Aurobindo College of Dentistry

Indore, Madhya Pradesh

INDIA

Module plan

- Topic : *ETIOLOGY OF MALOCCLUSION*
- Subject: Orthodontics
- Target Group: Undergraduate Dentistry
- Mode: Powerpoint – Webinar
- Platform: Institutional LMS
- Presenter: *DR. RAKESH THUKRAL*

-:INTRODUCTION:-

- *The orthodontic speciality deals with treatment of various malocclusion.*
- *Etiology of malocclusion is the study of its cause or causes.*
- *Malocclusion can occur due to a number of possible causes.*
- *Mainly malocclusion are caused by either genetic factor or by environmental factor .*

- *Comprehensive orthodontics management involves identification of the possible etiology factor and an attempt to eliminate the same,helps in prevention and interseption.*

- *Development of normal dentition and occlusion depends on a number of interrelated factors i.e. skeletal,dental,neuromuscular.*

Dental equilibrium

Influence of forces being generated intra orally don't move the teeth because of dental equilibrium

Teeth and 1.lips 2.cheeks 3.tongue 4.periodontal membrane 5.masticatory muscles

Classification of etiological factors

1.Moyer's 2.White &Gardiner's 3.Graber's

-:MOYER'S CLASSIFICATION OF ETIOLOGY OF MALOCCLUSION:-

1. ***Heredity***
   - *a. neuromuscular system*
   - *b. bone*
   - *c. teeth*
   - *d. soft parts*
2. ***Development defects of unknown origin***
3. ***Trauma***
   - *a. Prenatal trauma and birth injuries*
   - *b. Post natal trauma*
4. ***Physical agent***
   - *a. Premature extraction of primary teeth*
   - *b. Nature of food*

5. Habit

a. Thumb sucking and finger sucking

b. Tongue

c. Lip sucking and lip biting

d. posture

e. nail biting

6.Diseases

a. systemic disease

b. endocrine disorders

c. local diseases

1. nasopharyngeal diseases and disturbed respiratory function

2. gingival and periodontal disease

3. tumor

4. caries

7. Malnutrition

-:WHITE AND GARDINER'S CLASSIFICATION OF ETIOLOGY OF MALOCCLUSION:-

A). Dental base abnormalities

1. *Vertical malrelationship*
2. *Antero- posterior malrelationship*
3. *Disproportion of size between teeth and basal bone.*
4. *Lateral malrelationship*
5. *Congenital abnormalities*

B). Pre-eruption abnormalities

1. *Abnormalities in in position of developing tooth germ*
2. *Missing teeth*
3. *Supernumerary teeth and teeth abnormal in form*
4. *Prolonged retention of deciduous teeth*
5. *Large labial frenum*
6. *Traumatic injury*

C. Post –eruption abnormalities

1. Muscular

a) Active muscle force

b) Rest position musculature

c) Sucking habits

d) Abnormalities in path of closure

2. Pre mature loss of deciduous teeth

3. Extraction of permanent teeth

D. Abnormalities in path of closure

1. *Premature loss of decidious teeth*
2. *Extraction of permanent teeth*

-:GRABER'S CLASSIFICATION OF ETIOLOGY OF MALOCCLUSION:-

GENERAL FACTOR

1. *Heredity*
2. *Congenital*
3. *Environment*
    a. *Pre-natal*
    b. *Post-natal*
4. *Pre-disposing metabolic climate and disease*
    a. *Endocrine imbalanace*
    b. *Metabolic disturbance*
    c. *Infectious diseases*
5. *Dietary problems(nutritional deficiency)*

6.Abnormal pressure habits and functional aberrations

- *a. Abnormal sucking-Thumb and finger sucking,tongue sucking*
- *b. Tongue thrust*
- *c. Lip and nail biting*
- *d. Abnormal swallowing habit*
- *e. Tonsils and adenoids*
- *f. Respiratory abnormalities*
- *g. Speech defects*
- *h. Psychogenitics and bruxism*

7. Posture

8. Trauma and accidents

LOCAL FACTOR

1. *Anomalies of number: Supernumerary teeth , Missing teeth*
2. *Anomalies of tooth size*
3. *Anomalies of tooth shape*
4. *Abnormal labial frenum*
5. *Premature loss of deciduous teeth*
6. *Prolonged retention of deciduous teeth*
7. *Delayed eruption of permanent teeth*
8. *Abnormal eruptive path*
9. *Ankylosis*
10. *Dental caries*
11. *Improper dental restoration*

