

Review Article

Racial Characteristics of Human Teeth

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INTRODUCTION

The term “race” engenders much discussion, with little agreement between those who claim that “races” are real biological entities and those who maintain that they are socially constructed. Those who agree that race is biological entities sometimes stresses empirical evidence for the existence of biological “racial” differences, and those who agree that human race is socially constructed, stresses the role that human agency has had in creating distinctions between people.^[1,2]

Till the late 16th and early 17th centuries, “race” is not used as a tool of social categorization. Although the existing races of man differ in terms of color of skin, hair, shape of skeletal, proportions of the body, etc., All the remaining structures are taken into consideration and it was observed that they are similar to each other in a multitude of points.^[3] We have tried to explain the racial differences with the help of dental features.

It is very difficult to determine the racial affinity of an unknown individual with the help of dentition. However, there are some dental characteristics which are predominant in one of the racial groups which help in the racial identification process. According to all physical anthropologists, human biologists, and geneticists that all men belong to a single species that is

ABSTRACT

Forensic odontology is a branch of dentistry which deals with the appropriate handling and examination of dental evidence which help in identification of person and presentation of dental findings in the interest of justice. It is concerned with the application of science and technology in human identification, requiring the coordinated efforts of a multidisciplinary team. Determining the racial affinity of an unknown individual from dentition for identification is indeed a difficult endeavor. However, there are some dental characteristics which are predominant in one of racial groups, and these contribute important indicators in the identification process. Forensic anthropologists most often provide details of bone studies, but forensic dentists can assist in the process. The determination of sex and ancestry can be accessed from shape and form of the skull, especially from skull appearance. Forensic dentists can determine race within the three major groups: Caucasoid, Mongoloid, and Negroid. Additional characteristics of teeth, such as cusps of Carabelli, shovel-shaped incisors, and multicusped premolars, can also assist in the determination of ancestry.

KEY WORDS: Australoids and Negroid, Caucasoid, dental characteristics, forensic science, mongoloid

Homo sapiens, and they, therefore, share a common ancestry. According to anthropologists, biological and cultural patterns of a population in a particular environment are considered.^[4]

HISTORY OF RACIAL CLASSIFICATION

Racial classification required both genetics and biomedical research which are more interested and topic for debate.^[5,6] Historically, biological classification of races has been associated with a hierarchical ranking of races for genocide (e.g., the Nazi-led Holocaust), colonialism, slavery, and other social inequities.^[7] Given this tainted history of biological studies of race, it is very difficult to use these biological markers for racial classifications.

Few of the early classifications of race were disassociated from the social and political views of the time. Natural taxonomic categories of the human species were considered by Linnaeus in 1758 for classification of race.^[8] He differentiated *Homo sapiens afar* and *Homo sapiens europaeus* and added four geographical subdivisions of humans: White Europeans, red Americans, yellow Asians, and black Africans.^[7] Although Linnaeus intended an objective classification, he used both

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biological and cultural data in his subdivision descriptions. Blumenbach, in 1775,^[9] categorized humans into five “races,” which is similar to Linnaeus’s classifications. Coon in 1962,^[10] on the basis of phenotypic physical features, further refined classification into five races; he called the races as Caucasoid, Mongoloid, Australoid, Negroid, and Capoid.

Despite disagreement among anthropologists, this classification remains in use by many researchers, as well as lay persons. Caucasoids, Mongoloids, Negroids, and Australoids (Australian aborigines) are four major groups considered in the world. In Peninsular Malaya, Malays, Chinese, and Indians are three major ethnic groups. Subgroup of Caucasoid also called Indo-Dravidian (Indo-European), all the others belong to the Mongoloid race.

Careful examination of physical, skeletal, and dental structures may collectively support the racial identity of an individual; otherwise, it is impossible to specify any distinct anatomic characteristic exclusively to a particular race. Skin, hair, head shape, face type, eyes, nose skeletal size, and dentition are considered as distinguishing features in the study of races. However, racial characteristics are not diagnostic features; they are considered as suggestive features in determining the racial origin of the individual. Teeth are most important and reliable sources of information during racial differentiations.

Dental identification of humans occurs for a number of different reasons such as criminal, marriage, burial, social, and closure. Dental traits are features such as ridges, bulges, crown, root of the teeth number of teeth, occlusal and bony relationship, and individual tooth measurement which vary in size.^[11] Teeth are one of the parts of skeleton for which measurements on living and fossils are directly comparable. Measurement of these parameters also referred as odontometry. According to Dhalberg in 1963,^[12] these dento-anthropologic structures are most important and reliable sources of information in ascertaining racial affinities.

