

THE THIRD MOLAR – A DENTISTRY TOPIC REQUIRING AN INTERDISCIPLINARY APPROACH

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A statistical analysis of the main formation and development characteristics of the third molar was performed on an extended population sample of 1100 people, aged between 5 years and 6 months and 18 years and 6 months at the beginning of the study.

During research we investigated the average chronological age and maximum variation for the beginning of the third molar's tooth bud formation, gender related variations, upper vs. lower jaw differences. The third molar was investigated from the perspective of a potential source of pathology and as an active therapeutic aid.

Being a tooth with possible influences in all dental medicine specialities, an interdisciplinary diagnostic and therapeutic approach is considered necessary in order to evaluate the third molar's potential as an aetiological factor of dental pathology (orthodontic, surgical, dental, periodontal) or as an active therapeutic element to compensate the absence of neighbouring or more distant teeth.

Key words: Third molar; Tooth formation; Interdisciplinary treatment.

INTRODUCTION

The definition of the morphological characteristics of the contemporaneous man is one of the requisites for therapeutic success in medical practice. Knowledge of the present particularities of the dento-maxillary system by itself and within the head as a whole is essential not only from an anatomic or anthropologic perspective, but also for the etiopatogenic explanation and for the therapeutical approach of the dental conundrum, ubiquitous in the contemporary human.

In the historic moment corresponding to the last decades, even centuries, the main pathological entities confronting dental medicine are: tooth decay, periodontal disease, growth and development discrepancies of the dento-maxillary system.

The increased incidence of dental and dento-maxillary disorders is not only the consequence of an inadequate therapeutical approach – prophylactic or curative –, but also of the particular phylogenetic

and ontogenetic characteristics of the cephalic extremity for most human populations in the Modern Age :

- cephalisation process – dimensional decrease of the visceral part of the cranium in favour of the neural part;

- phylogenetic reduction of the number and dimensions of the teeth, of the jaws;

- different rhythm of dimensional reduction for teeth and jaws;

- decrease of the muscular activity in the dento-maxillary area ;

- food habits modification;

- populational outcrossing, endogamy being a more isolated behaviour, of some specified social groups, classes, or ethnicities^{1,2}.

In this context, the third molar holds a particular status within the dento-maxillary system, due to its formation, development and evolution particularities, being an exponent of the inevitable interaction of phylogeny, ontogeny and the historical, social, economical and cultural features.

MATERIALS AND METHOD

Phylogenetic tendencies in the evolution of the dento-maxillary system – reduction of the number and dimensions of the teeth, delayed eruption, dimensional decrease of the jaws, muscle activity reduction – are most often displayed at the level of the third molar, last tooth of the molar group

The speciality literature contains numerous research projects regarding the third molar's formation and development in the modern human, investigating:

– actual tooth formation, formation age, development timeline, eruption time, eruption abnormalities, form, number, eruption abnormalities, left vs. right side differences, gender, race and cline differences.

We considered necessary to conduct a study on the contemporary Romanian population to provide up to date information regarding the third molar's formation and development, as well as the dental and general medical pathology generated by this tooth. For this purpose, we assembled a sample of 1100 patients, representative for the population analyzed, people who requested treatment for Orthodontic or General Dentistry problems. Case selection was performed in order to obtain a representative sample for the studied population.

Most patients were treated in the Orthodontics Department of the University of Medicine and Pharmacy "Carol Davila" Bucuresti, during 10 academic years. For each case, third molar investigation was performed by examining orthopantomograms, and in some cases also profile radiographic cephalometry, posteroanterior radiographic cephalometry, computed tomography and three-dimensional image analysis.

The research sample subjects were grouped by age groups, each correspondent to a chronological year. 13 age groups were formed: 6 years, 7 years, 8 years, 9 years, 10 years, 11 years, 12 years, 13 years, 14 years, 15 years, 16 years, 17 years and 18 years, each containing subjects whose age was up to 6 months before or after the respective chronologic year (e.g.: subjects aged from 6,5 to 7,5 years of age constituted the 7 years group).

RESULTS AND DISCUSSION

Aspects of the formation and evolution of the third molar

Within the human dentition, consisting of 20 deciduous teeth followed by 32 permanent teeth, the two upper third molars and two lower third molars are the last formed teeth, within a large chronological distance to all other teeth.

