Lec:8 4th stage/2025 Dr. Baraa Al Rubai B.D.S, M. Sc.(orthodontics)

Deciduous and permanent dentition 2

Mixed Dentition period

(Around 6 years- 13 years) Most malocclusions make their appearance during this stage The mixed dentition period can be divided into:

1. First transitional period.
2. Inter-transitional period.
3. Second transitional period.

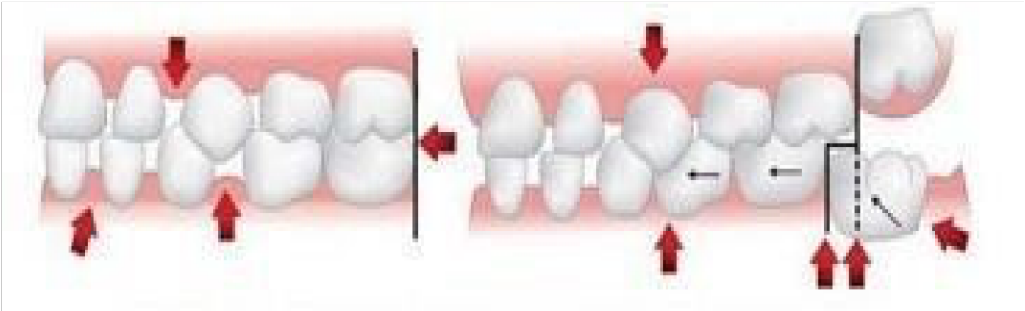
I. First Transitional Period

Emergence of the first permanent molars and transition of incisors. The following events take place during this period:

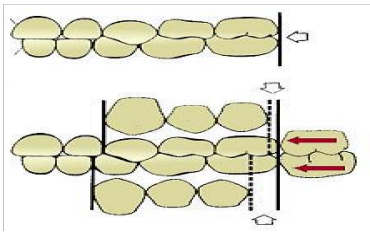
a. Eruption of Permanent First Molars

The first permanent molars erupt at 6 years. They play an important role in the establishing and in the functioning of occlusion, in the permanent dentition. Anteroposterior positioning of the permanent molars is influenced by Terminal plane relationship.

b. Early mesial Shift: Early shift occurs during the early mixed dentition period. Since this occurs early in the mixed dentition, it is called **early shift**, the eruptive force of first permanent molar push the deciduous 1st and 2nd deciduous molar to close the primate space. In a spaced arch, eruptive force of the permanent molars causes closing of any spaces between the primary molars or primate spaces, thus allowing molars to shift mesially.



c. **Late mesial Shift:** This occurs in the late mixed dentition period when the second deciduous molar exfoliate the first permanent molar drift mesially and use leeway space and is thus called **late mesial shift**. When the primary second molar are lost there is an adjustment in the occlusion of the first molar teeth, there is a decrease in arch length in both maxillary and mandibular arches as the first molar shift mesially this shift is more in mandible which accounts for the establishment of full cusp molar class I relation from flash terminal plane relationship in deciduous dentition this shift is called late mesial shift of molars.

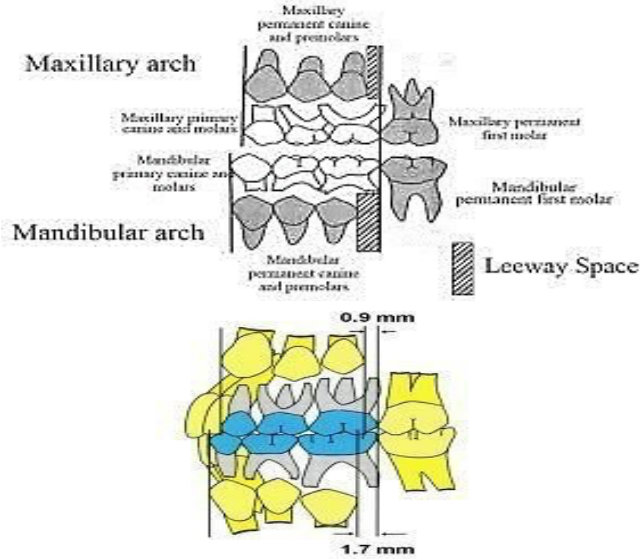


Leeway Space of Nance

Described by Nance in 1947 (the combined mesiodistal width of the permanent canines and premolars is usually less than of the deciduous canines and molars.

Maxilla: 0.9 mm/segment = 1.8 mm arch.

Mandible: 1.7 mm/segment = 3.4mm arch.



