Presumed Chronological, Developmental and Clinical Classification of Human Dentitions

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Abstract: Diphyodont, including man, have traditionally two dentitions the deciduous and permanent. The significances of the presence of two dentitions may lie behind the fact that once the teeth have been developed, they are unable to grow, by the common sense of the word. Since the individual organs and tissues grow by time and the jaws also do, therefore, other generation of dentition is needed to match the new situation, that is, the permanent dentition. However, this typing of dentition into two sets is oversimplified and nonindcative for the condition in which the teeth are variably represented. It also, does not exhibit the different and definite cases by which the teeth are expressed. Taking these drawbacks into consideration, a presumed classification has been presented indicating the developmental, clinical and chronological situations of the different sets of dentitions. The presumed classification may be valuable not only for pedagogic purposes but also for the developmental and clinical studies.
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Principles of classification

The human dentition may have two sets, three phases and two conditions which may be indicated as follow:

1 - The two sets are the deciduous and permanent dentitions.

2- The period of time for the existence of each set of dentition is not sharply distinct from the other, However, both dentitions partly share a common period is termed the phase of mixed dentition. In this phase, some of the deciduous teeth and some of the permanent teeth simultaneously exist.

3- Each set of dentition tends to be only present at a certain period of time before or after the phase of mixed dentition. Therefore, the time consumed from the start of deciduous teeth development to the beginning of the permanent teeth development, in which the deciduous teeth predominate, is termed the phase of pure deciduous dentition. Also, the time elapsed between the exfoliation of the last deciduous teeth to the loss of all permanent teeth, in which the permanent teeth predominate, is termed the phase of pure permanent dentition.

4- In respect to the condition by which the teeth exist, the distinction whether the teeth are present intraosseously inside the jaw crypt or appearing in the mouth is determined. The former situation is termed the *developmental condition* while the latter is termed the *clinical condition*.

5- The nomenclature of *developmental dentition* denotes the period of time starting with the commencement of enamel organ development and terminates with the complete root formation. The observation of this variant of dentition can be partly determined either by radiographic or by postmortem investigations for the unerupted developing teeth and for the growing root of the teeth which have already erupted. However, the teeth in this variant of dentition continue their root development following the eruption event.

6. The nomenclature of *clinical dentition* denotes the period of time starting by the eruption of the crown in the mouth until the ultimate tooth loss. The disappearance of the teeth may occur either physiologically by exfoliation or due to the various environmental influences. The observation of this variant of dentition can be determined clinically, as its name implies, by the nacked eyes.

7. The accounting for the time consumed either for the beginning of certain event of odontogenesis, was considered for either the deciduous or permanent dentition as a whole. For instance, it is accounted by the time elapsed from the commencement of enamel organ development of the firstly formed teeth in deciduous dentition, that is, the incisor teeth at about 7 WIU to the lastly developed enamel organ of the maxillary second deciduous molars at about 9 WIU.

The same also was done for accounting the time for the root completion, where the first completely formed roots are those of deciduous incisors at about 1.5 year of age and the last completely formed roots are those of the deciduous second molars at about 3 years of age. So that the time consumed for the developmental deciduous dentition is about 2-3.5 years of age. The same was also followed for the time

consumed with the developmental permanent dentition which may figure about 10.5-16 years of age. The same strategy was also followed for the time consumed with the developmental permanent dentition which may figure about 10.5 -16 years of age.

Classification of human dentitions

The various human dentitions, presumed through the present study, can be mainly classified into chronological and typal ad eitherone has its proper characteristics as follow:

I. Chronological Classification

1. Developmental dentition: it is concerned with the completion of development of either set of teeth, whether they are deciduous or permanent. The developmental dentition would be accounted from the time of start of development of the firstly formed enamel organs in either set of teeth until the time of root completion. This is based on the last tooth to end its root development in that set.

a) Developmental deciduous dentition: it begins with the development of enamel organ of the deciduous teeth at 7-9 WIU in their crypts inside the jaw. However, by 1.5-3 years of age the roots of all the deciduous teeth have been completely developed. So, the developmental deciduous dentition may consume about 2- 3.5 years, that is, the time required for completing the development of all deciduous dentition.

b) Developmental permanent dentition: it begins with the development of enamel organ of the permanent molars at about 4 MIU - 4 years in their crypts inside the jaw. However, by the time from 10-25 years of age, all the permanent teeth have completely developed their roots. So that the developmental permanent dentition may consume about 10.5-16 years, that is, the time required for the complete development of all permanent dentition.