Compared to all the other permanent teeth, whose formation and eruption are completed by 12–13 years of age, the development timeline of the third molar is as follows⁵:

– tooth bud formation – 4–5 years of age ;

– initial mineralization – 7–9 years of age ;
– end of crown mineralization – 12–15 years of age;

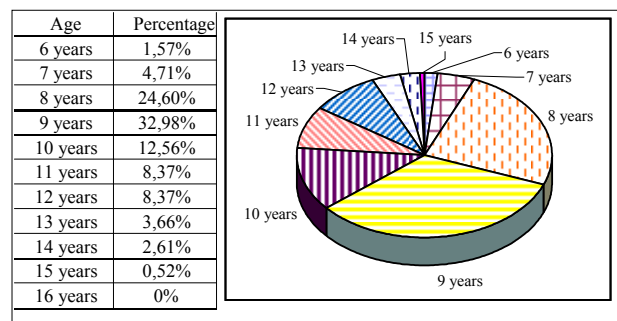
– tooth eruption – 17–21 years of age;

– root formation completed – 18–25 years of age.

The results of our study indicate the average age for radiological observation of the third molar's bud, corresponding to the beginning of calcification, to be 9 years and 5 months. The earliest forming bud was observed in a 5 years and 8 months subject, and the latest in a 15 years 3 months subject.

Table 1

Percentage distribution of the investigated sample by age groups at third molar initial mineralization stage.



The comparative statistical analysis of the age at which the third molar's bud appears at the maxillary and mandibular level did not show any significant differences.

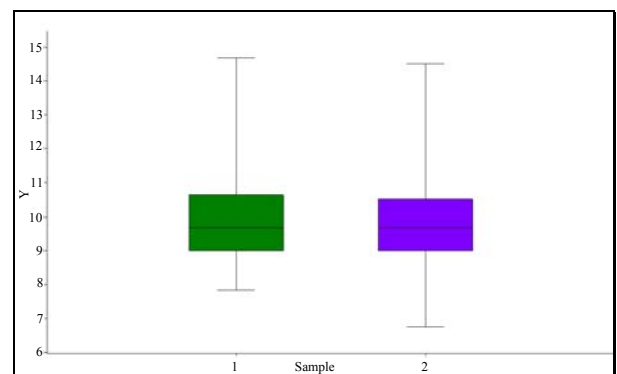


Fig. 1. Comparative statistical analysis upper / lower jaw for the first stage of third molar formation.

Instead, there is a gender distinction in third molar formation, this being more precocious in female subjects:

– the average age for third molar appearance is 9 years and 3 months in girls and 9 years and 10 months in boys.

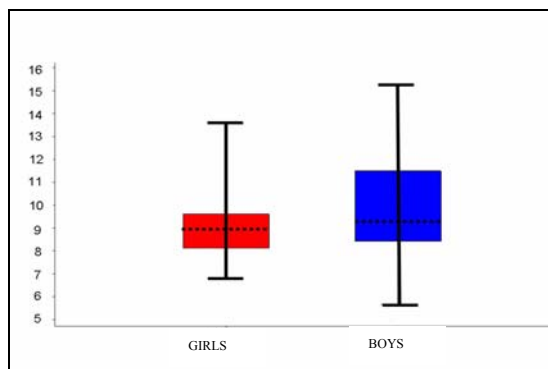


Fig. 2. Comparative statistical analysis girls / boys for the third molar formation age.

The pre-pubertal growth peak was found to have no influence on the third molars' growth for neither of the genders.

As regards phylogenesis, the findings regarding abnormalities noted at the third molar's level are of interest. Most of the published literature acknowledge that third molar anodontia occurs in 7–26% of the Caucasian population⁴. The overall frequency of third molar anodontia found in our research is 10,6%. Anodontia of two or more third molars usually involves homologous teeth. We also observed that the existence of third molar anodontia increases the risk of anodontia in other groups of teeth. Supernumerary teeth in the retro-molar area (atavism – resembling the dental formula of the first mammals, which included four molars²) were found in 0,18% of the cases.

Most authors affirm that third molars have the highest variability in terms of form, dimensions and eruption pattern³. Most frequently, the upper third molar's crown is undersized and the upper third molar's crown is oversized, while roots are short and insufficiently developed, more or less malformed. The frequency of third molar microdontia in the studied sample is 2,72%, 95% of the teeth involved being located in the upper jaw.

Eruption disorders are also particular for the third molar: eruption in various malpositions, or bone retention – incomplete or total. The final position of this tooth is the result of cumulative causes: the third molar's formation and development characteristics, the regional growth characteristics of the areas in which it develops. The bone growth is incriminated especially in the mandible, where the third molar is developing in the space between the second molar and the anterior ridge of the ramus, frequently reduced due to the skeletal growth deficit. The lower third

molar displays the most frequent retention situations.

Upper third molar retention is also frequent, although less often compared to the lower; the obstacle is not bony, but musculo-ligamentar.

Most complications generated by third molars are linked to it's retention, either incomplete or total.

