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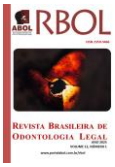

Forensic odontology

RADIOGRAPHIC DENTAL AGE ESTIMATION APPLIED TO RECTIFICATION OF BIRTH RECORDS – A CASE REPORT.

Estimativa de idade dental radiológica aplicada à retificação de certidão de nascimento – relato de caso.

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ABSTRACT

Introduction: Dental age estimation can be useful in criminal and civil scenarios. Among the civil applications of dental age estimation of adults is the rectification of legal documents, such as birth certificates. In this context, rectification is needed when birth registers are delayed or misfiled. The radiographic examination of teeth can be useful because it enables a non-invasive or destructive analysis of age-related parameters, namely the deposition of secondary dentin and the subsequent reduction of the pulpal space. This study reports a case of dental age estimation applied to the rectification of birth records. Case report: An adult male, who planning retirement, claimed to be 10 years younger than his current chronological age (50 years old). The man was referred to the State Medicolegal Institute for dental age estimation to aid the civil Court to decide whether rectification of birth records was necessary. Three non-invasive radiographic dental age estimation methods for adults were applied. One method was based on the linear measurements of the permanent mandibular right canine and first premolar, and the other two considered the pulp/tooth area ratio measured on the radiograph. Conclusion: The methods indicated that the individual was between 60-66 years, confirming his initial claim. Combined with medical and anthropological examinations, dental age estimation contributed to a case of legal rectification.

KEYWORD

Forensic dentistry; Radiograph; Teeth.

INTRODUCTION

Dental age estimation can be applied to the deceased and the living.[1] The former includes methods that can be invasive (destructive or not) or non-invasive, while the latter covers methods that must not produce harm to the examinee.[2] Examples of non-invasive methods are the radiographic ones. In children and adolescents, these methods are mostly based on the development and formation of crown and roots.[3] After the age of 21 years, dental development is normally finished,[4] requiring age estimation by

means of morphological parameters. These parameters include attrition, reduction of the pulp chamber and root canals after the deposition of secondary dentin, periodontosis, cementum apposition, root resorption and translucency.[5]

The assessment of secondary dentin with periapical radiographs of the permanent teeth is one of the approaches for dental age estimation of adults. Methods based on this parameter have been proposed since the 50's and have been tested in populations worldwide,[6] such as Brazil. Examples of radiographic methods for dental age estimation of adults considering the deposition of secondary dentin are those proposed by Kvaal et al.,[7] Cameriere et al.[8] and Azevedo et al.[9] Application of dental age estimation of adults usually encompasses cases of alleged incorrect birth certificates jeopardizing legal registration for retirement, pension and other human rights. In these cases, Courts may request forensic examinations to rectify an official document.

The present study aimed to report a case of radiographic dental age estimation of an adult, considering the parameter of secondary dentin deposition, with the main purpose of legal rectification of a birth certificate.

CASE REPORT

In 2024, a man was referred to the local medicolegal institute for age assessment after a legal claim of misfiled (wrong registration) birth records. The purpose of the analysis was to clarify whether the individual was indeed 50 years old per his birth certificate or if he was older (age claimed: 61 years). The analyses based on sex were accomplished in combination between medicolegal examiners, forensic odontologists and anthropologists.

The external facial analysis highlighted dark brown skin color, black hair and eyebrows with sparse withe discoloration, several expression lines on the forehead and lower third of the face, ptosis of the upper palpebrae, black eyes with well-marked *arcus senilis* (a peripheral grayish band of the cornea) (Figure 1), scarred cleft lip on the right upper side.

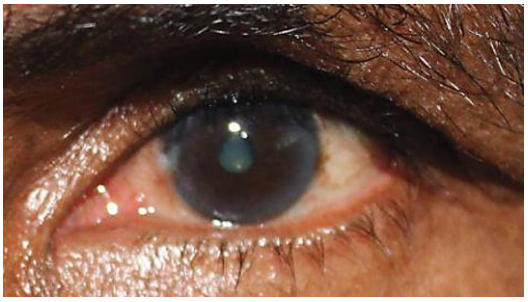

Figure 1 – Well-marked *arcus senilis* (peripheral grayish band of the cornea).

The intraoral examination revealed edentulous maxillary arch with cleft palate, and mandibular arch with root remains of the permanent central and lateral incisors (Figure 2), as well as slightly decayed permanent canines and mandibular right first premolar. The examinee was not wearing dental prostheses.

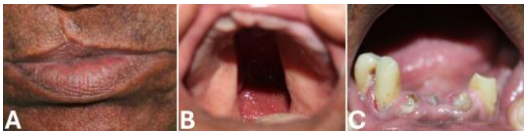

Figure 2 – Mouth with scarred upper lip (A), clef palate (B), permanent canines, mandibular right first premolar and root remains (C).

