed by analysing tooth wear of ancient anterior teeth (Krueger *et al* 2012). In an innovative way Occlusal Fingerprint Analysis (OFA) was used as a 'dental compass' useful in the determination of individual age, the association assessment of isolated teeth, or the evaluation of the dietary spectra in ancestral populations (Kullmer *et al* 2009).

4. Concluding Remarks

The field of tooth microwear analysis is ever expanding since the initial works using basic 2D microscopy. The later use of SEM widened the possibilities of use of tooth wear analysis as a tool to understand dietary and non-dietary use of teeth. With the advent of 3D textural analysis (DMTA) researchers are now armed with an accurate and error free technique to characterise micro features on tooth surface. This non-destructive approach has been helpful in understanding diets of ancient populations which was otherwise impossible, given the paucity of evidences. Determining the age of weaning is also an important contribution of this method to archaeology. With advancing technological improvements, tooth microwear analysis will prove to be an indispensable instrument for archaeologists.

Unfortunately, in Indian archaeological contexts, very few researchers have attempted this approach. Most of the studies are based on dentistry point of view. These studies evaluate gross dental attrition from pathological and epidemiological aspect (Hegde *et al* 2018; Praveena *et al* 2018; Yoithapprabhunath *et al* 2018) which is applicable to clinical and community dentistry.

As Mushrif *et al* (2015) have presented the most comprehensive and current inventory of archaeological human remains recovered during excavations for last 30 years. It is believed that Mesolithic people were hunter-gatherers and as their population burst they opted for food producing and settled down. There is large number of Mesolithic, Neolithic, chalcolithic, megalithic and early historical sites in India and large number of biological remains are unearthed. Teeth being tough are recovered intact, often. In case of Mesolithic populations, hardly any plant or faunal evidence found because of their migratory life style. In case of megalithic people, apart from the burials in the form of stone circles, little habitational evidence is available. In a Neolithic habitation, the change in diet strategies can be discerned clearly by studying tooth wear. These archaeological populations provide ideal settings to experiment dental microwear studies in planned and problem oriented manner. DMTA is a powerful, less time-consuming and economical means to interpret subsistence strategies of the archaeological populations and there is a vast scope to its use in Indian archaeology.

Competing Interests

The author has no competing interests to declare.

References

Aliaga-Martinez, A, Romero, A, Galbany, J, Hernandez-Aguilar, RA and **Perez-Perez, A.** 2017. Buccal dental microwear texture and catarrhine diets. *Physical Anthropology*, 163: 462–473. DOI: https://doi.org/10.1002/ajpa.23219

Butler, PM. 1952. The milk-molars of perissodactyla with remarks on molar occlusion. *Proceedings of Zoological Society London*, 121: 777–812. DOI: https://doi.org/10.1111/j.1096-3642.1952.tb00784.x

Daegling, DJ, Hua, LC and **Ungar, PS.** 2016. The role of food stiffness in dental microwear feature formation. *Archives of Oral Biology*, 71: 16–23. DOI: https://doi.org/10.1016/j.archoralbio.2016.06.018

Dahlberg, A. 1960. Microscopic studies of abrasion and attrition on tooth surfaces. *Journal of Dental Research*, 39(4): 713–714.

Dawson, H and **Brown, KR.** 2013. Exploring the relationship between dental wear and status in late medieval subadults from England. *American Journal of Physical Anthropology*, 150: 433–441. DOI: https://doi.org/10.1002/ajpa.22221

Fiorenza, L, Benazzi, S, Tausch, J, Kullmer, O, Bromage, TG and **Schrenk, F.** 2011. Molar Macrowear Reveals Neanderthal Eco-Geographic Dietary Variation. *PLOS Journal* 10(3): e14769. DOI: https://doi.org/10.1371/journal.pone.0014769