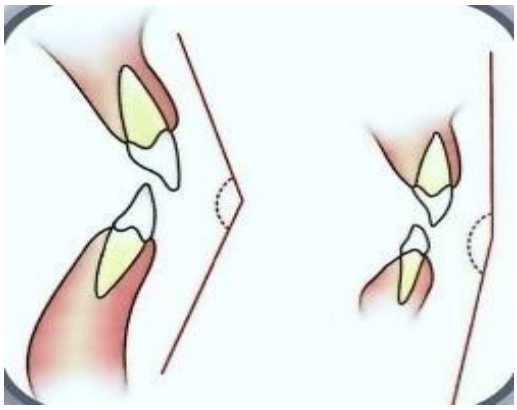
Exchange of Incisors:

Transition of permanent incisors which develop lingual to the primary incisors. For incisors to erupt in normal alignment, there is space requirement in the anterior part of both the arches which is termed as **the incisal liability** (permanent incisors is larger than deciduous incisors the difference between the amount of space needed for the incisors and the amount available for them) is overcome by the following factors:

1. Interdental physiological spacing in the primary incisor region. (4 mm in maxillary arch and 3 mm in mandibular arch)
2. increase in inter-canine arch width: Significant amount of growth occurs with the eruption of incisors and canines
3. Increase in anterior length of the dental arches: Permanent incisors erupt labial to the primary incisors to obtain an added space of around 2-3 mm, change in inclination of permanent incisors, Primary teeth are upright but permanent teeth incline to the labial surface and this increases the arch parameter.

Change in inclination of permanent incisors:

Primary teeth are upright but permanent teeth incline to the labial surface thus decreasing the inter-incisal angle from about 150° in the deciduous dentition to 123° in the permanent dentition This increases the arch perimeter.



II. Inter-Transitional Period

This is a stable phase where little changes take place in the dentition. The teeth present are the permanent incisors and first molar along with the deciduous canines and molars.

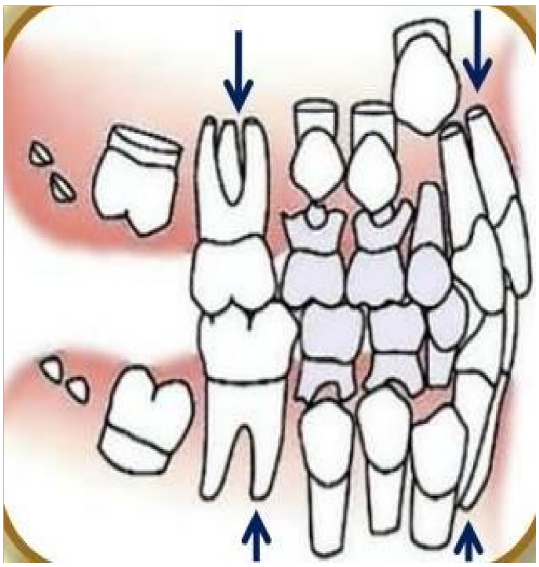
Some of the features of this stage are:

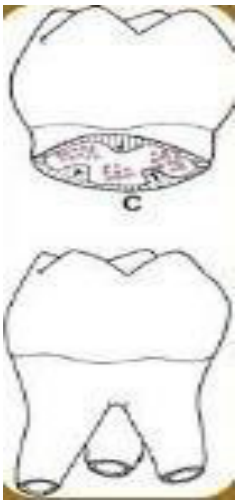
1. Any asymmetry in emergence and corresponding differences in height levels or crown lengths between the right and left side teeth are made up.
2. Occlusal and interproximal wear of deciduous teeth causes occlusal morphology to approach that of a plane.
3. Ugly duckling stage.
4. Root formation of emerged incisors, canines and molars continues, along with concomitant increase in alveolar process height.
5. Resorption of roots of deciduous molars.

it is a **silent period** extend from 8.5 years of age to IO years of age, this period is called (Lull period). In this period, the teeth present are:

6EDC21 12CDE6

This phase prepares for the second transitional phase.



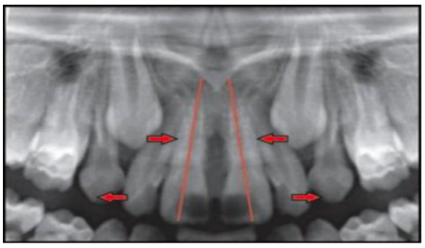


Ugly Duckling Stage (Broadbent's phenomenon):

Around the age of 8 - 9 years, a midline diastema is commonly seen in the upper arch, which is usually misinterpreted by the parents as a malocclusion. Its typical features are:

1. Flaring of the lateral incisors.
2. Maxillary midline diastema.

Crowns of canines on young jaws impinge on developing lateral incisor roots, thus driving the roots medially and causing the crowns to flare laterally, the roots of the central incisors are also forced together, thus causing maxillary midline diastema, with the eruption of the canines, the impingement from the roots shift incisally thus driving the incisor crowns medially, resulting in closure of the diastema as well as the correction of the flared lateral incisors.