Based on the remaining teeth, the following dental age estimation methods were chosen: Kvaal et al.,[7] Cameriere et al.[8] and Azevedo et al.[9] Hence a periapical radiograph of the mandibular right permanent canine and premolar was obtained (Figure 3).

Figure 3 – Periapical radiograph of the right mandibular permanent canine and first premolar.

The method by Kvaal et al.[7] considered original six horizontal and three vertical measurements performed on the periapical radiograph of the permanent mandibular right canine and the mandibular first premolar (Figure 4). The method by Cameriere et al.[8] considered the pulp/tooth area ratio of the mandibular premolar (Figure 5), in which the outline of the pulpal space and the tooth are measured and imported into the authors' original formula for age calculation. The same rationale was considered in the method by Azevedo et al.,[9] but the tooth of choice is the permanent mandibular canine.

After the radiographic analyses of the teeth, the estimated age for the three methods were: Kvaal et al.[7] = 60.44 years for the permanent mandibular canine and 66.18 years for the mandibular first premolar; Cameriere et al.[8] = 59.98 years, and Azevedo et al.[9] = 64.93 years.

The outcomes of the dental age assessment were combined with the medicolegal examination and anthropological assessments to conclude that the individual was (at least) about 10 years older than the age pointed out in his birth certificate.

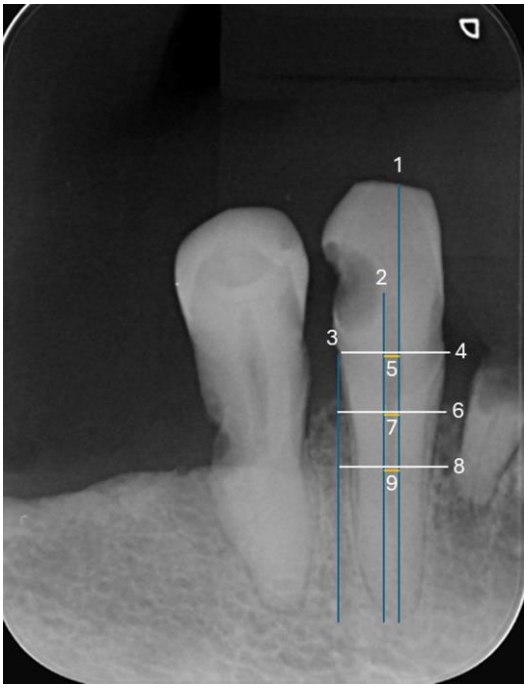

Figure 4 – Measurements performed for dental age assessment using the method by Kvaal et al.,[8] being: the maximum tooth length (1), maximum pulp length (2), and root length (3), followed by the root width at cementum-enamel junction (4), pulp width at cementum-enamel junction (5), root (6) and pulp (7) width midway between measurements 4 and 8, and root (8) and pulp (9) width midway between apex and cementum-enamel junction.