2. Clinical dentition: it is concerned with the period of appearance and maintenance of either set of teeth in the mouth. The clinical dentition, therefore, would be accounted from the start of teeth eruption until their loss by the shedding of deciduous teeth or the extraction of permanent teeth for whatever reason. This can be recorded *clinically* in a contradistinction to the developmental dentition which can be recorded *radiographyically* or by the *postmortem investigation.*

a) Clinical deciduous dentition: it begins by the eruption of mandibular central deciduous incisors at 6-8 months of age, and the second maxillary deciduous molars at 30 month of age. It ends by about 11 years of age; the time of exfoliation of the last deciduous teeth, that is, the maxillary canines. So, the clinical deciduous dentition may consume about 10.5-8.5 years, that is, the time the deciduous teeth are physiologically represented or remain in the human mouth.

b) Clinical permanent dentition: it begins by the eruption of the first permanent molars at about 6 years of age, and ends by the loss of all permanent teeth. However, no definite time can be recorded for the end of the clinical permanent dentition.

II. Typal classification

1. Pure dentition: it refers to the exclusive presence of a certain set of teeth, that is, the deciduous or permanent dentition. The pure developmental dentition only exists in case of the deciduous teeth.

a) *Pure developmental deciduous dentition:* it begins by the development of the deciduous incisor – molar enamel organs at about 7-9 WIU to the commencement of development of the first permanent molar enamel organs at about 4 MIU. Through these two months, intervening these chronological events, only the deciduous enamel organs are seen developing intraosseously in the jaw. Therefore, the time consumed by this variant of dentition is about 2 months..

b) Pure clinical deciduous dentition: it begins by the eruption of deciduous incisors at about 6-8 months of age and ends by the eruption of the first permanent molars at about 6 years of age. So, the pure clinical deciduous dentition may consume about 5.5 years, that is, the time thorugh which the pure deciduous dentition only appeared in the mouth.

c) *Pure clinical permanent dentition*: it begins at about 11 years of age when all the deciduous teeth are exfoliated by shedding of the maxillary canines, and continues until all the permanent teeth are ultimately lost.

2. Mixed dentition: it means the simultaneous presence of the two sets of teeth; the deciduous and permanent. Their existence, however, not only occurs clinically but can also be noted developmentally.

a) Developmental mixed dentition: since the developmental dentition is initially concerned with

the enamel organs development. So that the developmental mixed dentition begins at about 4 MIU. At which time, the enamel organs of the first permanent molars are starting their development while the previously developed enamel organs of all the deciduous teeth have already existed inside the jaw. The developmental mixed dentition ends by the complete root formation of the deciduous incisors – molar at 1.5-3 years of age. So that the time consumed for the developmental mixed dentition is about 2-3.5 years.

b) Clinical mixed dentition: it occurs as the child reaches the age of 6 years. At this time, the first permanent molars are clinically seen erupting distal to the second deciduous molars. The clinical mixed dentition continues to about the age of 11 years, where the maxillary deciduous canines exfoliate ending the phase of mixed dentition. So that this variant of dentition consumes about 5 years.

Problems resolved

(1) The nomenclature of the *developmental dentition*, in this classification, denotes and accounts the period of time starting with the commencement of development of enamel organ and ends by the complete root formation. The determination of this variant of dentition can be partly performed either radiographically or by the postmortem analysis, where the developing teeth are initially present intraosseously, and partly by the nacked eye following their eruption.

The eruption process may normally intervene between the commencement of enamel organ development and the root completion. So, through the time of developmental dentition, lying between the eruption and the root completion, the crown can be seen clinically while the relative amount of the root formed can be accounted radiographically. Theoretically, it is known that as the tooth erupts, about $^{1}/_{3}$ to ½ the normal root length may be formed and may be completed after the eruption of permanent teeth by about 3 years and after the eruption of deciduous teeth by about 1 year.

(2) The forementioned rule was being well applied for accounting the *developmental dentition*, that is , starting with the development of enamel organ and ending with the complete root formation. However, a problem has been encountered, that is, reflected with the incapability of the application of this rule in respect to the developmental mixed dentition as indicated in the following categories:

a) The commencement of the enamel organs development of the deciduous dentition coincides with that of the deciduous incisors at about 7 WIU while it occurs for the enamel organs of the permanent dentition, coinciding with that of the first permanent molars, at about 4 MIU. Thereby, it is apparent, from this presentation, that there is*unsharing period* between these two chronological ages (Fig.1). This periods, unfortunarely, can not be accounted in the domain or the expense of the mixed developmental dentition.

