ESTIMATE OF AGE THROUGH THE ANALYSIS OF X-RAY OF THIRD MOLAR AND HAND AND WRIST: CASE REPORTS

ABSTRACT

The Forensic Anthropology and Forensic Dentistry, in one of its branches, aim to base skills making possible to estimate the age period for an individual, through factors such as tooth mineralization and bone development. This paper aims to report on two cases from Scientific Expertise Center - Renato Chaves, Belém- PA, where two individuals after committing crime, were referred to under 18s without supporting documents. Through data collected in the archives of the Scientific Expertise Center, an analysis of the mineralization of the teeth were made, highlighting the third molars by panoramic radiography; as well as the study of bone development of the hands and wrists of individuals through radiographs. After, the analysis was compared to surveys conducted by Nicodemos, Moraes and Médici-Filho, befitting the chronology of mineralization of permanent teeth among Brazilian citizens together with the work of Greulich-Pyle, Radiographic correlation concerning the chronology of the development of the hand and wrist. As a result of the analysis, it was obtained, for case 01, an estimated age of 17; and for case 02 the estimated age was between 18-19 years.

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INTRODUCTION

Legal Dentistry is a specialty that applies the dentistry knowledge, no exception, from the anatomy and basic disciplines to the most complexes specialties to the interests of Right.[1]

Forensic anthropology is concerned with studies on people identity, their identification, among other, with its methods, procedures and techniques. Through human identification, it studies qualitative and quantitatively several characteristics which are different among individuals. In fact, bone test provides fundamental help to investigate the animal species, gender and biotype to estimate age determine his or her age period. [2]

Alves (1965) clarify that, in general, hiding identity presupposes crime or contravention, even felony. The same author continues asserting when an offense is committed, who has committed it have to be punished and not another one.

Through radiograph examination of bones and teeth is possible carry out a report of judicial interest, for court, called forensic, in order to obtain final technical advice. Due to the need of forensic being a way for technical clarifying, it is necessary that experts have knowledge not only on the anatomical aspects of bones, articulations (joints) and teeth, they should know particularities which could be found, who could take enough information to achieve the main goal after analysis: the conquest of the truth.

According to Arbenz (1988), forensics procedures to estimate the age period have practical and rigorous indications on the following cases: a) absence of civil registration; b) register with false attribution; c) two registers requiring scientific base.

There are signals which whether do not provide the exact age they can give a period of human life, because the body suffers transformations over time, allowing fixing a person, corpse or skeleton age. These signals comprehend teeth development, bone maturity, development of secondary sexual characters, longitudinal furrow son the nails, gray hair, among other.

Studies on Forensic Dentistry and Forensic Anthropology routinely associate dental development to skeleton one to obtain more precise diagnosis. Bone maturity like carpal development and dental elements suffer less transformation from the environment, and that is the reason to be commonly employed to estimate an age period. Therefore, it is indispensable the use and analysis of x-ray for more reliable results, where the mineralization can be observed, for example, in permanent teeth, as well as presence or absence of the third molars, classifying them on the stages described by Nicodemos, Moraes and Médici Filho (1974).

Hand and wrist are the parts of skeleton more commonly used to evaluate the skeleton maturity [5, 6].

On the evaluation of development we should observe skeleton maturity through complete, incomplete or absence of fusion, between the diaphysis and epiphysis of long bones. The fusion degree is characterized by metaphysis, cartilaginous line that separate two bones, whose disappear with the complete bone calcification. Presence and development of sesamoid bone of adductor thumbs is also an indication of age period, and that is the reason it has to be considered in the X-Ray analysis.

Through data obtained from files of Scientific Expertise Center – Renato Chaves the aim is estimate the age of two live individuals with legal finality. After commit an offense, they were addressed to the center with no documents proving the age. Analyses of mineralization of third molars were carried out, as well as of bone development in hands and wrists through radiography.

MATERIAL AND METHODS

A survey was performed on the files of the Scientific Expertise Center – Renato Chaves (Belem-PA), and the inclusion criteria were forensic trials performed from 2011 to 2013, which have as aim estimate the age of an individual who had committed an offense and did not have documents proving the age.

Through the files was possible know the characteristics of the individuals, like height and weight, as well as dental elements present or absent in the mouth and panoramic radiographies of hands and wrist of each individual.

From these data collected was assumed that the individuals presented normal skeleton growth and dental development, both common to Brazilian citizens.