Fiorenza, L and **Kullmer, O.** 2013. Dental wear and cultural behaviour in Middle Paleolithic humans from the near east. *American Journal of Physical Anthropology*, 152(1): 107–117. DOI: https://doi.org/10.1002/ajpa.22335

Gordon, KD. 1982. A study of microwear on chimpanzee molars: implications for dental microwear analysis. *American Journal of Physical Anthropology*, 59: 195–215. DOI: https://doi.org/10.1002/ajpa.1330590208

Grine, FE. 1986. Dental evidence for dietary differences on *Australopithecus* and *Paranthropus*: A quantitative analysis of permanent molar microwear. *Journal of human evolution*, 15: 783–822. DOI: https://doi.org/10.1016/S0047-2484(86)80010-0

Grippo, JO, Simring, M and **Schreiner, S.** 2004. Attrition, abrasion, corrosion and abfraction revisited; A new perspective on tooth surface lesions. *Journal of American Dental Association*, 135: 1109–1118. DOI: https://doi.org/10.14219/jada.archive.2004.0369

Hegde, MN, Yelapure, M, Honap, MN and **Devadiga, D.** 2018. The prevalence of tooth wear and its associated risk factors in Indian South West coastal population: An epidemiological study. *Journal of ICDRO*, 10(1): 23–26. DOI: https://doi.org/10.4103/jicdro.jicdro_22_17

Hillson, S. 2005. *Teeth,* 286–316. Cambridge University Press. DOI: https://doi.org/10.1017/CBO9780511614477

Krueger, KL and **Unger, PS.** 2012. Anterior dental micro wear texture analysis of the Krapina Neanderthals. *Central European Journal of Geosciences*, 4(4): 651–662. DOI: https://doi.org/10.2478/s13533-012-0111-1

Kullmer, O, Benazzi, S, Fiorenza, L, Schulz, D, Bacso, S and **Winzen, O.** 2009. Technical note: Occlusal Fingerprint Analysis: Quantification of tooth wear pattern. *American Journal of Physical Anthropology*, 139: 600–605. DOI: https://doi.org/10.1002/ajpa.21086

Littleton, J, Scott, R, McFarlane, G and **Walshe, K.** 2013. Hunter-gatherer variability: dental wear in South Australia. *American Journal of Physical Anthropology*, 152: 273–286. DOI: https://doi.org/10.1002/ajpa.22358

López-Frías, FJ, Castellanos-Cosano, L, Martín-González, J, LlamasCarreras, JM and **Segura-Egea, JJ.** 2012. Clinical measurement of tooth wear: Tooth wear indices. *Journal of Clinical and Experimental Dentistry*, 4(1): e48–53. DOI: https://doi.org/10.4317/jced.50592

Mahoney, P. 2006. Micro wear and morphology: Functional relationships between human dental micro wear and mandible. *Journal of Human Evolution*, 50: 452–459. DOI: https://doi.org/10.1016/j.jhevol.2005.11.003

Martinez, LM, Estebaranz-Sánchez, S, Galbany, J and **PérezPérez, A.** 2016. Testing dietary hypotheses of east African hominines using buccal dental microwear data. *PLoS ONE*, 11(11): e0165447. DOI: https://doi.org/10.1371/journal.pone.0165447

Mills, JR. 1955. Ideal dental occlusion in primates. *Dental Practices*, 6(2): 47–63.

Mushrif-Tripathy, V, Chakraborty, KS and **Lahiri, S.** 2015. Where Are They Now? The Human Skeletal Remains from India. In: *A companion to South Asia in the past,* 496–533. John Wiley & Sons, Inc. DOI: https://doi.org/10.1002/9781119055280.ch32

Pérez-Pérez, A, Lozano, M, Romero, A, Martínez, LM, Galbany, J, Pinilla, B, Estebaranz-Sánchez, F, Bermúdez de Castro, JM, Carbonell, E and **Arsuaga, JL.** 2017. The diet of the first Europeans from Atapuerca. *Scientific Reports*, 7: 43319. DOI: https://doi.org/10.1038/srep43319

Praveena, J, Battur, H, Fareed, N and **Khanagar, S.** 2018. The prevalence and impact of teeth wear on oral health related quality of life among rural adult population of Sullia taluk, D.K. *Indian Association of Public Health Dentistry*, 16(3): 198–202.