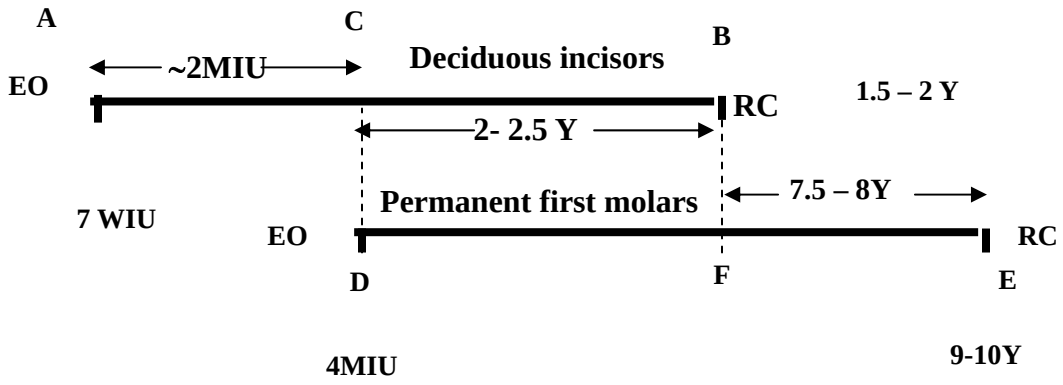

Fig. 1: diagram showing the *sharing periods of time* (2-2.5y) of deciduous dentition (C-B) with permanent dentition (D-F) during developmental mixed dentition. *Unsharing period of time* (A-C) for deciduous dentition occurs between deciduous incisor enamel organs development (A) at 7WIU to first permanent molar enamel organ development (D) at 4MIU. Other *unsharing period of time* (F-E) for permanent dentition occurs between deciduous incisors root completion (B) at 1.5-2 years of age to first permanent molars root completion (E) at 9-10 years of age. Enamel organ (EO) and root completion (RC).

CLASSIFICATION OF HUMAN DENTITIONS

CHRONOLOGICAL CLASSIFICATION

DEVELOPMENTAL DENTITION

It denotes the teeth formation from the development of the enamel organ to the root completion

1. **Developmental deciduous dentition**
- ☐ Begins by the development of incisor-molar enamel organs at about 7-9WIU
- ☐ Ends by the root completion of incisers-molars at 1.5-3Y.
- ☐ The time consumed is about 2-3.5 Y.

2. **Developmental permanent dentition**
- ☐ Begins, by the development of the first –thrid molar enamel organs at 4MIU-4Y.
- ☐ Ends by the root completion of the first-third molars at 10-25Y
- ☐ Time consumed is about 10.5-16Y

CLINICAL DENTITION

It denotes the appearance of teeth in the mouth which begins by the time of teeth eruption to their loss.

1. **clinical deciduous dention**
- ☐ Begins by the eruption of incisors –molars at about 6-30M
- ☐ Ends by the shedding of maxillary canine at 11Y
- ☐ Time consumed is at about 10.5-8.5Y

2. **Clinical permanent dentition**
- ☐ Begins by the eruption of the first molars at 6Y
- ☐ End by the loss of all the teeth.
- ☐ Variable time is consumed.

M: Month of age
Y: year of age
WIU: week intra-uterine
MIU: month intra-uterine

TYPAL CLASSIFICATION

PURE DENTITION

It denotes the exclusive presence of one set of teeth, either the deciduous or permanent

1. **Pure developmental deciduous dentition**
- ☐ Begins by development of incisor-molar enamel organs at about 7-9WIU
- ☐ Ends by development of the first permanent molar enamel organs at about 4MIU.
- ☐ Time consumed at about 2M

2. **Pure clinical deciduous dentition**
- ☐ Begins by the eruption of the deciduous incisors at about 6-8M
- ☐ Ends by the eruption of the first permanent molars at about 6Y.
- ☐ Time consumed is at about 5.5Y.

3. **Pure clinical permanent dentition**
- ☐ Begins as all deciduous teeth are exfoliated at about 11Y
- ☐ Ends by the ultimate loss of all permanent teeth.
- ☐ Variable time is consumed.

