Journal Reviews

The frontal sinus morphology in radiographs of Brazilian subjects: Its forensic importance

Camargo, JR., Daruge, E., Prado, FB., Caria, PHF., Alves, MC., Silva, RF., and Daruge Jr., E.
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The determination of gender of unknown persons is of vital importance in forensic investigations, such as anthropologic, medical and dental forensic studies, mainly in cases where only fragments of the skull remain and there is no possibility of identification based on the dental arch. In this study, gender was identified using frontal sinus measurements evaluated from 100 radiographs taken by Caldwell technique. The sample comprised of 50 Caucasian females and 50 males, with a mean age of 25 years. Only healthy individuals were selected for this study and those with a history of orthodontic treatment or orthognathic surgery, trauma, or any surgery of the skull, history or clinical characteristics of endocrine disturbances, nutritional diseases or hereditary facial asymmetries were taken as exclusion criteria.

In all the radiographs, the lines that bordered the area of the frontal sinus were determined with the help of a radiograph viewer and tracing paper and the following parameters were measured: right height, left height, right width, left width, total area, left area and right area.

The greatest height of each side was determined from the maximum distance between the base and upper lines of the frontal sinus, and the largest width of the frontal sinus was determined from the maximum distance between the medial and lateral lines of the right and left side of the frontal sinus.

The use of the left area of the frontal sinus was used as a parameter to establish a mathematical model to determine sex based on the results of the analysis and comparison of the width and height of the frontal sinus. Student's *t*-test was applied to compare the means of the groups (males and females) for all the response variables studied. Student's *t*-test showed strong indications ($p < 0.01$) of differences between the means of the male and female groups for all the response variables studied. The means for the measurements of the men were consistently greater than those of the women. From the results, it showed a tendency for the left side of the frontal sinus to be larger than the right side. The logistic regression technique used in this study used a dependent (left area of the frontal sinus) and an independent (gender) variable. This analysis provided a 79.7% precision in the determination of gender, even when only a single variable is used.

Sexual dimorphism in mesiodistal and buccolingual tooth dimensions in Chilean people

Iván Suazo Galdames; Mario Cantín López; Bernarda López Farías; Catherine Sandoval Marchant; Sebastián Torres Muñoz; Patricio Gajardo Rojas & Marcelo Gajardo Rojas
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Dental morphology owing to its physical and chemical properties is used to determine sexual dimorphism of teeth due to its uniqueness in each individual. In this study, presence of sexual dimorphism in the size of the crowns of permanent maxillary teeth in 67 males and 83 females aged between 18 and 24 years were analysed. Plaster models of the maxillary and mandibular arches from alginate impressions in these patients were obtained. Mesiodistal and vestibulolingual diameters of each permanent tooth were measured using a digital caliper.

The statistical significance of differences in mean in mesiodistal and buccolingual diameters between males and females were calculated using the t test. Results showed that most of the mesiodistal and buccolingual dimensions of the maxillary and mandibular tooth crowns were higher in males than in females. Significant differences were found mainly in buccolingual diameters. No significant differences in the mesiodistal diameter of the analyzed teeth were found.

The utility of dental patterns in forensic dentistry

Stella Martin-de-las-Heras, Aurora Valenzuela, Juan de Dios Luna, Manuel Bravo
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Diversity of dental patterns was analysed in different age and birth cohorts in adult samples for forensic identification purposes. Their analysis was based on full dentitions and partial dentitions typically available in mass disaster situations. Data from 3166 adults were extracted from surveys corresponding to three different years. Each survey comprised of 2 adult age groups (35–44 years and 65–74 years), therefore six data sets were available for their study.

Both the DMFT index (decayed, lost due to caries or any other reason, and filled permanent teeth) and the percentage of edentulous individuals varied considerably among the six datasets. Chi square analysis adjusted for clustering (individuals) was used to compare the distribution of dental codes among the six data sets. There was a significant association ($P < 0.001$) between data sets and dental codes.

For example, ''unrestored'' was the most frequent among older adults (65–74 years). All the six samples showed substantial variability in oral health status (caries history) and dental code distribution, not only between age groups within the same survey year, also between different survey years for the same age group.

This reflects the complex age-period-cohort effect in dental caries prevalence. Pairwise comparison was performed and total number of pattern matches were produced. For each forensic situation, total and conditional diversity was calculated. Studies showed that majority of the patterns were unique (70–95%), whereas the edentulous pattern was especially frequent among older individuals (17–27%) but less common than the other unique patterns. Studies proved that total diversity values were low and conditional diversities were high and uniform. A combined diversity value above 0.99 was obtained following pooling of data. It can be concluded from this study that conditional diversity value derived from dental pattern is a valuable tool for personal identification.