The third molar: aspects of dental pathology

The third molars are frequently a source of pathology in the dento-maxillary system, the lower one being more often cited in connection with eruption accidents. The pathology is generated either during eruption or while remaining in retention. There are four categories of complications:

- infection: result of the infection of the dental follicle (pericoronaritis), extended in surface (mucous complications), extended in-depth (sinusitis), or extended to a distant site (limph node inflammation, flebitis);
- tumor: cysts, rarely odontogenic tumours – mainly benign pathology;
- nerve impairment: pain, very frequent during eruption, perceived either as localized retro-molar pain or as difuse pain in the trigemen nerve, radiating towards the ear, other teeth, the whole side of the face;
- mechanical complications: due to the malpositions of the totally/partially erupt or retentioned third molar, disturbing adjacent or distant structures (lesions of the mucous cheek membrane, second molar decay, second molar's distal root resorption, temporo-mandibular disorders.

The third molar becomes an important source of surgical, periodontal or dental pathology, all these complications being triggered by third molars malpositions, either retained or erupted.

Our research revealed a high frequency of axial modifications at this level:

– the upper third molar can be disto-inclined (DI – 72.7%), have a vertical axis (V – 16.3%), mesio-inclined (MV – 10%), horizontal (– 10%);

– the lower third molar was found: in the ramus, mesially inclined (VMI – 56.08%), in the angle formed between the anterior ramus ridge and upper ridge of the mandibular base, mesially inclined (UMI – 37,41%), in the mandible base, mesially inclined (OMI – 5.76%), in the mandible base, vertical (OV – 0.75%).

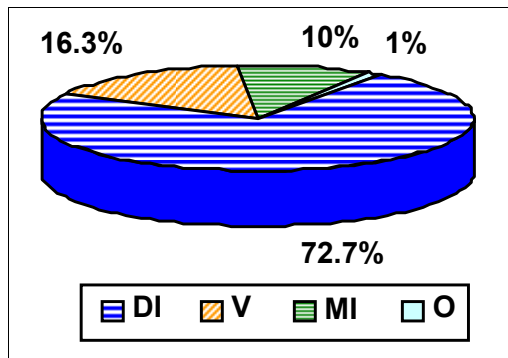


Fig. 3. Percentage distribution of upper third molar bud positional variations.

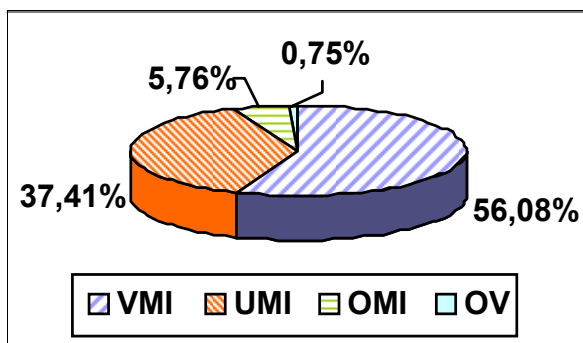


Fig. 4. Percentage distribution of lower third molar bud positional variations.

Malpositions are frequently favored by the lack of alveolar space necessary for its development and eruption.

The third molar in orthodontics: potential problems; resources

The specialty literature contains an abundance of studies on the orthodontic implications of the third molar, the subject being of concern even since the XIX century, when Robinson (1859) wrote: "The third molars are frequently the immediate cause of teeth irregularity"⁶. There are many facets to the role of the third molar in orthodontics, and accordingly within dento-maxillary disorders.

On one side, it is a source of orthodontic pathology, potentially generating frontal crowding, especially in the lower jaw, malpositions of the second molar, relapse after orthodontic treatment completion. On the other side, the third molar can have an active therapeutic role in all clinical situations with absence of other teeth, independent on the etiology: loss of teeth following decay complications, hypodontia / oligodontia, trauma, dental iatrogenesis, extraction following orthodontic indication.

The active role of the third molar – mesial displacement and edentulous spaces length reduction – was found in 10.6% of the total number of third molars of the investigated subjects. Based on the etiology, edentulous spaces distribution within the investigated sample is as follows:

- 6.4% cases – first molar extraction or early loss;
- 2.3% cases premolar hypodontia (not including extraction following orthodontic indication);
- 1.5% other hypodontia (lower central incisor, upper lateral incisor) requiring third molar preservation and even its therapeutic aid;
- 0.4% second molar extraction following orthodontic indication, always conditioned by third molar presence.

The foremost value of the third molar – for the actual Romanian population at least – resides in its therapeutic value in the first molar loss, frequent consequence of decay pathology. The otherwise neutral or even pathogenic factor, the third molar becomes a "biological reserve", with favorable influence on the general dental situation.

CONCLUSIONS

Within the dento-maxillary system, the third molar is the element most frequently subjected to variations – as regards morphological characteristics, its pathological or therapeutic influences. This diversity of choices requires the interdisciplinary evaluation of the third molar's potential as prophylactic or curative aid. Regardless of his specialization, the doctor must assume an expectative attitude towards the third molar and approach it either as source of pathology or biological resource offered within a certain timeframe by the dento-maxillary system.

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