

An Application of Odonto-Metric Analysis in Archaeology

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Abstract

The study of the ancient study of teeth has provided a new way of investigating power to view and understand the microscopic world associated with human odontology. It appears to have substantially affected the strong relationship between Biao-archaeological studies of ancient remains. In some cases of archaeological investigation where human prints destroyed by skeletonization and fire. Various experts used comparatively diverse array of analytical dental techniques used to determine the ancient dietary pattern, ancient behavior, sexual dimorphism, and dental age estimation. In the present article, the author debates the most integrating question of odontology in the field of archaeology. The research has undergone to present the multiple types of dental analysis to address the archaeological question that makes possible to trace the geographical origin, migration of the people and ancient dietary pattern. Moreover, the study shows the relationship between archaeologist and odontologist. Thus, in this regard, our results suggest that unlike other bones teeth remains constant throughout the organism lifetime due to their excellent preserving of biomaterial and isotopes oxygen ratio within the enamel shell of the teeth.

Keywords: Isotopes; Archaeology; Abrasion material; Dental erosion; Cheiloscopy

Introduction

Odontology can play a pivotal role in the analysis of the archaeological recovered material. This particular study makes use of the past through careful documentation and collection of artifacts bones and teeth. As a separate discipline in the course of human excavation, it can obviously contribute to the study of human remains exhumed. The nature of its discipline provides subsequent knowledge about physical properties of teeth. As a scientific discipline, it is inter-connected with archaeology. Therefore, make possible chances for an archaeologist to extract or replace pieces of evidence to draw the conclusion where it came from also help to keep the minimum amount of information regarding teeth's. Odontology in archaeology most notably applied as a contributory factor in the archaeological investigation. It can able to determine the indicators of human behavior. These indicators are further used to show a dietary incidental implemental pattern of individual culture [1]

Literature Review

The investigation of odontology figure required the application of stone grinding tools that is performed by archaeologist often help to add traces of abrasion material such as sand and silicates and the connection of population with its occupation. However, the traces of abrasion in this process are accidental in origin. But clearly reflects Dental erosion and feeding methods of ancient time periods. In this regards the use of feeding devices takes a variety of dietary practices may result in the accidental dental modification. Thus, the study of odontology in archaeology concentrate on inter and intra-societal differentiation, therefore, use as a mean of a variable for cultural identification of individual and groups [2].

Odonatologist who specialized in the examination of minute pieces can make an analysis of the archaeologically excavated material. They possess skills that can add archaeologist in the identification of teeth fibers that may be recovered in the course of excavation. Their laboratory has a wide array of analytical instrumentation that can be used to analyze fibers. The use of routine fibers allows the identification of natural fibers in human teeth. Finally, odontologist give a better understanding of archaeological spice man for the examination of the taphonomy of various forms to trace evidence. The fragmentary condition of the material recovered from the grave along with the lack human skeletal remains led that excavation team to conclusion content of the grave.

So, in this way to accomplish the major task archaeologist applied a variety of analytical techniques by the coordination of odontologist. Their skills make them valuable collaboration in this endeavor.

Strontium isotopes analysis

Strontium isotopes analysis is the well-established procedure used to examine the distribution of stable isotopes within a chemical compound. This technique has long been used by geologist archaeologist and anthropologist to acquire data regarding socio-cultural question pertaining to material resistance pattern in teeth [3]. At archaeological excavation fragments of human and animal's teeth comprised of tissue remains recovered from archaeological sites can be analyzed isotopically. Teeth remained vulnerable and resistant to physical change over time due to an environmental factor. They have potential fluctuation that may accumulate in tooth mineralization over the course of time that could be used to study aspect of geographical location, origin of foodstuff by extension and consulted to provide ancient behavior [4].

In the archaeological investigation, strontium isotopes method is employed to establish the provenience of artifacts as well as reconstruct the ancient mobility pattern of pre-historic bones and teeth by

analyzing samples isotopically. This activity performed by the coordination of Odonatologist with an archaeologist. They select enamel sample from the pre-molar as well as from permanent molars. Mostly in archaeology, the human tooth enamel rely on the bulk sampling method in which enamel is collected from the occlusal margin to the elements enamel junction across a tooth buccal-lingual mesial and distal crown surface [5]. In fact, isotopes analysis indicates a preference for the most resistance phosphate group over the abundant digenetic carbonates. It yields potential evidence of ancient culture when applied to the food web making it possible to acquire direct estimate concerning diet tropical level and subsistence [6].

Amino acid racemization analysis

Dental age estimation in archaeology is a non-invasive method used to evaluate the sequence and timing of developing dentition also defined growth stages, modification of traits in the mature dentition in the living and its surrounding tissues. The origin of dental age estimation can be traced back 170 years ago when for the first-time tooth eruption was used in connection with child labor by Edwin Saunder. He was the first dentist who published dental implication in age assessment by presenting his pamphlet in 1873 named "teeth a test of age". Later, his work was carried out in many disciplines to access mature estimation of age [7]. Presently estimation of age is a matter of concern in two broad areas of research. Archaeology and forensic science. In archaeology, age estimation is considered as an essential part of human osteology for reconstructing information from teeth and bones. It is often recognized as the major organizing principle of density. Although in archaeological investigation different aging methods have common basic in their construction but particularly for estimation of age amino acid racemization technique is used. It contains primary or secondary amino groups within their molecular structure [8]. It is a biochemical reaction which progress with time and has potential to be used in any material capable of requesting amino acid e.g. bones teeth avian eggshells. This calculation method determined degenerative changes in a young individual which have reached its full skeletal and dental maturity also used to reconstruct temperature and history of a site. In fact, in cases where data about age at death body is required amino acid racemization analysis is used as an important aspect for identification of different relative age grades of an individual with their socio-biological development stages [9].

