

ORTHODONTICS

✚ Malocclusion -local factors

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Etiological assessment of malocclusion is an important aspect in orthodontics as the genesis of the deformity provides key to the planning of treatment. The main etiological factors which play a part, at least to some extent in most malocclusions are—the skeletal relationship, function of oral musculature and the size of the dentition in relation to the size of the jaw bones. Less frequently, local factors may cause malocclusion, either in conjunction with or independent of other etiological factors.

Graber has listed the following as local factors causing malocclusion:

- Anomalies of number
 - Supernumerary teeth
 - Missing teeth
 - Anomalies of tooth size
 - Anomalies of tooth shape
 - Premature loss of deciduous teeth
 - Prolonged retention of deciduous teeth
 - Delayed eruption of permanent teeth
 - Abnormal labial frenum
 - Dental caries
 - Improper dental restorations
 - Ankylosis
 - Abnormal eruptive path.
- Anomalies of Tooth Number

Anomalies of tooth number include presence of extra teeth or absence of one or more teeth that can predispose to malocclusion.

✓ Supernumerary Teeth:

Extra teeth in relation to the normal complement of teeth are generally referred to as supernumerary teeth. These teeth usually have abnormal morphology and do not resemble normal teeth. Extra teeth, which closely resemble the normal teeth are called as supplemental teeth, which are often observed to occur on lateral incisors (Figure 1A) and premolar regions. The term mesiodens is used for extra tooth in the midline between two permanent maxillary central incisors, the most common site for supernumerary teeth. Mesiodens are usually conical shaped although they can be tuberculated. Mesiodens can be erupted or impacted and when present may cause malocclusion by displacing one or both the central incisors (Figure 1B). An extra tooth

adjacent to the molar is called as a paramolar and when present distal to the last molar is called as distomolar. The term paramolar is sometimes used for an extra tooth in premolar regions (Figure 1C). The occurrence of supernumerary teeth may be single or multiple, unilateral or bilateral, erupted or impacted (Figure 1D) in one or both the jaws. Supernumerary teeth may cause arch length tooth material discrepancy and crowding when erupted; may delay, prevent, or deviate the path of eruption of adjacent teeth. Unerupted supernumerary teeth show a tendency for cyst formation and unerupted mesiodens can cause midline diastema. Other causes of median diastema are:

1. Deciduous dentition
2. Ugly duckling stage
3. Racial predisposition, Negroids
4. Microdontia
5. Congenital absence of lateral incisors
6. Supernumerary tooth in the midline
7. Abnormal frenal attachment
8. Abnormal pressure habits (digit sucking and tongue thrust habit).
9. Trauma
10. Impacted tooth in the midline



A.



B.



C.



D.

Figure 1: A. Supplemental tooth in the maxillary lateral incisor region. B. Erupted mesiodens C. Supplemental teeth in the mandibular pre-molar region D. impacted mesiodens

- [Congenitally Missing Teeth](#)

The occurrence of congenitally missing teeth may be single or multiple, unilateral or bilateral and in one or both the jaws (Figure 2). Anodontia or congenital absence of teeth may be of two types, total and partial.

- Total anodontia in which all teeth are missing may involve both deciduous and permanent teeth. Total anodontia is quite rare and usually occurs in association with hereditary ectodermal dysplasia whereas, partial anodontia, involving one or more teeth is rather common.
- The term hypodontia is used for absence of only few teeth; oligodontia refers to the absence of many but not all teeth.



Figure 2: A. Bilateral congenitally missing permanent lateral incisors causing spacing in the anterior segment of the maxillary arch.

- [Anomalies of Tooth Size](#)

Anomalies of tooth size may occur as two forms: microdontia or macrodontia. The term microdontia is used to describe teeth, which are smaller than normal (Figure 3A). Microdontia can be generalized involving all the teeth in a dentition or localized involving a single tooth. Localized microdontia most commonly affects maxillary lateral incisors and third molars (Figure 3B). The term macrodontia (Figure 3C) refers to teeth that are larger than normal. Like microdontia, macrodontia can also be generalized or localized.



A.

B.



C.

Figure 3: A. Microdontic maxillary incisors causing spacing in the anterior region of the arches. B. Microdontic right maxillary second molar. C. Macrodontic right maxillary central incisor causing crowding in the arches.

- **Anomalies of Tooth Shape**

Anomalies of tooth shape often occur in association with anomalies of tooth size. Some of the anomalies of tooth shape with considerable significance in orthodontia are listed below. They may predispose to malocclusion.