Schmidt, CW. 2010. On the Relationship of Dental Micro wear to Dental Macro wear. *American Journal of Physical Anthropology*, 142: 67–73.

Scott, RM and **Halcrow, SE.** 2017. Investigating weaning using dental micro wear analysis: A review. *Journal of Archaeological Science: Reports*, 11: 1–11. DOI: https://doi.org/10.1016/j.jasrep.2016.11.026

Scott, RS, Ungar, PS, Bergstrom, TS, Brown, CA, Childs, BE, Teaford, MF and **Walker, A.** 2006. Dental microwear texture analysis: Technical considerations. *Journal of Human Evolution*, 51: 339–349. DOI: https://doi.org/10.1016/j.jhevol.2006.04.006

Scott, RS, Ungar, PS, Bergstrom, TS, Brown, CA, Grine, FE, Teaford, MF and **Walker, A.** 2005. Dental microwear texture analysis shows within species diet variability in fossil hominins. *Nature*, 436: 693–695. DOI: https://doi.org/10.1038/nature03822

Teaford, MF and **Oyen, OJ.** 1989. Differences in the rate of molar wear between monkeys raised on different diets. *Journal of Dental Research*, 68(11): 1513–1518. DOI: https://doi.org/10.1177/00220345890680110901

Teaford, MF and **Walker, A.** 1984. Quantitative differences in dental microwear between primate species with different diets and a comment on the presumed diet of Sivapithecus. *American Journal of Physical Anthropology*, 64: 191–200. DOI: https://doi.org/10.1002/ajpa.1330640213

Ungar, PS. 2012. Dental Evidence for the Reconstruction of Diet in African Early Homo. *Current Anthropology*, 53(Supplement 6): s318–s329. DOI: https://doi.org/10.1086/666700

Ungar, PS, Brown, CA, Bergstrom, TS and **Walker, A.** 2003. Quantification of dental microwear by tandem scanning confocal microscopy and scale-sensitive fractal analyses. *Scanning*, 25: 185–193. DOI: https://doi.org/10.1002/sca.4950250405

Ungar, PS, Scott, JR and **Steininger, CM.** 2015. Dental microwear differences between eastern and southern African fossil bovids and hominins. *South African Journal of Science*, 112(3/4): 2–5. DOI: https://doi.org/10.17159/sajs.2016/20150393

Walker, A, Hoeck, HN and **Perez, L.** 1978. Microwear of mammalian teeth as an indicator of diet. *Science*, 201: 908–910. DOI: https://doi.org/10.1126/science.684415

Watson, JT. 2008. Changes in food processing and occlusal dental wear during the early agricultural period in northwest Mexico. *American Journal of Physical Anthropology*, 135: 92–99. DOI: https://doi.org/10.1002/ajpa.20712

Yoithapprabhunath, TR, Ganapathy, N, Mudiyayirakkani, M, Maheswaran, T, Dineshshankar, J and **Mohanapriya, S.** 2018. Prevalence of tooth wear among young individuals with malocclusion – An Institutional study. *IOSR Journal of Dental and Medical Sciences*, 17(9): 29–32.

Zaatari, S and **Hublin, J.** 2014. Diet of upper paleolithic modern humans: Evidence from microwear texture analyses. *American Journal of Physical Anthropology*, 153: 570–581. DOI: https://doi.org/10.1002/ajpa.22457

How to cite this article: Mahajan, S. 2019. Role of Human Tooth Wear Analysis in Archaeology: A Review. *Ancient Asia*, 10: 6, pp. 1–7. DOI: https://doi.org/10.5334/aa.181

Published: 23 October 2019