Observed the characteristics described on the teeth analysis, it is highlighted the mineralization degree of third molars, they were placed in the stages described by Nicodemos, Moraes and Médici Filho (1974), and next were related to the ages consistent to the development stages, the arithmetic averages were calculated for the values found on the table to establish a tooth age for each individual.

By radiographic examination of hand and wrist the fusion degree was observed between the epiphysis and diaphysis of long bones, metacarpals and phalanx, connecting to the stages described by Greulich and Pyle (1959), corresponding to each age.

CASE REPORT

CASE #1

Patient JCLS, male, was arrested after criminal practice and addressed to the Scientific Expertise Center – Renato Chaves in

Belem/PA in June 02nd 2013 through judicial requirement to perform forensic examination in order to estimate the age of the individual.

The individual presented the color mulatto, male, no profession activity, Brazilian citizen, from Pará state originally, homeless with no identification document.

The biometric examination presented: weight 77 Kg and height 1.72 m. Intraoral examination presented the following permanent dental elements according to the International Dental Notation (FDI): 18, 17, 15, 14, 13, 12, 11; 21, 22, 23, 24, 25, 26, 27, 28; 38, 37, 36, 34, 33, 32, 31; 41, 42, 43, 44, 45, 46, 47,48. By probable old avulsion, the following dental elements were absent: 16 and 35 (Figure 1).

Figure 1. Panoramic radiograph of patient J.C.L.S.

The radiographic examination of dental arches presented the images of root apexes of the dental elements 18; 28; 38; 48, opened, to mineralize, in stage 07 of Nicodemo, Moraes and Médici Filho table (1974) (Figure 2).

The radiographic examination of hands and wrists presented: images of radiolucent line between epiphysis and diaphysis of radio and ulna bones, revealing that the bone maturity process was active with cartilaginous line evident; presence of sesamoid bone of thumb adductor (Figures 3 to 5).

After analysis of teeth development according to Nicodemo, Moraes and Médici Filho (1974) and bone development (carpal) according to Greulich and Pyle (1959), through clinical and radiographic examination, the age was estimated between 17 years and 17 years and 6 months.

Figure 2. Lower third molars with open apex.

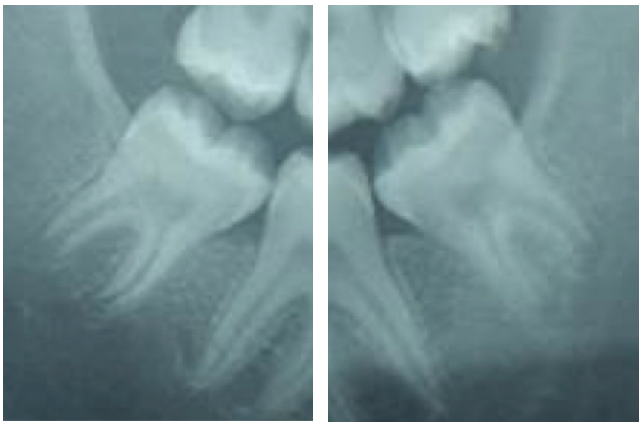


Figure 3. Hand and wrist radiograph.

Figure 4. Hand and wrist radiograph of left hand showing radiolucent line between the epiphysis and diaphysis of radio and ulna bones.

Figure 5. Hand and wrist radiograph of right hand showing radiolucent line between the epiphysis and diaphysis of radio and ulna bones.

To the law requirements requested in forensics of aging estimative, it was answered: 1st - "Is the individual under 18 years old? Yes." 2nd- "Is in affirmative case over 14 years old? Yes".

Using the studies described in this work, the age of the individual was estimated between 17 and 17 years old and 6 months, confirming the age determined by the forensic officer.

CASE #2

Individual A.P.M., arrested after commit offense was addressed to the Scientific Expertise Center – Renato Chaves in March 08th 2013, for dentistry forensic in order to estimate an age to an individual through judicial require.

The individual presented the color mulatto, male gender, Brazilian, natural from the state of Para, unknown residence, no

professional occupation. No identification document.

Biometric examination: weight 60.2 kg and height 1.67 meters. The intraoral examination presented the following permanent dental elements according the International Dental Notation (FDI): 11, 12, 13, 14, 15, 17, 18; 21 22, 23, 24, 25, 26, 27, 28; 31, 32, 33, 34, 35, 36, 37, 38; 41, 42, 43, 44, 45, 46, 47, 48. The 16 element was absent probably by old avulsion (Figure 6).