Unfortunately, due to the small number of fossil specimens and the high degree of morphological variation due to masticatory habits, all dental features cannot be used for these purposes. The lingual surface of the upper incisors usually draws the attention of dental morphologists. The Japanese dental morphologist, Mizoguchi in 1985,^[13] defined three incisor variants according to the degree of expression of marginal ridges and their connection with the lingual tubercle: (1) Weak marginal ridges converging toward the cervix, (2) strong parallel nonconverging ridges and a large lingual tubercle, and (3) markedly developed and converging ridges and a reduced lingual tubercle.

Korenhof, in 1982, described three trigonid crests, the middle trigonid crest belongs to the system of trigonid crests of the lower molars.^[14] The distal crest is a good marker of the modern Mongoloid race. The middle trigonid crest has attracted less attention, but it is also equally important. The middle trigonid crest is formed by the main ridges of the protoconid and metaconid in the middle of the trigonid area. According to the terminology suggested by the American paleontologist, Hershkovitz in 1971,^[15] this feature must be called an “epicristid.”

METHODS OF QUANTIFICATION

Dento-anthropologic structures are one part of the skeleton for which measurements on the living after eruption are directly comparable with the fossil remains which have survived ravages of time.’ Both metric and nonmetric parameters can be used. To conformed metric parameters, all the measurements are taken; this procedure is also called as odontometry. All the measurements such as mesiodistal, buccolingual, and crown height are taken using digital calipers. “Scoring” or qualitatively describing features such as presence/absence of a trait, degree of its expression, and frequency (unilateral or bilateral) are carefully done.

Sometime trait characters are seen in small percentages among the population, and then it becomes an abnormal trait. When trait characters’ percentage is much higher, then the trait is just a variation. Variability in the dental condition mostly results from genetic and environmental influences acting on developing teeth, jaws, and other craniofacial structures. Ultimately, this causes different combinations of tooth size and shape within or between populations to occur.^[16]

MONGOLOID

The racial differences are more marked in the permanent dentition than the deciduous dentition. The most distinguishing feature in the Mongoloid dentition is found on the lingual surface of the incisors in fusion of the lateral or marginal ridges which formed a raised cingulum and creates a deep lingual fossa. The ridge fades toward the incisal portion of teeth, and this gives the tooth a “shovel” or “scoop” shape appearance [Figure 1]. This condition is found in approximately 90% of Mongoloids inclusive of Eskimos and American Indians.^[17] Occasionally, there may be a groove on the lingual surface at the cervical margin up to the root surface and “Screw like or Finger like” projections from the cingulum toward the incisal margins [Figure 2a and b]. Frequently, the prominent lingual marginal ridges which produce the Mongoloid shovel-shaped incisor extends onto the labial surface [Figure 3]. These produce a mesiodistal concavity of the labial surface and are termed “double-shovel shaped” incisor.^[17,18]

Bailit in 1975 has shown that the population of Asian ancestry has large upper lateral incisors as compared to



Figure 1: Shovel-shaped incisors

central incisors.^[19] This was demonstrated among the 19% Japanese male shows central incisors bigger than that of lateral incisors. In contrast, the values for American Whites and Norwegian Lapps were 33% and 24%, respectively. A study conducted by Yaacob and Talib in 1993, among Malay adolescents found that the central incisors were bigger mesiodistally only by 17% than the lateral incisors of the males and were bigger by 13% in the females.^[20]

Mongoloid incisors, therefore, show a greater curvature than Caucasoid. Canines are mostly affected. Mongoloids premolar may display a tubercle, usually on the buccal cusp, scientifically this condition is called as Dens evaginatus. Singaporean Chinese exhibited bilateral five cusp forms on upper third molar and 43% of second molars. While in the lower molars, the distal (5th) cusp is usually more lingually placed than Caucasoids.

Root size and length reduce posteriorly and sometimes with extra distolingual root in the lower first molar and third molar. This is also observed in a second deciduous molar. In a study of extracted mandibular molars among Singaporean Chinese, distolingual roots were exhibited in 7.9% of the extracted first molars and 3.7% of the extracted third molars. None was found in the second molars. In an earlier study in 1971 on the first mandibular molars of Keewatin Eskimos, the incidence was much higher at 19%.^[21]

Most of Mongoloids show shorter anatomical roots, but the root trunks are better developed. Taurodontism caused due to increased growth of root trunk is also observed in Mongoloids. Furthermore, in Mongoloids, the enamel contour extends sometimes between the bifurcation of the roots [Figure 4]. It is more frequently seen with the mandibular molars when compared with maxillary molars and more so on the buccal surface. In case of Hong Kong Chinese, 79% of extracted first mandibular molars show the enamel contour extends between the bifurcation. Enamel pearls, which are protuberances at the external radicular portion of a tooth, are reasonably low in occurrence with a predilection for the third maxillary molars.^[22]