-Generalfactor
(1)HEREDITY:-

- *Heredity has for long been attributed as one of causes of malocclusion.*
- *The child is a product of parents who have dissimilar genetic material.*
- *The child may inherit conflicting traits from both the parents resulting in abnormalities of the dentofacial region.*
- *According to Lundstrom there exist a number of human trait that are influenced by the genes that include:*

- ***Tooth size:*** *Abnormalities of tooth size such as microdontia and macrodontia are attributed to heredity.*
- ***Arch :*** *The dental arch length and arch width are believed to be inherited.*
- ***Crowding /spacing :*** *Crowing and spacing of teeth are believed to be of genetic origin. most of these conditions are believed to be a uncoordinated inheritance of arch length and tooth material.*

- ***Abnormalities of tooth shape:*** *Anomalies of tooth shape such as the presence of peg shaped lateral is another trait that shows high genetics predisposition.*

- ***Abnormalities of tooth number :*** *Presence of either more or less number of teeth can also be inherited .*

- ***Overjet :****The horizontal overlap upper and lower dentition referred to as the overjet is believed to be genetically influenced.*

- ***Inter –arch variations:*** *Discrepancies in the transvers , sagittal and vartical plane between upper and lower jaws can be inherited.*

-General factors – (2) congenital

- *Congenital defects or development defects are malformations seen at the time of birth.*
- *It may be caused by a variety of factors including genetic, radiologic, chemical, endocrine , infection and mechanical factors.*
- *The causes that cause congenital abnormalities can be broadly classified as general and local causes for congenital defects-*

-:General causes of congenital defects-

a.Abnormal state of mother during pregnancy

b. Malnutrition

c. Endocrinopathies

d. Infectious diseases

e. Metabolic and nutritional distrubances

f. Accidents during pregnancy and at the time of childbirth

g. Intra- uterine pressure

h. Accidental traumatisation of the foetus by external forces

Local causes of congenital defects-

a. *Abnormalities of jaw development due to intra-uterine position*

b. *Clefts of the face and palate*

c. *Macro and microglossia*

d. *Cleidocranial dysostosis*

Frequently seen congenital conditions- :1-clefts of lip & palate:-

- *Clefts involving the lip and palate are the most commonly seen congenital defects that occur as a result of non-fusion between the various embryonic processes.*

- *Cleft patients may exhibit a number of dental problem including missing teeth , mobile teeth , rotation, crossbite etc.*

2 – Congenital syphilis:-

- *Syphilis of congenital origin is transmitted from the infected mother to the child.*
- *The child exhibits one or more of the following features:*

a. *Hutchinson's incisors*
b. *Mulberry molars*
c. *Enamel deficiencies*
d. *Extensive dental decay*
e. *The maxilla may be smaller in size relative to the mandible*
f. *Anterior crossbite*

3 – Maternal Rubella infection :-

- *Matrenal rubella infection during pregnancy believed to cause widespread congenital malformation in the child .*
- *The following are some of the feature that can be seen:*

a) *Dental hypoplasia*
b) *Retarded eruption of teeth*
c) *Extensive caries- all can lead to malocclusion*

4-Cleidocranial dysostosis:-

- *This is a congenital condition characterized by unilaterl or bilateral ,partial or complete absence of the clavical.*
- *The patient may exhibit the following features:*
    - *a. Maxillary retrusion and possible mandibular protrusion*
    - *b. Over retained deciduous teeth and retarded eruption of permanent teeth*
    - *c. Presence of supernumerary teeth*
    - *d. Presence of short and thin roots of the teeth*

5 –Cerebral palsy:-(brain injury during birth)

- *This is a condition where in the patient lacks muscular co-ordination.*
- *The uncontrolled and aberrant muscle activity upsets muscle (dental equilibrium) balance resulting in malocclusion.*

General Factors-
(3)Environment:-

- *Various prenatal and postnatal environmental factors can cause malocclusion:*

1. ***Prenatal factors:*** *The foetus is well protected against injuries and nutritional deficiencies during pregnancy in its amniotic sac, but there are certain factor , the presence of which can result in abnormal growth of the oro-facial region thereby predisposing to malocclusion.*

   Abnormal fetal posture during gestastion is said to interfere with symmertric development of the face.