Figure 6. Radiograph of patient A.P.M.

Through radiographic examination of dental arches it is observed images of root apex of dental elements 18; 28; 38; 48 closed, corresponding to the stage 08 by Nicodemo, Moraes and Médici Filho (1974) (Figures 7).

When performed the radiographic examination of wrist was noticed: absence of the radiolucent line between distal epiphysis and diaphysis, suggesting complete mineralization and presence of sesamoid bone (Figures 8 to 10).

After the analysis of teeth development according to Nicodemo, Moraes and Médici Filho (1974), and bone development (carpal) according to Greulich and Pyle (1959), through clinical and radiographic examinations, the individual's age was estimated between 18 and 19 years old.

Figure 7. Lower third molars with closed apex.

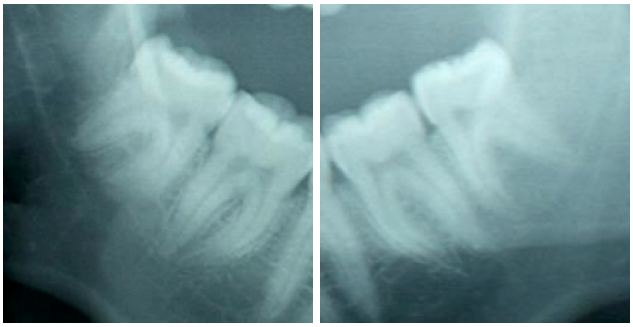


Figure 8. Hand and wrist radiograph.

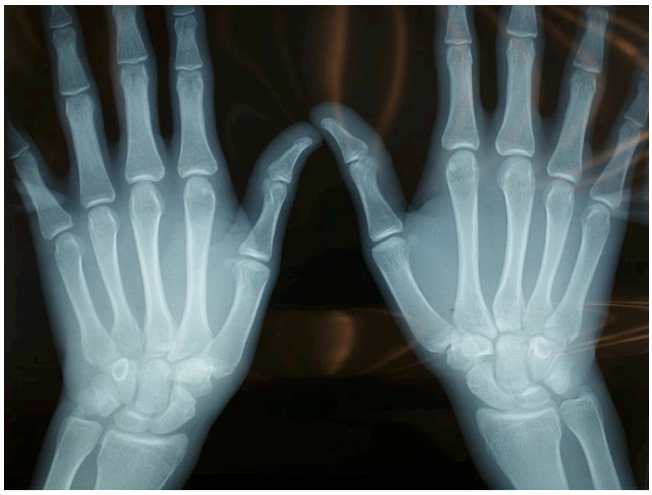


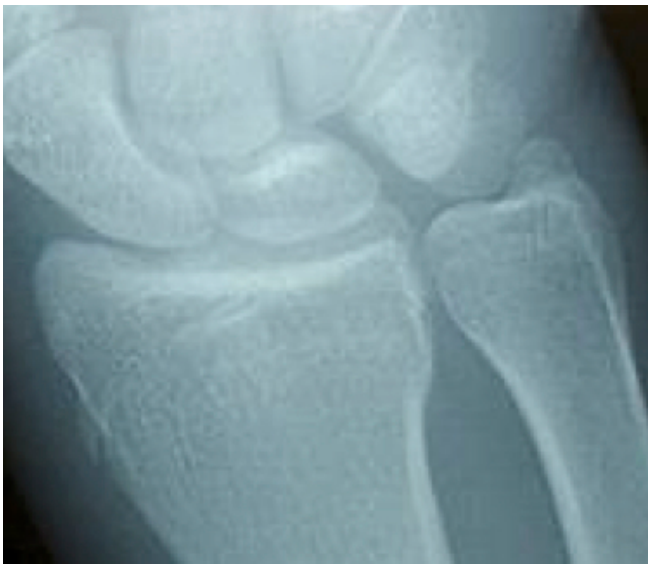
Figure 9. Hand and wrist radiograph of left hand showing radiolucent line between the epiphysis and diaphysis of radio and ulna bones.

To the law requirements requested in forensics of aging estimative, it was answered:

1st- "Is the individual over 18 years old? No."

2nd - "Is in affirmative case over 14 years old? Affected".

Figure 10. Hand and wrist radiograph of right hand showing radiolucent line between the epiphysis and diaphysis of radio and ulna bones.



Using the studies described in this work as base, the age of the individual was determined between 18 and 19 years old, confirming the age determined by the forensic officer.