1. **Talons Cusp:**

Anomalous structures projecting from the cingulum of maxillary permanent incisors (Figure 4). Its effect:

- When large, talon cusp may prevent establishment of normal overbite and overjet.
- Forces from the antagonistic tooth in occlusion with talons cusp may cause labial tipping of the affected tooth.



Figure 4: Talons Cusp

2. Peg Laterals

The maxillary lateral incisors with incisally converging mesial and distal surfaces to give a peg-shaped appearance (Figure 5). Its effect:

- Spacing in the arch
- Migration of adjacent teeth
- Abnormal incisors relationship

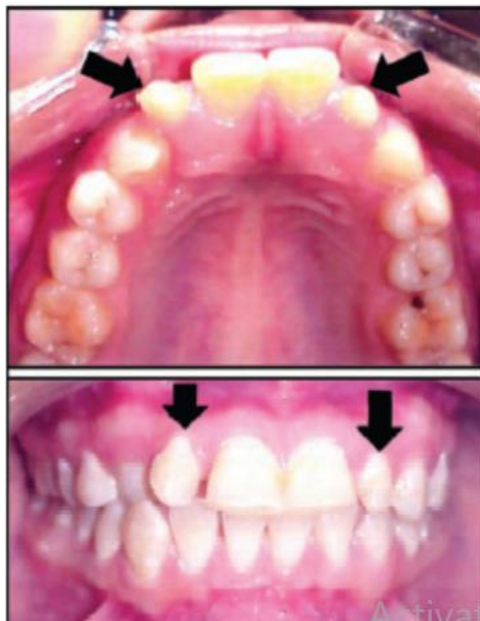


Figure 5: Peg Laterals

3. Leong Premolar

An accessory cusp or a globule of an enamel on occlusal surface between buccal and lingual cusps of premolars (Figure 6). Its effect:

- The extra cusp may prevent normal intercuspation with the opposing tooth

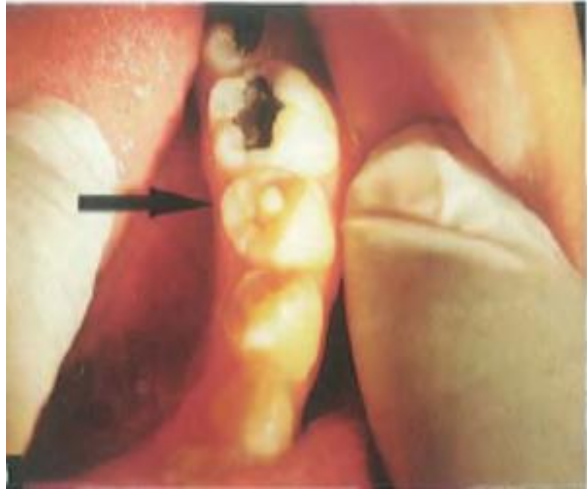


Figure 6: Leong Premolar

4. Mulberry Molars/Moon's Molar

In congenital syphilis, the crowns of first molars are often irregular with globules of enamel on occlusal surface (Figure 7) rather than well-formed cusps.

"Screw drivers" shaped incisors with a notch by the incisal edges (Figure 7) may also be seen in congenital syphilis. Its effect:

- Irregular occlusal surface of molars may prevent formal intercuspation of posteriors.



Figure 7: Mulberry teeth

5. Fusion

Fusion of adjacent teeth due to union of two normally separated tooth germs (Figure 8). Its effect:

- Spacing in the arch



Figure 8: fused mandibular central and lateral incisors

6. Gemination

Division of a single tooth germ with resultant incomplete formations of two teeth (Figure 9). Its effect:

- Discrepancy in arch length and tooth material that may cause crowding (if multiple teeth are affected).

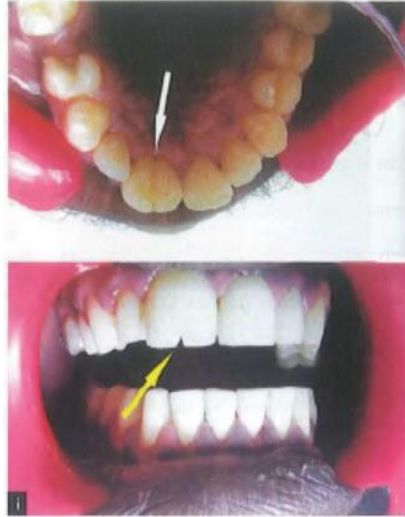


Figure 9: Gemination of right maxillary central incisor

7. Dilaceration

An abnormal angulation in the root of a tooth or between crown and the root (Figure 10). Its effect:

- The tooth may fail to erupt up to normal level.