Ugly Duckling stage

III. Second Transitional Period

This period is marked by the eruption of the four permanent second molar, establishment of proper occlusion, replacement of deciduous canines and molars by premolars and permanent cuspids, respectively.

The following events take place:

1. ***Exfoliation of primary molars and canines:***

At around 10 years of age, the first deciduous tooth in the posterior region, usually the mandibular canine sheds and marks the beginning of the second transitional period. Usually no crowding is seen before emergence except maybe between the maxillary first premolar and canine.

2. ***Eruption of permanent canines and premolars:***

These teeth erupt after a pause of 1-2 years following incisor eruption. The first posterior teeth to erupt are the mandibular canine and first premolar (9-10

years) followed by maxillary premolars and canine around 11-12 years. Most common eruption sequence is 4-5-3 in the maxilla and 3-4-5 in the mandible. Favorable occlusion in this region is largely dependent on:

- Favorable eruption sequence.
- Satisfactory tooth size- available space ratio.
- Completion of normal molar relation with minimum decrease of space available for bicuspids.

3. *Eruption of permanent second molars*:

The eruption of second permanent molars (upper and lower) at the age of 12 years old, it takes along path of eruption, but less than the path of eruption of canine, so they are subjected to less amount of crowding, the malocclusion of second molars is very rare, and their impaction very rare. The arch length is reduced prior to second molar eruption by the mesial eruptive forces. Therefore, crowding if present is stressed.

Mixed dentition problems

1.Premature loss of deciduous teeth

The major effect of early loss of a primary tooth, whether due to caries, premature exfoliation, or planned extraction, is localization of preexisting crowding. In an uncrowded mouth this will not occur. However, where some crowding exists and a primary tooth is extracted, the adjacent teeth will drift or tilt around into the space provided. The extent to which this occurs depends upon the degree of crowding, the patient's age, and the site.

- Deciduous incisor: premature loss of a deciduous incisor has little impact, mainly because they are shed relatively early in the mixed dentition.
- Deciduous canine: unilateral loss of a primary canine in a crowded mouth will lead to a centerline shift. To avoid this when unilateral premature loss of a deciduous canine is necessary consideration should be given to balancing with the extraction of the contralateral tooth.
- Deciduous first molar: unilateral loss of this tooth may result in a centerline shift. In most cases an automatic balancing extraction is not necessary, but

the centerline should be kept under observation and, if indicated, a tooth on the opposite side of the arch removed.

Centerline shift to patient's left owing to early unbalanced loss of lower left deciduous canine.

• Deciduous second molar: if a second primary molar is extracted the first permanent molar will drift forwards. This is particularly marked if loss occurs before the eruption of the permanent tooth and for this reason it is better, if at all possible, to try to preserve the second deciduous molar at least until the first permanent molar has appeared. In most cases balancing or compensating extractions of other sound second primary molars are not necessary unless they are also of poor long-term prognosis.

Loss of a lower second deciduous molar leading to forward drift of first permanent molar

Balancing extraction is the removal of the contralateral tooth – rationale is to avoid centerline shift problems.

Compensating extraction is the removal of the equivalent opposing tooth in the opposing arch – rationale is to maintain occlusal relationships between the arches.

2.Retained deciduous teeth

A difference of more than 6 months between the shedding of contralateral teeth should be regarded with suspicion. Provided that the permanent successor is

present, retained primary teeth should be extracted, particularly if they are causing deflection of the permanent tooth.

Retained primary tooth contributing to deflection of the permanent successor.

3. Infra-occluded (submerged) primary molars

Term for describing the process where a tooth fails to achieve or maintain its occlusal relationship with adjacent or opposing teeth.

4. Impacted first permanent molars

5. Dilaceration

Dilaceration is a distortion or bend in the root of a tooth. It usually affects the upper central and/or lateral incisor

Etiology:

There appears to be two distinct a etiologies:

- Developmental – this anomaly usually affects an isolated central incisor

and occurs more often in females than males. The crown of the affected tooth is turned upward and labially and no disturbance of enamel and dentine is seen.

A dilacerated central incisor.

• Trauma – intrusion of a deciduous incisor leads to displacement of the underlying developing permanent tooth germ. Characteristically, this causes the developing permanent tooth crown to be deflected palatally, and the enamel and dentine forming at the time of the injury are disturbed, giving rise to hypoplasia.

