

## DENTAL AGE ESTIMATION IN CHILDREN, ADOLESCENTS AND ADULTS

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### ABSTRACT

Age estimation, using forensic odontology, is a crucial step for biological identification and it plays an important role in pediatric and orthodontic dentistry, pediatric- endocrinology, archeology, paleo stomatology and in forensic dentistry as well.

Nowadays, we can use numerous methods for estimating age in various stages of life using dentition. It's very important to know that methods were developed based on the relationship between age and characteristics of tooth structure to assess the age in children and adults and which are most commonly used.

In this study we wanted to present reasons for age estimation as well as the different methods we can apply in the age assessing process.

Key words: age estimation, dental age estimation, methods for age estimation

**Key words:** hypersensitivity, toothpaste, pro-arginine

## Introduction

Forensic Odontology is the part of dentistry which does have the fundamental role to deal with the proper handling and examination of dental evidence, and also to present the proper evaluation as well as the proper dental findings. Forensic means "court of law" in Latin language, while odontology refers to the study of teeth. [1]

The persons' identity may be established by assessing one's age, which is a procedure accepted by many anthropologists, archaeologists and forensic experts. [2]

Age estimation plays an important role in pediatric and orthodontic dentistry, paediatric-endocrinology, archeology, paleo stomatology and in forensic dentistry as well. [3, 4, 5, 6, 7]

Today, many cases such as unidentified cadavers, human remains as well as the number of remains lacking age documentation, require age determination. [8] This requires age estimation, not only for differentiating the juvenile from the adult status in criminal law cases, but especially to determine the age of a crime victim. There are requires for chronological age estimation in relation to school attendance, social benefits, employment and marriage as well [8, 9] Furthermore this procedure is necessary to be done in the cases of the state administration (adoption, motorcycle driver license, passport release etc. [10], and also when patient suffer from amnesia. [6]

Also, as the consequence of economic globalization and European integration, the number of immigrants increase in the countries with high living standard, which implies the dental age determination of the incoming population through orthopantomogram analyses. [11,12]

The UN Protocol to Prevent, Suppress and Punish Trafficking in Persons, especially Women and Children (2000) definition of human trafficking implies the exploitation of a person by means of the threat or use of force. The most recent reports state that trafficking victims were identified

in 124 countries (2010–2012) what is considered like the global issue.

There is a different motivation for people trafficking, including: sexual exploitation, forced labor in, for example, catering, domestic servitude, textile production, construction, forestry, mining, forced military recruitment, begging etc. and involved victims are usually originating from less developed countries.

Children are vulnerable to trafficking and they are also involved in criminal activities, often with no proper identity documents. [13]

According the UN guidelines the different age groups take over the different kind of law responsibility. It implies the correct age of subject have to be assessed.

The interest in the age assessment of living young persons with no birth certificates are available, is not a recent phenomenon and does have a long history. For example, in ancient Rome adolescents were considered mature enough to be involved into military service, as soon as their second molars had fully emerged. [14]

In England's history there is also one of the well-known attempts using teeth as the indicator of age where juvenile work and criminality were serious social problems when dentist Edwin Saunders, was the first to publish information regarding dental implications in age assessment by presenting a pamphlet entitled „Teeth A Test of Age“ to the English Parliament in the 19 th. century. [15]

Age estimation is a complex and challenging task. It's the main aim is to find the best optimal method for legal, medical age estimation which is in the same time simple, reliable and reproductive, that can be applied in both, living and in the deceased persons as well. [15]

There are many various methods for age estimation today. Andre Luiz Bergamo et al. (2016) in their extensive investigation made conclusion that the techniques based on the relationship between age and characteristics of tooth structure to estimate the age in children and adults are developed and most commonly used. [16]

So, dental age estimation methods may be classified as:

1. According to the degree of development of the dentition:
  - Methods applied to the forming dentition
  - Methods for the adult fully formed dentition.
2. According to the technique of investigation:
  - Clinical or visual
  - Radiographic
  - Histological
  - Physical and chemical analysis.

Then, methods to be employed in dental age determination using dentition can be grouped into 3 phases:

1. Age estimation in prenatal, neonatal and early postnatal child
2. Age estimation in children and adolescents
3. Age estimation in adults.