The other prenatal influences include maternal fibroids, , amniotic lesions , maternal diet and metabolism.

Maternal infection such as German measles and use of certain drugs during pregnancy such as Thalidomide can cause gross congenital deformities including clefts.

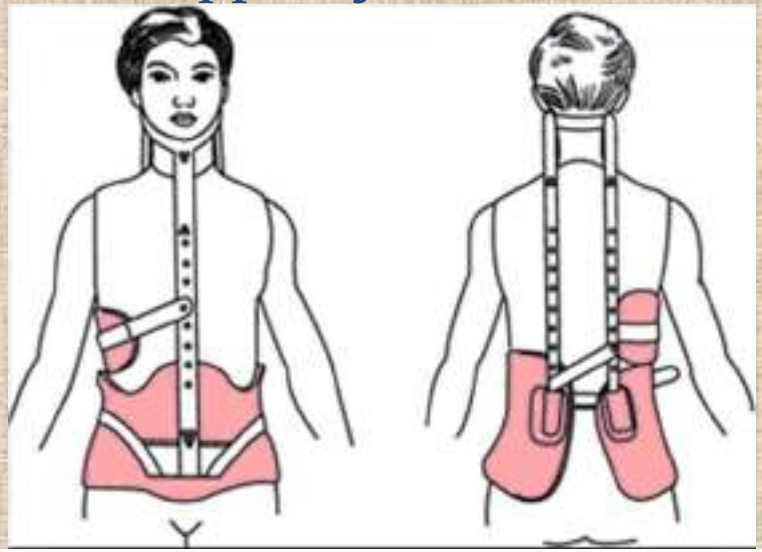
2. *Postnatal factors:* *The following are some of the postnatal factors that can cause malocclusion:*

a) *Forceps delivery can result in injury to the temporomandibular joint joint area, which can undergo ankylosis. Such patients show retarded mandibular growth and thus have a hypoplastic mandible.*

b) Cerebral palsy is a condition characterized by muscle incoordination . This may occur due to birth injuries . The patient can exhibit malocclusion due to loss of muscle balance.

c) Traumatic injuries that cause condylar fracture can cause growth retardation resulting in marked facial asymmetry.

d) Milwaukee braces are used for treatment of scoliosis. These braces derive support from the mandible.



General factors (4)-Pre-disposing metabolic climate & disease:-

A number of endocrinal disorders , infectious conditions and metabolic disturbances can predispose to malocclusion.

(1).Endocrine imbalance:

- *Certain endocrinal disorders may result in malocclusion .*
- *The following are some of the endocrinal disturbances that can cause malocclusion:*
  a. *Hypothyroidism*
  b. *Hypoparathyroidism*
  c. *Hyperthyroidism*
  d. *hyperparathyroidism*

(2). Metabolic disturbance:

- *Acute febrile diseases are believed to slow down the pace of growth and development .*
- *These condition may cause a disturbance in tooth eruption and shedding thereby increasing the risk of malocclusion.*

General factor (5)-Dietary problems:-

- *Nutritional deficiencies during growth may result in abnormal development , causing malocclusion.*
- *These problems are more common in the developing countries than in the development world.*
- *Nutritional related disturbances such as rickets, scurvy and beriberi can produce severe malocclusion and may upset the dental developmental timetable.*

General factors (6)-Abnormal pressure habits &functional aberrations-thumb sucking,tongue thrusting,lip &nail biting,abnormal swallowing oral breathing,tonsils &adenoids,psychogenic tics &bruxism

General factor (7)- Posture :-

- *Poor postural habits are said to be a cause for malocclusion.*
- *They may be associated with abnormal pressure and muscle imbalance thereby increasing the risk of malocclusion.*
- *Children who support their head by resting chin on their hand and those who hand their head so that the chin rests against the chest are observed to have mandibular deficiency.*

-General factor (8)-Accidents & trauma:-

- *Children are highly prone to injuries of the dento-facial region during the early years of life when they learns to crawl, walk or during play.*

- *Most of these injuries go unnoticed and may be responsible for non- vital teeth that do not resorb & cause defelction of erupting permanent teeth into abnormal position*

LOCAL ETIOLOGICAL FACTORS

-:ANOMALIES IN NUMBER OF TEETH:-

- *Presence of extra teeth or absence of one or more teeth predisposes to malocclusion:*

1].Supernumerary teeth:

Teeth that are extra to the normal complement are termed supernumerary teeth. Teeth have abnormal morphology. Extra teeth that resemble normal teeth are called supplemental teeth.