DISCUSSION

Forensic Dentistry, working on the perspective of aging determination, has using mineralization of third molar as parameter to help on aging determination of corpses and human remains, as well as aging of living people in order to differentiate the youth state and the adult one in cases of Criminal Law[7,8].

Cordeiro et al.[9] (1999) discoursed on estimate aging affirming that the method

commonly used to the aging estimate in the Institutes of Legal Medicine is the visual one, observing presence or absence of third molars in the mouth cavity and placing the individual over 18 years old with presence of third molar, and under 18 years old with the absence. However, this method is quite lame because this tooth has irregular eruption and due to the evolution, there was decrease of the arch, what cause, many times, lack of space and the tooth stay impactedor was extracted by orthodontic reasons, among others. A more reliable method would be the radiographic one, because through a panoramic radiography is possible observe the mineralization of all the teeth, and with appropriate training and comparison with tables could estimate more accurately the age of an individual by the evaluation of all the teeth.

In normal individuals, bone age should be approximately within 10%of chronological age. According to Smith, narrated by Abraão et al. (2014), on the contrary to the chronological age, the skeleton one cannot be determined precisely, and is necessary consider an error rate about 6 months on the results obtained.

Among several methods described by different authors, in specific regions become difficult apply them in regions different of those described. For Saliba[10] (1997), Nolla Method (1960) it is the more applicable; however, it does not have a table to associate age and the Graph of development, what make the application difficult. Therefore, it is more reliable use Nicodemos, Moraes and Médici Filho method because they described a table with chronology of development corresponding to each age among Brazilian citizens.

Greulich and Pyle (1959) analyzed the bone maturity and its development related to the age. In their studies, they noticed the bone development degree was closely linked to the appearing, development and fusion of epiphysis with diaphysis of long bones. Based on the studies they established that cartilages between epiphysis and diaphysis of long bones are filled by bone, indicating the complete fusion of the process of bone maturity has ceased and the individual is at minimum 18 years old.

The report should answer accurately and not likely double interpretations the law requirements asked by the authorities. In the examination for estimative aging two requests proposed by the authorities have to be answered: 1st – Is the individual under 18 years old? 2nd – In affirmative case, is the individual over 14 years old? The answer should be “yes” for affirmations, “no” for negations and “affected” in cases where the question is associated to another previous one whose answer invalidate any other posterior conclusion.[2]

For legal requirements of the case number 1, we found the age between 17 years

and 17 years and 6 months, as well as the age found by the forensic, based on the studies exposed in this work. Therefore, to the first requirement the forensic officer answer “yes”, and to the second requirement “yes”. For the case number 2, the age found was between 18 and 19 years, as well as the age found by the forensic officer, based on the studies exposed in this work. For the requirements answer by the forensic officer for this case, the first answer was “no”, and the second was “affected”.

CONCLUSION

Based on studies performed by the authors previously mentioned, the analysis of radiographies was performed. At the end of observations, the characters presented by the forensic were compared to those described on the tables, considering the bone maturity and the teeth mineralization, making possible determine a life period for each individual.

We conclude that the age estimated of the individual, in the clinical case number 1, comprehend the teeth mineralization standard observed on the third molars is framed in the stage 7 by Nicodemos, Moraes and Médici Filho (1974), after performed the arithmetic average among the periods described on the chronology table by the authors, we conclude that the individual’s dental age is 17.7 years. Related to the analysis of hand and wrist by Greulich and Pyle (1959), we noticed metaphysis between epiphysis and diaphysis of the bones radio and ulna, suggesting still there is no total fusion. Therefore, the individual is still in bone maturity process, confirming the age found by the study of teeth mineralization in approximately 17 years. It reaffirms the age found by the forensic officer during the examination, between 17 years and 17 years and 6 months.

For the clinical case number 02, the individual presents teeth mineralization standard observed in third molars befitting with stage 8 of teeth development by Nicodemos, Moraes and Médici Filho (1974), and it is possible notice sealing in the radicular Apex after performed arithmetic average between the periods described on the chronology table by the authors. Then, we conclude that the individual’s teeth age is comprehended in 19.2 years. Regarding to the hand and wrist analysis, according to Greulich and Pyle (1959), we observed complete fusion of epiphysis with diaphysis of long bones radio and ulna, demonstrating that the individual is in complete process of maturity, confirming the idea found by the study of teeth mineralization, between 18 and 19 years. Then reaffirming the age found by the forensic during the examination, between 18 years and 19 years.

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