6. Supernumerary teeth

Effects of supernumerary teeth and their management

A-Failure of eruption

The presence of a supernumerary tooth is the most common reason for the non-appearance of a maxillary central incisor. However, failure of eruption of any tooth in either arch can be caused by a supernumerary. Management of this problem involves removing the supernumerary tooth and ensuring that there is sufficient space to accommodate the unerupted tooth in the arch. If the tooth does not erupt spontaneously within 1 year, then a second operation to expose it and apply orthodontic traction.

Management of a patient with failure of eruption of the upper central incisors owing to the presence of two supernumerary teeth: (a) patient on presentation aged 10 years; (b) radiograph showing unerupted central incisors and associated conical supernumerary teeth; (c) following removal of the supernumerary teeth upper removable orthodontic appliance was fitted to open space for the central incisors, until 1/erupted 10 months later; (d) 7 months later /1erupted and a simple appliance was used to align /1 ; (e) occlusion 3 years after initial presentation.

B-Displacement

The presence of a supernumerary tooth can be associated with displacement or rotation of an erupted permanent tooth. Management involves firstly removal of the supernumerary, usually followed by fixed appliances to align the affected tooth or teeth.

Displacement of 1/1caused by two erupted conical supernumerary teeth.

C-Crowding

This is caused by the supplemental type and is treated by removing the most poorly formed or more displaced tooth.

Crowding due to the presence of two supplemental upper lateral incisors

7. Habits

The effect of a habit will depend upon the frequency and intensity of indulgence.

8. First permanent molars of poor long-term prognosis

The integrity of the first permanent molars is often compromised due to caries and/or hypoplasia secondary to a childhood illness. Treatment planning for a child with poor-quality first permanent molars is always difficult because several competing factors have to be considered before a decision can be reached for a particular individual. First permanent molars are never the first tooth of choice for extraction as their position within the arch means that little

space is provided anteriorly for relief of crowding orcorrection of the incisor relationship unless appliances are used. Removal of maxillary first molars often compromises anchorage in the upper arch, and a good spontaneous result in the lower arch following extraction of the first molars is rare. However, patients for whom enforced extraction of the first molars is required are often the least able to support complicated treatment.

9. Median diastema

Median diastema occurs in 98 per cent of 6-year-olds, 49 per cent of 11-yearolds, and 7 per cent of 12–18-year-olds.

Etiology

Factors, which have been considered to lead to a median diastema include the following:

- physiological (normal dental development)
- small teeth in large jaws (a spaced dentition)
- missing teeth
- midline supernumerary tooth/teeth
- proclination of the upper labial segment
- prominent fraenum

Management

It is advisable to take a periapical radiograph to exclude the presence of a midline supernumerary tooth prior to planning treatment for a midline diastema. In the developing dentition a diastema of less than 3 mm rarely warrants intervention; in particular, extraction of the deciduous canines should be avoided as this will tend to make the diastema worse. However, if the diastema is greater than 3 mm and the lateral incisors are present, it may be necessary to consider appliance treatment to approximate the central incisors to provide space for the laterals and canines to erupt.

The Permanent Dentition

Permanent teeth or adult teeth: are the second set of teeth formed in mammals. In humans, there are thirty-two permanent teeth, consisting of six

maxillary and six mandibular molars, four maxillary and four mandibular premolars, two maxillary and two mandibular canines, four maxillary and four mandibular incisors.

The first permanent tooth usually appears in the mouth at around six years of age, and the mouth will then be in a transition time with both primary (or deciduous dentition) teeth and permanent teeth during the mixed dentition period until the last primary tooth is lost or shed. The first of the permanent teeth to erupt are the permanent first molars, right behind the last 'milk' molars of the primary dentition.

These first permanent molars are important for the correct development of a permanent dentition. Up to the age of thirteen years, twenty-eight of the thirty-two permanent teeth will appear. The full permanent dentition is completed much later during the permanent dentition period. The four last permanent teeth, the third molars, usually appear between the ages of 17 and 25 years; they are considered wisdom teeth.

Calcification of permanent teeth begins at birth with the calcification of the cusps of the first permanent molar and extends as late as the 25th year of life. Complete calcification of incisor crowns take place by 4 – 5 years and of the other permanent teeth by 6 – 8 years except for third molars, at approximately 13 years of age all permanent teeth except third molars are fully erupted.

The permanent incisors develop lingual to the deciduous incisors and move labially as they erupt. The premolars develop below the diverging roots of the deciduous molars.