-:CLASSIFICATION OF SUPERNUMERARY TEETH BASED ON ITS MORPHOLOGY:-

1)Peg shaped conical supernumerary teeth:

They usually present with conical or triangular – shaped crown and compete root formation. They are usually found between the maxillary central incisor . They may remain unerupted and cause midline diastema and cause rotation of incisor and non-eruption of central incisor

2.Barrel shaped or tuberculate supernumerary:

- *The tuberculate supernumerary has a barrel-shaped apperance and a crown consisting of multiple tubercles.*
- *It may be invaginated.*
- *Tuberculate type have either incomplete or absent root formtion.*
- *They are generally larger than conical supernumerary teeth and are usually found in a palatal position relative to the maxillary incisor.*

3.*Supplemental teeth*:

- *Supplemental supernumerary teeth resemble their respective normal teeth.*
- *They form at the end of a tooth series.*
- *The most common supplemental tooth is the permanent maxillary lateral incisor, although supplemental premolar and molar also occur.*

4. Odontomes:

- *These are benign ,disordered overgrowth of mature tissue comprising all dental tissues and appearing radiographically as well demarcated ,mostly radio-opaque lesions in tooth bearing areas.*
- *They can be compound or complex.*
- *Compound odontomes comprise many separate, small tooth- like structues.*
- *A complex odontome is a single, irregular mass of dental tissue that has no morphologocal resemblance to a tooth.*

Problem associated with supernumerary teeth :they can cause

1. Failure of eruption
2. Displacement or rotation of permanent teeth
3. Crowding
4. Pathology and other complication
5. Incomplete space closure during orthodontic treatment

Missing teeth

- *Congenitally missing teeth are by far more common than supernumerary teeth and can occur in either of the jaws.*
- *Congenitally absence of teeth is referred to as hypodontia if some teeth are missing from the arch or anodontia if all of teeth are absent . If six or more permanent teeth are missing, the term 'oligodontia' is used.*
- *Hypodontia usually affects the last teeth in each series , i.e. third molars, upper laterals , second premolars.*

Hypodontia	Oligodontia	Anodontia
		
Tooth loss excœpt third molars	More than 6 teeth missing	All teeth missing
2-10(15)%	0.1-1%	Extremely rare
Msx1, Pax9	Msx1, Pax9, Axin2	

- *The following are some of the commonly missing teeth in decreasing order of frequency:*

a. *Third molars*
b. *Maxillary lateral incisor*
c. *Mandibularsecond premolar*
d. *Mandibular incisor*
e. *Maxillary second premolar*

- ***Hypodontia or oligodotia can be classified as:***

1. *Isolated or non-syndromic hypodontia*
2. *Syndromic hypodontia*

-:ANOMALIES OF TOOTH SIZE:-

- *The normal occlusion requires a good harmony between the tooth size and arch length and also between the maxillary and mandibular tooth size.*
- *Macrodontia refers to a tooth or teeth larger than normal for partocular tooth type.*
- *Frequency of Macrodontia in permanent dentition is 1.1% while in primary dentition it is unknown.*
- *Affects most frequently upper central incisior, second premolar and lower third molar.*

- *Microdontia refers to teeth that appear smaller in size compared to normal .*
- *It is important to note that the teeth affected are usually the ones that are also most often congenitally absent.*
- *Microdontia is frequently seen associated with Downs syndrome and various type of ectodermal dysplasia, frequency in permanant dentition is 5% while in primary dentition less than 1%.*