In the literature we can find description of several techniques addressing age determination in adults. Different methods are classified into three categories: morphological, biochemical as well as radiological methods. [15, 16, 17]

We can also make difference between non-invasive and invasive methods in the process of age assessment in permanent dentition:

1. Non-invasive methods:
  - Age assessment using Gustafson and Koch method
  - Age assessment using Schour and Massler method
  - Age assessment using third molar development
  - Age assessment using physiological changes of the teeth structure during the period of use (chromogenic changes of teeth, attrition, periodontal destruction, apposition of secondary dentin and/or cementum).

2. Invasive methods:

- Age assessment using Gustafson method
- Age assessment using quantification of tooth cementum annulation
- Age assessment using aspartic acid racemization. [14]

When we talk about age of person, we make distinction between biological, chronological and dental age. [18]

In many cases, chronological age and biological age may not to be same, because of their developmental variations. [15] And it is well known that somatic development is connected to chronological age. [19]

The most commonly used developmental indicators include:

- Tooth development and eruption- Dental age
- Skeletal maturity- Skeletal age
- Sexual development- Sexual age
- Body height and weight [19,20,21]

Some investigators have suggested the applicability of the bone age determination method, while others choose advantages of the dental age determination method. They underline that teeth mineralization is less affected by external factors. Yet, many authors have advocated to combine both type of methods in different populations. [22] Also, dental maturity is more relevant in comparison to the teeth emergence into the oral cavity, so it is less affected by nutritional and endocrine status. [15,23]

Teeth represent useful material for age estimation [8, 24] as being the most resistible structure in the human body able to survive every disaster such as fire accidents, bomb blast, plane crashes, mass disasters etc. [25] So, everyone have to be aware of dental evidence importance for forensic age determination procedures. [26]

Moreover, dental post-mortem data can help us in predicting the age of person from approximately 18-20 weeks in utero until the last tooth is lost. [26]

In the line with recommendations suggested by the international and interdisciplinary Study Group on Forensic Age Diagnostics established in 2000., in Berlin, every expert's finding should comprise three independent evaluations by forensic experts in the relevant disciplines:

- Clinical examination- the recording of body measurements and an evaluation of signs of sexual maturity.
- Skeletal examination- X-ray examination of the left hand.
- Dental examination- dentition status and evaluates on orthopantomogram. [12, 30, 31, 32]

Methods for age estimation in children and adolescents include:

1. Schour and Massler's method (1941)
2. Nolla's method (1960)
3. Morrees, Fanning and Hunt method (1963)
4. Demirjian's method (1973)
5. Open apex method (Cameriere method)
6. 3rd molars [1]

We can assess the dental age amongst children with greater accuracy, so many teeth are undergoing development and calcification simultaneously. But this accuracy is in descending with the completion of a person's dental development. [6, 24, 26]

Although development process of teeth is one of the most valuable biomarkers for age estimation in childhood [27], age estimation is especially difficult after the age of 14 because all of the teeth, except unerupted ones, are in the process of completing their apical formation, in 16 or 17 years. [28] So, the third molars are staying to continue maturing to later age only. [26]

Furthermore, according the suggestions of Study Group on Forensic Age Diagnostic, one essential criterion for dental age assessment is the evaluation of third molar mineralization and eruption. [12, 29, 30, 31]

„Dentes sapientes“ show the greatest frequency of agenesis, also their variations in shape, size, position, time of maturation and time of eruption and tend to appear earlier in males than females. [32, 33] Robinson (1993.) described these characteristics of third molars with this aphorism: „The only thing we can predict about a third molar is its unpredictability.“ [34]

Although the third molars show great variability in their dentition, they stay like the most reliable biologic indicator available for age determination during the middle teens and early twenties, [6, 33] because they are the latest teeth to initiate and complete development. [26, 34]

## Conclusion

There are many different methods for age estimation today. But age estimation is a complex and challenging task so it's the main aim is to find the best optimal method for legal, medical age estimation which is simple, reliable and reproducible and that can be applied in both, living and in deceased persons as well.

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