Objective measurement of dental color for age estimation by spectroradiometry

Stella Martin-de las Heras, Aurora Valenzula, Renzo Bellini, Carlos Salas, Manuel Rubino, Jose Antonio Garcia
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Tooth color estimation is of great interest in forensic odontology. Several authors have reported that teeth tend to darken with age . Estimation of the age of a deceased individual can be of great importance in identification cases.

In this study, spectroradiometry is used as an objective method for dentine color measurements for estimation of age. Two different samples were studied. Two hundred and fifty healthy human permanent teeth(sample group I) were extracted from 115 women and 135 men from 10 to 89 years of age. Other population group (sample group II) composed of 37 healthy erupted permanent teeth obtained from human skeletal remains buried during an interval ranging from 21 to 37 years (19 women and 18 men aged 22-82 years)were also studied. Molars were excluded from the study. Collected teeth were placed in saline solution and root was ground to a depth of approximately 0.5 mm to remove the cementum. Colour measurements were performed as suggested in the CIE 1931 (International Commission on Illumination). Chromaticity coordinates (x, y, z), luminance (Y), whiteness index (WIC, Z%, WIC) and yellowness index (YI) were obtained. Correlations between these colorimetric variables and aging were established by linear regression analyses. All the variables fit the mathematical model with correlation coefficients ranging from 0.53 to 0.75. This method of color measurement produced an expected

associated error of calibration averaging 13.7 years about the mean estimated values, at a 70% level of confidence. Two different multiple regression models for dental age estimation were tested and variables that made the greatest contributions to age calculation were identified.

They found that the dentinal colors white, cream, and yellow were associated with age 12-37 years, while dark yellow and brown were associated with the age-group 55-64 years. From the study, it can be concluded that determination of dentin color by spectroradiometry could be used in combination with other morphological methods in order to improve the accuracy to estimate the age.

Reliability of third molar development for age estimation in a Texas hispanic population: A comparison study

Kathleen A. Kasper, Dana Austin, Alan H.Kvanli, Tara R.Rios, David R.Senn
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Age estimation plays an important role in forensic medicine and every branch of dentistry. The third molars are the teeth that are most often congenitally missing. If present, they might follow an abortive eruption path and become impacted. Impacted third molars are developmental pathologic medical deformities characteristic of a modern civilization. The eruption times of third molars have been reported to vary with the ethnicity of individuals. Third molar development is most significant for age estimation of individuals from the mid teens to early twenties, a time when aging methods based on skeletal development include epiphyseal development and fusion in multiple regions of the body.

In this study, they evaluated third molar from panoramic radiographs of 950 Hispanic individuals aged 12-22 years using Demirijan's methods. This study was compared with other study. They found that Hispanic third molar development was 8-18 months faster than Amercian Caucasians as reported by Mincer, Harris and Berryman in 1993. This represents a statistically significant increase. Earlier development was more apparent in the later stages F through H. Hispanic males reach developmental stages faster than females and maxillary third molars reach developmental stages faster than mandibular third molars in both sexes. The earlier age observed for stages B-H and the oldest age observed for stages B-G were developed to facilitate age prediction of unknown individuals. The third molars of males matured earlier than females for all stages and in the both maxilla and mandible.

They concluded that no other non-invasive biometric method is currently known for the age of transition from juvenile to adult status, Analysis of the development

of third molars is a useful and reliable method of age estimation.

Bite mark analysis and comparison using image perception technology

A.Van der Veladen, M. Spiessens, G.Willems
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In this study, a new method of comparing and analysing photographs of bite marks with overlays of a suspected biter's dentition using image perception software is used. Photographs of bite marks were resized to 1:1 scale using Photoshop® of Adobe systems. Dental study casts were scanned using the flatbed scanner. Hollow and compound overlays were produced from these casts. The methods used for both procedures are described by Bowers and Johansen. The photographs were imported into the image perception program and processed. With image perception software, it is possible to make 256 different greyscale values visible by rendering intensity information as surface height by mapping individual pixel intensities to the z-axis. Areas of equal luminance can also be artificially coloured to enhance the image information that facilitates the recognition of the individual tooth impressions in the bite mark area and thus improving diagnostic procedures. With this technology, it is possible to artificially colour areas with equal intensity values and depict a 2-D image as a pseudo -3-D surface object. They concluded that use of image perception technology may allow visualization of a degree of detail unavailable with any other method. Although more research is needed to explore the possibilities of image perception technology, its possibilities to visualise more details in a bite mark photograph are promising. The availability of additional colouring of selected areas with similar intensity values as well as rendering 2-D photographs as pseudo 3-D images may enable the researcher to analyse the image more extensively and come to a more accurate conclusion regarding the source of the bite.

Preethy Mary Donald,
K Indrapriyadharshini
*Postgraduate Students,
Meenakshi Ammal Dental College, Chennai, India.
Email: drpreethyrenjith@gmail.com*