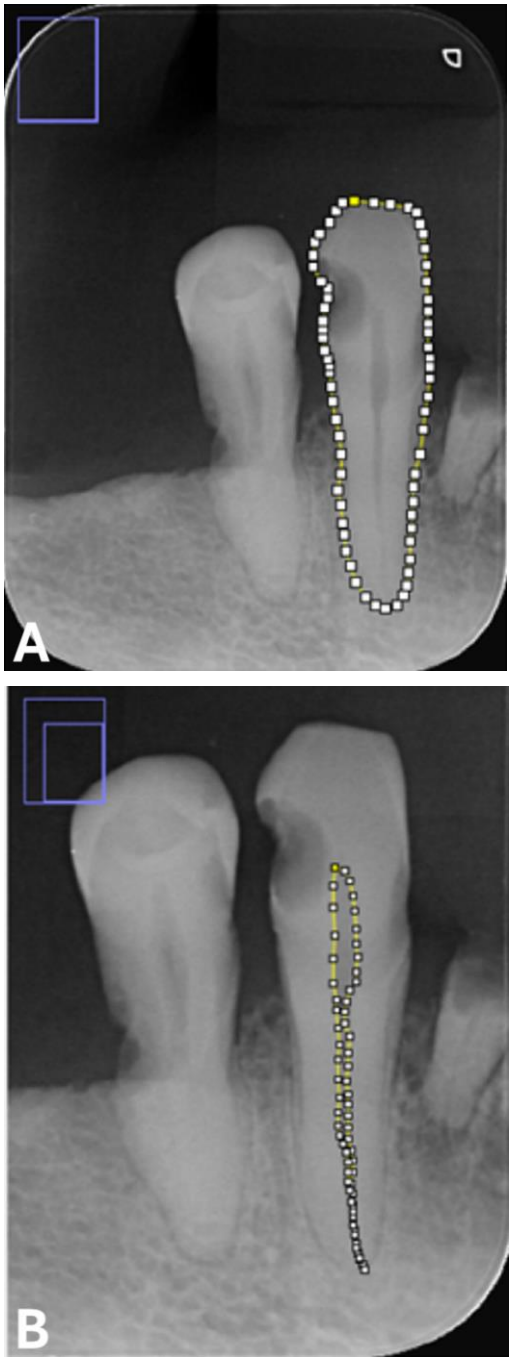

Figure 5 – Area of the tooth (A) and area of the pulpal space (B) measured on the radiograph to calculate age using the methods by Cameriere et al.[8] (premolar) and Azevedo et al.[9] (canine).

DISCUSSION

This is a case in which forensic odontology, aided by radiology, proves its applicability to help Justice. Rectification is a legal procedure[10] common to societies that recognize the importance of human rights. Moreover, by assuring rectification, the legal system guarantees human rights to the elderly. It must be noted that situations like this normally occur in countryside regions in which the access to legal registries are more difficult and where families have low education and socioeconomical conditions. In these circumstances, the register of birth may be delayed for years. On the other hand, there is also the possibility of truly man-made misfiled records during the registration of a person. Both situations justify the need for legal rectification.

One of the positive aspects of dental age estimation in adults is the possibility of assessing age from several parameters even with scarce number of teeth, such as a single tooth.[8] In this case, a permanent canine and a first premolar were decisive to enable the application of three methods for dental age assessment. The parameter of choice, in this case, was the deposition of secondary dentin and the subsequent reduction of the pulpal space because this parameter can be analyzed radiographically and non-invasively.[7-9]

Another positive aspect of this case was the fast application of the dental age estimation methods. All the methods were feasible from a periapical radiograph of the available teeth.[7] This type of equipment may be found in less developed facilities and is low-cost. The application of the methods, however, might not be simple for first-timers. The radiographic analysis of the human teeth requires knowledge of dental age estimation methods that are usually taught in advanced training courses, such as specialization and master courses in forensic odontology. Moreover, the is the

need for knowledge in dental anatomy, which is often taught at undergraduate level and revisited in continuous education programmes.

The difficulties behind these methods rely on the status of the available teeth. Canines stand out,[9] in this context, because they are robust teeth that can resist trauma and decay throughout life. The teeth used in this study were not fully intact since cavities could be observed. However, they were the only part of the scarce resource of morphological dental information for age estimation. Whenever available, intact teeth should be preferred. In addition to the teeth, other physical and skeletal information can be considered and combined to forensic odontology to assure a more comprehensive approach practice. This is because age assessment is a multidisciplinary tool with interface between many fields in forensic sciences.

FINAL CONSIDERATION

Oral imaging has its forensic applications in the field of dental age estimation. Radiologists and forensic experts must be aware of the existing dental age estimation methods to help Justice whenever necessary and feasible. The reported case illustrates and corroborates the utility of intraoral radiographs when age related evidence is scarce.

RESUMO

Introdução: A estimativa da idade dental pode ser útil em cenários criminais e civis. Dentre as aplicações civis da estimativa da idade dental em adultos está a retificação de documentos legais, como certidões de nascimento. Nesse contexto, a retificação é necessária quando os registros de nascimento são tardios ou arquivados incorretamente. O exame radiográfico dos dentes pode ser útil por permitir uma análise não invasiva e não destrutiva de parâmetros relacionados à idade, especialmente a deposição de dentina secundária e a consequente redução do espaço pulpar. Este estudo relata um caso de estimativa da idade dental aplicada à retificação de certidão de nascimento. Relato de Caso: Um homem adulto, planejando sua aposentadoria, alegou ter 11 anos a mais do que sua idade cronológica registrada (50 anos). O indivíduo foi encaminhado ao Instituto Médico-Legal Estadual para a realização da perícia, a fim de auxiliar a decisão judicial sobre a necessidade de retificação do registro de nascimento. Foram aplicados três métodos radiográficos não invasivos de estimativa da idade dental para adultos. Um dos métodos baseou-se em medições lineares do canino inferior direito e do primeiro pré-molar permanente, enquanto os outros dois consideraram a razão entre a área da polpa e a área do dente medida na radiografia. Conclusão: Os métodos indicaram que o indivíduo tinha entre 60 e 66 anos, confirmando sua alegação inicial. Combinada com exames médicos e antropológicos, a estimativa da idade dental contribuiu para um caso de retificação documental.

PALAVRAS-CHAVE

Odontologia legal; Radiografia; Dentes.

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