MIXED DENTITION

It denotes the presence of both the deciduous and the permanent teeth simulatneoulsy

1. Developmental mixed dentition
- ☐ Begins by the development of the enamel organ of the first permanent molar at about 4MIU
- ☐ Ends by the root completion of the deciduous incisors-molars at about 1.5-2Y
- ☐ Time consumed is at about 2-2.5Y.

2. Clinical mixed dentition
- ☐ Begins by the eruption of the first permanent molars at 6Y.
- ☐ Ends by the shedding of the deciduous maxillary canines at about 11Y
- ☐ Time consumed is at about 5Y.

b) The complete root formation of deciduous dentition, coincident with that of deciduous incisors, ends at 1.5-2 years of age. At which time, the roots of permanent molars, partly sharing the development of deciduous incisors, are not yet completely formed, where their root development completes at 9-10 years of age. Thereby, it is apparent, from this presentation, that there is *unsharing period* between these two chronological ages (Fig.1) This unsharing period, between these two chronological ages, can not be accounted in the domain or in the expense of the mixed developmental dentition.

These dual technical discrepancies were reconciliated by regarding the commencement of developmental mixed dentition, in which the deciduous and permanent dentitions simultaneously develop and share certain period of time, at about 4 MIU meanwhile, the end of root formation for this dentition occurs at about 1.5-3 years of age. This situation will simulate an exclusive exception to the forementioned rule for accounting of the mixed developmental dentition.

(3) In concern to the accounting of both the timing and the commencement of developmental dentition, which is designated to begin with the enamel organ development and ends by the complete root formation, two approaches have been arised:

• Firstly, *single representation concept*: it considered the start of the developmental deciduous dentition, for instance, with the time of development of the initially formed enamel organ of the deciduous incisor at about 7 WIU as a single representative for the initiation of the deciduous developmental dentition. However, this dentition is presumed to end with the root completion of the second deciduous molar at about 3 years of age. This concept may designate the chronology for the deciduous developmental dentition individually by marking the start of this dentition and its end with either the developmental events for a single tooth.

• Secondly; *dual representation concept* : it considered the beginning of developmental deciduous dentition, for instance, with the initially developed enamel organs of both the deciduous incisors group of teeth and the second molars group at about 7 and 9 WIU, respectively. With the same strategy, the consideration for the end of deciduous developmental dentition was followed. Thereby, the end of this dentition will be represented by the time of complete root formation for both the deciduous incisors and the second molars at about 1.5-2 and 3 years of age, respectively.

• The presumed classification presented, here in this study, has adopted the dual representation concept since it was the more inclusive and representative for the whole dentition in general.

(4) The accounting of time consumed by any variant of dentition is considered by recording the period of time elapsed between the two subsequent chronological events. For instance, hroughout the developmental deciduous dentition, the first chronological event is the development of enamel organ for the initially formed teeth, the deciduous incisors, is at about 7 WIU. The subsequent chronological event, that is, the root completion for these incisor teeth occurs at about 1.5 years of age. Accordingly, the time consumed for the developmental dentition is about 2 years. The same strategy was also used for both the deciduous molars and the developmental permanent dentition.

(5) In case of the *clinical permanent dentition*, while it is accounted to begin with the eruption of the first permanent molar, however, there is no expectation for the end /or loss of this dentition. This is due to the absence of an actual expectation for the end of clinical permanent dentition. Crucially, any of the environmental, endocrinal or genetic factors may be highly significant in the determination of the end of this dentition. These factors are variable between the different individuals and the various communities which certainly influence the timing of loss for the permanent teeth.

(6) Occasionally, some deciduous teeth may abnormally remain orally even after their proper time of exfoliation and so they are traditionally referred to as the *retained teeth*. In the extreme, early eruption of the permanent successors may also be encountered in association with the premature loss of deciduous teeth. All these instances are regarded abnormal departure from the ideal condition and are excluded from the present classification.

(7) Some deciduous teeth have shown a premature root resorption even prior to their complete root formation. Such situational discrepancy in the time of root resorption for deciduous teeth were coinciding with the complete crown formation for their permanent successors. This is based on the concept that the eruptive - resorptive dialogue which denotes and endorses the synchronism between the root resorption and the crown completion. That is to say that immediately after or in association with the crown completion, the root begins to form which per se is coinciding with the start of the pressure-resorption process where the crown of permanent successor contacts the root of deciduous predecessor.

(8) *The pure developmental dentition* exclusively exists in case of the deciduous dentition. In the extreme, no pure developmental permanent dentition does exist. This is due to the initiative and exclusive presence of the developing deciduous teeth while the permanent teeth initiate their development thereafter.

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