Figure 10: A tooth specimen showing dilacerated root

- Premature Loss of Deciduous Teeth

This is a condition where a primary tooth is lost before its permanent successor is ready to erupt. As the adjacent teeth get sufficient time to migrate into the created space, thereby delaying, preventing and deviating the path of eruption of the succeeding permanent tooth. Premature loss of deciduous teeth, if not intercepted often lead to malocclusion. Deciduous teeth may be lost prematurely due to dental caries, trauma and hyperthyroidism. Possible consequences of premature loss of deciduous teeth on occlusion are listed in Table 1.

Table 1: Possible consequences of premature loss of deciduous teeth

Premature loss of	Possible consequences
Deciduous anterior teeth	<ul style="list-style-type: none"> • Spacing in the arch. • A shift in the midline, if primary canine is lost from one side of the arch only
Deciduous molars	Premature loss of deciduous second molar ↓ Mesial migration of the permanent first molar ↓ Loss of arch length ↓ Lack of space for permanent second premolar to erupt (Fig. 10.8) ↓ Permanent second premolar forced to erupt lingually/buccally ↓ Crowding in the posterior segment
Premature loss of deciduous Maxillary second molar	Mesial migration of permanent molars ↓ Loss of arch length ↓ Maxillary canine, the last anterior tooth to erupt may cause changes its path of eruption and erupt labially ↓ Crowding in anterior segment

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- Prolonged Retention of Deciduous Teeth

This is a condition in which there is undue retention of deciduous teeth beyond the usual exception age of their permanent successor. More often that not, some parts of deciduous molar roots escape resorption as their successor. There are number of causes for prolonged retention of deciduous teeth as listed below:

1. Absence of underlying permanent tooth
2. Nonvital deciduous tooth, which fail to resorb
3. Ankylosed deciduous tooth that do not resorb
4. Endocrinal disturbances, for example hypothyroidism.

A retained deciduous tooth may be left untouched of its permanent successor in congenitally missing as evidenced by radiographic evaluation.

- Delayed Eruption of Permanent Teeth

Permanent teeth erupt in a preprogrammed sequential manner throughout mixed dentition period to occupy their respective places. A delay in the eruption of any of the permanent teeth, out of normal time to meet, however, can cause migration of adjacent teeth into the eruption of the tooth involved or its complete impaction. Some of the common causes of delayed eruption of permanent teeth are listed below:

1. Presence of supernumerary teeth, for example mesiodens can delay eruption of maxillary centrals.
2. Retained deciduous root fragments in the jaw may delay or displace the erupting successor tooth (Figure 11).

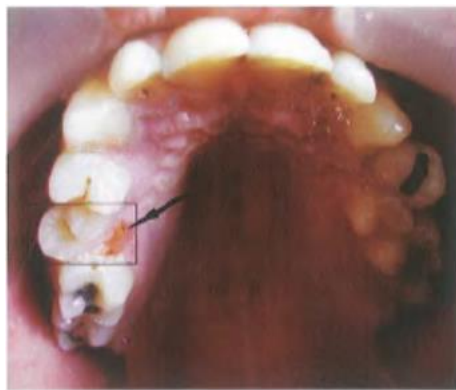


Figure 11: Delayed eruption of permanent teeth: Retained deciduous root fragments of second molar has resulted in distobuccal rotation of left permanent second premolar

3. Presence of thick mucosal barrier overlying the erupting permanent tooth (Figure 12).



Figure 12: Delayed eruption of permanent teeth: Presence of thick mucosal barrier overlying the erupting maxillary permanent central incisors.

4. Premature loss of deciduous tooth can delay eruption of its successor due to formation of bony barrier.
5. Ankylosed deciduous tooth that do not resorb can delay eruption of its successor.
6. Endocrinal disturbances like hypothyroidism.
7. The succedaneous tooth might be congenitally missing, delaying the loss of the primary tooth.
8. Hereditary, in certain children teeth erupt much later than established norms.
9. Early loss adjacent primary teeth with a consequential flaring or spacing between erupted permanent teeth. This may lead to decreased space availability for eruption of the succedaneous teeth.

- **Abnormal Labial Frenum**

At birth, the labial frenum is attached to the alveolar ridge, with fibers running into the lingual interdental papilla. As the teeth erupt and as alveolar bone is deposited, the frenum attachment migrates superiorly with respect to the alveolar ridge. In some cases, fibers may persist below the maxillary central incisors and in the "V" shaped intermaxillary suture. Abnormal labial frenum attachment can be diagnosed clinically by blanch test. When upper lip is pulled forward upward, a blanching of the tissue just lingual to the maxillary central incisors in the region of incisive papilla is observed. Radiographic examination reveals a notch like radiolucency seen interdentally between two maxillary centrals near the alveolar crest. Presence of an abnormal labial frenum attachment prevents the approximation of two central incisors leading to spacing between these two teeth called as midline diastema (Figure 13). Nevertheless, other possible causes of midline diastema, such as mesiodens, abnormal pressure habits, racial tendencies, congenitally missing or microdontic teeth should be ruled out before attempting frenectomy.