Cusp of Carabelli is usually not present in Mongoloids, which is considered as one of the notable features in this race. If present, it is usually a reduced form. In general, Mongoloids have a parabolic arch, especially lower arch with large incisors, canines, small premolars, and large molars behind them.^[23]

CAUCASOID

Caucasoids usually have narrow “v-” shaped arch giving rise to crowding of teeth.^[22] The anterior teeth of Caucasoids are described as “chisel shaped” having smaller and smoother lingual surface. In 37% of Caucasoid, the cusp of Carabelli is seen and consider as another noted feature which of the Caucasoids [Figure 5].^[24]

This is seen on the mesiopalatal cusp of the maxillary first permanent molars and the maxillary second deciduous molars. Sometimes, this trait may vary as pits, furrows, or slight protuberance. The second molars mostly have four cusps as

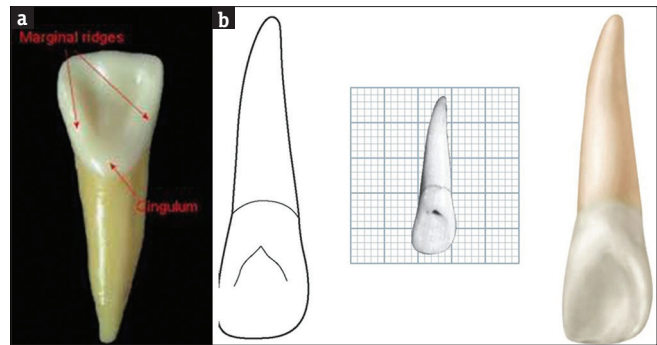


Figure 2: (a) Prominent marginal lingual ridge (lower incisor). (b) Prominent marginal lingual ridge (upper incisor)



Figure 3: Prominent labial marginal ridge (upper incisor)

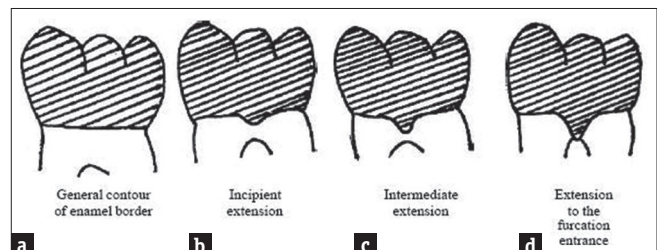


Figure 4: (a-d) Various type of enamel extension

opposed to five in some races. This was observed in 94% of Anglo-saxons examined by Lavelle.^[25]

Some Central Europeans have a wide-based prominent cingulum on the lingual surface of their incisors rather than rolled smooth continuum common to the most Europeans. The upper lateral incisor is the more variable of this type, and the reduced lateral incisor forms are usually peg shaped.^[12] Shovel-shaped incisors are exhibited among in about 30%–36% of the Danish and Swedish population, 46% of the Palestinian Arabs, and also in 51% of the Indians.^[26] According to Lunt, maxillary lateral incisors of Europeans are more likely to appear as shovel shaped.^[17]

AUSTRALOID

The arch size of the Australoids is usually large, naturally accommodates larger-sized teeth. Molars are of bigger size



Figure 5: Cusp of Carabelli

than that of among any living race (termed as megadont). The mesiodistal diameter of the first molar is 10% longer than that found in Norwegian Lapps and White American.^[19,27] The presence of large premolars is also noted, but the anteriors are relatively small in comparison. Sever attrition is a common finding in this race leading to edge-to-edge bite and typical spatulate anterior teeth. Mesial drift of teeth is another notable feature of this race.^[28] Shovel-shaped incisors and the appearance of cusp of Carabelli are rare. According to Campbell, there may be the presence of enamel pearls exhibited between the roots and the third molars may be missing.^[29]

NEGROIDS

The teeth of Negroids are small with spacing, especially with midline diastema. There is an increased tendency for the existence of supernumerary teeth. The lower first premolar has two distinct cusps; sometimes even three cusps. The presence of the cusp of Carabelli and shovel-shaped incisor is uncommon. The third molars are always present and rarely impacted. Class III malocclusion and open bite are more common in Negroid. Bimaxillary protrusion and both maxillary and mandibular alveolar bone are protruded with incisor slanted labial. Mongoloid and non-Anglo Caucasoids may show this trait, but it is more pronounced in black population. Twenty percent of black do not show this trait due to racial breeding.^[30]

CONCLUSION

Every individual is having different tooth morphology. It is very difficult to determine the racial affinity of an unknown individual with the help of dentition. However, there are some dental characteristics which are predominant in one of the racial groups which help in the racial identification process. Some prominent morphological variations of teeth, arch pattern, root length occlusal, and bony relationship help in racial differentiation.

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There are no conflicts of interest.

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