-:ANOMALIES OF TOOTH SHAPE:-

- *Anomalies of tooth size and shape are very interrelated. Abnormally shaped teeth predispose to malocclusion.*
- *The following are some of the examples of frequently seen tooth shape anomalies:*

a. *The presence of peg shaped maxillary lateral incisors is often accompanied by spacing and migration of teeth.*
b. *Another example is presence of an abnormally large cingulum on a maxillary incisor.*
c. *The mandibular second premolars may rarely have an additional lingual cusp, thereby increasing the mesio-distal dimension of tooth.*

-:ABNORMAL LABIAL FRENUM:-

- *Abnormalities of the maxillary labial frenum are quite often associated with maxillary midline spacing .*
- *Prior to the teeth , the maxillary labial frenum is attached to the alveolar ridge with some fibers crossing over lingually to the region of the incisive papilla.*
- *This may prevent approximation of central incisors and diastema,confirm by blanch test.*

-:PREMATURE LOSS OF DECIDUOUS TEETH:-

- *It refer to loss of a tooth before its permanent successor is sufficiently advanced in development and eruption to occupy its place.*
- *Early loss of deciduous teeth can cause migration of adjacent teeth into the space and can therefore prevent the eruption of the permanent successor.*

The severity of malocclusion caused due to early loss of a deciduous tooth depends on the following factors:

A].Location of the missing tooth.

B]. The earlier the deciduous teeth are extracted before the successional teeth are ready to erupt , the greater is the possibility of malocclusion.

C]. In a parson having arch length deficiency or crowding the early loss of deciduous teeth may worsen the existing malocclusion.

-:PROLONGED RETENTION OF DECIDUOUS TEETH:-

- *This refer to a condition where there is undue retention of deciduous teeth beyond the usual eruption age of their permanent successors.*
- *Prolonged retention of deciduous anteriors usually result in lingual or palatal eruption of their permanent successors.*
- *Certain parts of the deciduous roots which are away from the path of eruption of the permanent teeth fail to get resorbed thereby leaving small fragment of the root within the jaw .*

The following are some of the reasons for prolonged retention of deciduous teeth:

a. *Absence of underlying permanent teeth .*

b. *Endocrinal disturbances such as hypothyroidism.*

c. *Ankylosed deciduous teeth that fail to resorb.*

d. *Non – vital deciduous teeth that do not resob.*

-:DELAYED ERUPTION OF PERMANENT TEETH:- can cause migration of adjacent teeth and a malocclusion

- *There are a number of reasons that can delay the eruption of permanent teeth.*
- *The following are some of them:*
  a) *Congenital absence of the permanent tooth*
  b) *Presence of supernumerary tooth or pathology such as odontomes can block the erupting permanent tooth.*
  c) *Premature loss of deciduous teeth can result in delayed eruption of the underlying permanent teeth due to formation of thick cortical bone over the erupting permanent tooth.*

d. *Endocrinal disorders such as hypothyroidism can cause a delay in eruption of the permanent teeth.*

e. *Presence of deciduous root fragments that are not resorbed can block the erupting permanent teeth.*

-:ABNORMAL ERUPTIVE PATH:-

- *One of the causes of malocclusion is an abnormal path of eruption , which could be due to arch length deficiency , presence of supernumerary teeth, impacted teeth , retained root fragment , or formation of a bony barrier.*

- *The maxillary canines develop almost near the floor of the orbit and travel down to their final position in the maxilla .*

-:ANKYLOSIS:-

- *Ankylosis is a condition wherein a part or whole of the root surface is directly fused to the bone with no intervening periodontal membrane.*
- *Anlylosis can also be associated with certain infections, endocrinal disorders and congenital disorder such as cleidocranial dysostosis.*

-:DENTAL CARIES:-

- *Caries can lead to premature loss of deciduous or permanent teeth thereby causing migration of contiguous teeth , abnormal axial inclination and supra-eruption of opposing teeth.*

- *Proximal caries that has not been restored can cause migration of the adjacent teeth into the space leading to a reduction in arch length.*

-:IMPROPER DENTAL RESTORATIONS:-

- *Improper dental restorations may predispose to malocclusion.*
- *Over- contoured occlusal restorations cause prematuer contacts leading to functional shift of the mandible during jaw closure.*
- *Under –contoured occlusal restorations can permit the opposing dentition to undergo supra eruption*
- *Proximal restorations that are under- contoured invariably result in loss of arch length due to drifting of adjacent teeth to occupy the space.*

THANK YOU