It is a significant fundamental Biao-archaeological technique valuable in the study of the demography and study of the pathological process of a past population so provide important information regarding studies of paleopathology and social identity. These calculation methods determined degenerative changes in a young individual which have reached its full skeleton and dental maturity. Moreover, the popularity of these methods arises from high survival rate of teeth within an archaeological context. They can raise the level of confidence and percentage of success in determined age [10].

For age, estimation attrition is described as most obvious age evidence related to the human dentition. It predicts the dental hygiene and dietary habits caused by the prolonged exposure to masticatory forces. Attrition is evaluated by examining incise and occlusal tooth surfaces. In order to allocate an age to the spine man in archaeology observation of tooth pattern most probably utilized for the estimation of aging of adult skeleton remains. Because it is apparent that teeth become more brown and yellowish with age. It happened due to the discoloration of organic compounds in hard tissues [11]. In fact, Dental development is a process that has a developmental indicator

and a strong genetic compound which are least skeptical of an environmental factor.

Morphological analysis

For estimation of sex, teeth are often considered as a potential source of information. They are carried out as indicators for the analysis of gender discrimination. In archaeological investigation unlike pelvis skulls and mandible teeth show a high level of sexual dimorphism for the archaeologist. Therefore, in archaeology, the estimation of sex is based upon odontometric dental features. For example, male and females tooth dimension, their morphology, the mesiodistal buccolingual measurement of their diagonal crown dimensions are different from one another as well as in cuspl diameter. Other than those teeth of the male are larger as compared to female [12]. In this way certain crown traits required non-invasive techniques, types of methods and approaches used to determine the estimation of sex. These approaches reluctantly with visual inspection and statistical analysis of teeth [13].

Although, in sex determination multiple methods are applied in every field but particularly in the field of archaeology estimation of sex is done by morphological analysis. It involves hard tissue analysis called as oral analysis like odontometric orthometric and miscellaneous analysis while paroral analysis based upon soft tissues analysis linked with lip print cheiloscopy and palatal rugae pattern-uroscopy [14]. So, taking into account the above mention knowledge it is north worthy to say that in human being's teeth are foremost important indicators of sex determination.

DNA and geometric morphometric analysis

Out of the numerous fields of study and analysis in archaeology, an important principle is the recognition and interpretation of marks and injuries produced for human bites in the human skin. They played a pivotal role to determine the social evolution of the past. Bite mark on the skin is complex injuries consisting of lacerations, abrasions, and contusions caused by the crushing action of the teeth and related structures [15]. For the first time in history, David sweet Canadian was used human bite mark analysis to draw the historical be ground of ancient people. Later on, the reliability of his analysis was remained heated among many scientific studies.

In archaeological perspective, the human bite mark analysis is commonly used to show the defending and attacking position of humans through teeth. Because in ancient times most notably teeth were used by human beings as a weapon to defend and protect themselves. It used to make sense of human phycolgy also determined the past human society. In this regard, analysis is done by physical comparison of the teeth on the skin of victim and suspect. In this process DNA and saliva is extracted from dental pulp and from hard tissues of the mouth considered as sufficient [16]. This activity is often applied on two swabs. One is known as wet swabs method. In which wash skin flow by a dry one to collect the moisture. While the other one is known as sweet swab method. This method is rightly called gold standard technique. In this method a freezer mil with liquid nitrogen is used to make artificial bones and teeth [17]. Although this method is extremely bitter for sampling but helped to identify the types of deceased. Except that, in archaeology PCR (polymerase chain reaction) and STR analysis allow collection of postmortem samples to known antemortem samples parental DNA from teeth. These techniques make possible the amplification of small DNA samples. For

that purpose, the introduction of pol Mitochondria material used for body identification. This Examination is performed by direct sequences of its nitrogenous basis through teeth [18].

Discussion

In fact, for human bite mark analysis many classifications of bite mark types have been proposed but present-day in archaeological perspective, the only standard method of odontology is Geometric Morphometric analysis. This standard method of information collection or comparison has been agreed by a number of scholars. It is a mathematical base method used to portray dental features by capturing the geometry of morphological structure of interest and information. In archaeology, this qualitative analysis has significant contribution to compare the shape which is mandatory to superimpose the sets of data. Its information is proved by statistical analysis of dental features like inner carmine width mesial-distal length rotations and tooth height variations [19]. However, this method is based upon landmarking and semi landmarking process carried out to study the lower and upper interior teeth also differentiate the shape of an object from the size of the object. The advantage of this method is the optimal reproducibility measurement and the possibility of performing geometric morphometric analysis for teeth [20].

Conclusion

To be concluded my research article it is said archaeology and Odontology are overlapped with each other. Both disciplines have been advancing for last three decade has a key role to play in exploring and reconstructing ancient history of areas in its long-term perspective. Therefore, in this course, above mention multiple no-metric and metric analysis are used by an archaeologist to give valuable information also addressing the key questions regarding human morphology. Although these analyses are enlisted into biological social and chemical categories but particularly in archaeology these analyses can be interpreted as strontium isotopes analysis, amino acid racemization analysis, morphological analysis, and geometric morphometric analysis used to achieve desired goals. These dental analyses have ensured the dynamic nature of ancient population to trace primary evidence also explore the most integrating question in archaeology about sexual dimorphism, human bite mark, provenience of artifacts, and age estimation. Finally, it is noteworthy to say that as a discipline odontology has proved to open broad new records in archaeology.

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