The third molars erupt at 17-25 years of age; their path of eruption is nearly similar to the path of eruption of the second molars. The upper molars developed at the posteroinferior position of the maxillary tuberosity, so these teeth are subjected to a high amount of crowding in comparison with the first or second molars due to the lack of space available for them. The lower third

molars may be subjected to impaction due to lack of space, these teeth may be absent or congenitally missing.

Features of the permanent dentition:

1. Coinciding midline.
2. Class I molar relationship of the permanent first molar.
3. Vertical overbite of about one-third the clinical crown height of the mandibular central incisors.

The sequence of Permanent teeth emergence:

There is wide variability in the sequence of arrival of teeth in the mouth.

Maxilla 6-1-2-4-3-5-7 or 6-1-2-4-5-3-7 (most common
Mandible 6-1-2-4-5-3-7 or 6-1-2-3-4-5-7 (most common)

Dental age 6: First stage of eruption

- Eruption of mandibular central incisor and permanent first molar Mandibular molar eruption precedes maxillary molar.

Dental age 7

- Eruption of maxillary central and mandibular lateral incisor. • Root formation of maxillary lateral incisor well advanced.
- Crown completion of canines and premolars.

Dental age 8

- Eruption of maxillary lateral incisor.
- Delay of 2-3 years before any further teeth erupt.

Dental age 9

- One-third root formation of mandibular canine and first premolar is complete.
- Root development of mandibular second premolar begins.

Dental age 10

- One-half root formation of mandibular canine and first premolar is complete.
- Significant root development of maxillary and mandibular second premolar as well as maxillary canine.
- Root completion of mandibular incisors and near completion of maxillary laterals.
- According to Moyers, mandibular canine erupts between 9 and 10 years.

Dental age 11

- Eruption of mandibular canine, mandibular first premolar and maxillary first premolar.
- Maxillary first premolar erupts ahead of canine and second premolar.

Dental age 12

- Remaining succedaneous teeth erupt.
- Second permanent molars nearing eruption
- Early beginnings of third molar

Dental age 13,14,15

- Completion of roots of permanent teeth
- Third molars apparent on the radiograph: Change in eruption sequence is a reliable sign of disturbance in normal development of the dentition.

Important Note: Root development complete 2–3 years after eruption.

	Calsification(months)	Eruption(years)
Maxillary teeth		
Central incisor	3-4	7-8
Lateral incisor	10-12	8-9
canine	4-5	11-12
First premolar	18-21	10-11
Secondpremolar	24-27	10-12
First molar	Around birth	5-6
Second molar	30-36	12-13
Third molar	84-108	17-25
Mandibularteeth		
Central incisor	3-4	6-7
Lateral incisor	3-4	7-8
canine	4-5	9-10
First premolar	21-24	10-12
Secondpremolar	27-30	11-12
First molar	Around birth	5-6
Second molar	30-36	12-13
Third molar	96-120	17-25

Abnormalities of eruption and exfoliation:

1. Eruption cyst:

An eruption cyst is caused by an accumulation of fluid or blood in the follicular space overlying the crown of an erupting tooth. They usually rupture spontaneously, but very occasionally marsupialization may be necessary.

2. Failure / delayed eruption

There is a wide individual variation in eruption times. Where there is a generalized delay in tooth eruption in an otherwise fit child, a period of observation is indicated. However, the following may be indicators of some abnormality and therefore warrant further investigation:

1. A disruption in the normal sequence of eruption.
2. An asymmetry in eruption pattern between contralateral teeth. If a tooth on one side of the arch has erupted and 6 months later there is still no sign of its equivalent on the other side, radiographic examination is indicated. Localized failure of eruption is usually due to mechanical obstruction – this is advantageous as if the obstruction is removed then the affected tooth/teeth has the potential to erupt. More rarely, there is an abnormality of the eruption mechanism, which results in primary failure of eruption (the tooth does not

erupt into the mouth) or arrest of eruption (the tooth erupts, but then fails to keep up with eruption/ development). This problem usually affects molar teeth and unfortunately for the individuals concerned, commonly affects more than one molar tooth in a quadrant. Extraction of the affected teeth is often necessary.

Causes of delayed eruption:

Generalized causes:

1. Hereditary gingival fibromatosis
2. Down syndrome
3. Cleidocranial dysostosis
4. Cleft lip and palate
5. Rickets

Localized causes:

1. Congenital absence
2. Crowding
3. Delayed exfoliation of primary predecessor 4. Supernumerary tooth
5. Dilacerations
6. Abnormal position of crypt
7. Primary failure of eruption