Figure 13: Heavy fibrous labial frenum preventing approximation of both the centrals causing “Midline Diastema”

- **Dental Caries**

Dental caries is one of the most common local causes of malocclusions. Proximal caries or complete loss of affected tooth with dental caries may cause the following effects:

- Premature loss of the affected tooth or proximal caries.
- Proximal caries can cause drifting of adjacent teeth into space created with resultant loss of arch length (Figure 14)
- Premature loss of affected tooth can cause migration of adjacent teeth into the space.
- Abnormal inclination of adjacent teeth.
- Over eruption of antagonistic teeth.

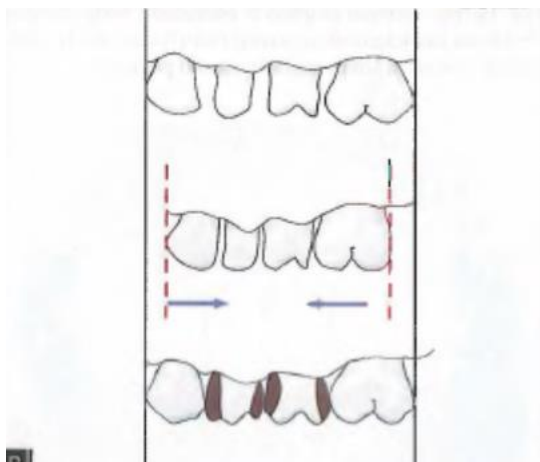


Figure 14: Proximal caries can cause drifting of adjacent teeth into the space created with resultant loss of arch length.

- Improper Dental Restorations

While restoring any tooth, it is important to restore the normal occlusal anatomy and proximal contours, so as to maintain normal intercuspation of the teeth and their mesiodistal dimension. Improper restoration of proximal contours may result in an increased arch length and occlusal irregularities. Possible consequences of improper dental restorations are listed below:

Over contoured proximal restorations causes

- Too tight proximal contact leading to elongation of restored tooth or adjacent teeth.
- Over contoured restoration in a segment can cause increase arch length.

Under contoured proximal restoration causes

- Loss of arch length due to drifting adjacent teeth into the space.

Overfilled occlusal restoration causes

- Functional occlusal prematurities
- Intrusion of antagonistic tooth leading to pseudo class III

Underfilled restoration causes

- Supraeruption of antagonistic tooth
- Functional occlusal disturbances

- Ankylosis

The tooth is said to be ankylosed when a part- or whole of its root surface is directly fused to the bone without intervening periodontal ligament. The term submerged teeth often refers to the ankylosed deciduous teeth. Deciduous second molars are most commonly affected. Ankylosis of deciduous teeth prevents their natural exfoliation and replacement by their successional permanent teeth. Once the adjacent permanent teeth erupt to their normal level, the ankylosed tooth appears to be submerged below the level of occlusion (Figure 15). This occlusion or submersion is created due to:

- Continued growth of alveolar process in relation to adjacent permanent teeth.

- Smaller crown height of deciduous tooth when compared to that of adjacent permanent teeth. The antagonistic tooth may supra-erupt leading to malocclusion.



Figure 15: Ankylosed mandibular deciduous second molar associated with, the congenitally missing predecessor tooth, the second premolar.

- **Abnormal Eruptive Path**

Malocclusions resulting from abnormal eruptive path of the teeth are not uncommon. Some of the factors, causing delayed eruption of permanent teeth may also deviate their path of eruption, such as:

- Trauma to the tooth during development
- Presence of supernumerary teeth
- Prolonged retention of deciduous teeth
- Presence of odontomas or a cyst or tremor may divert it if not altogether prevent its eruption
- Retained deciduous root fragments
- Deficiency of arch length and excess of tooth material
- Maxillary canine often shows an abnormal eruptive pathway possibly due to following factors:
 1. It has to travel a long distance from its developmental position near the floor of the orbit to its final position in the oral cavity.
 2. The sequence of its eruption is after the eruption of one or both of the maxillary premolars.
 3. After premature loss of primary canines, the premolars may migrate mesially depriving the canine of its erupting space.

Abnormal eruptive path of one or more teeth can cause:

- Crowding in the arch (Figure 16).
- Crossbite when more anteriors erupt palatally.



Figure 16: Ectopically erupted maxillary left permanent 'canine causing crowding in the arch.