

Etiology of malocclusion

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The etiological factors can be classified into

A. Genetics

B. Environment

Or

A. Skeletal factors

B. Soft tissue factors

C. Dentoalveolar disproportions (local factors)

D. Habit

A. Genetics

This theory says that from the moment of fertilisation, genes contain all the necessary information to regulate cells and tissue. All the genetic information is in the neural crest cells. In general there are two types of genes involved



1. **Regulatory genes:** Gene called “homeobox gene” and this is thought to be responsible for the whole development of the craniofacial complex
2. **Intercellular regulatory genes:** These are molecules which are further divided into 2 groups:

I. **Growth factors** : is a naturally occurring substance capable of stimulating cell proliferation, wound healing, and occasionally cellular differentiation. Growth factors are important for regulating a variety of cellular processes

II. **Steroid-Thyroxine Retinoic Acid (STRA) “super family”**, it is thought that a variation in these contributes to craniofacial malformations.

Certain terms in genetics

Dominant it is the mode of inheritance when one copy of the effective gene are required for expression of the trait.

Recessive, it is the mode of inheritance when two copies of the effective gene are required for expression of the trait.

Genotype is defined as the genetic constitution of an individual, and may refer to specified gene loci or to all loci in general.

Phenotype is the final product of a combination of genetic and environmental influences.

Polygenic means many genes.

Evidences of genetic roles in development of malocclusion:

1.Society studies: Genetically homogenous societies exhibit similar levels of malocclusion.

2.Twin studies: Monozygotic twins are genetically identical and share a similar trait of malocclusion



B. Environmental factors

1. Revolutionary theory
2. Modern theory

Revolutionary theory

Comparison of large population studies with archaeological records confirms that malocclusion has become more common over the past 1000 years. It has been hypothesized that dietary changes in modern societies, with increased consumption of soft, energy-rich food, has resulted in less interproximal wear between the teeth. (Begg, 1954). Additionally, hard diet requires vigorous mastication, stimulating the growth of facial bones, particularly in the transverse dimension of the maxilla and mandible. However, the tooth wear is merely a by-product, brought about by diet-related attrition and high masticatory activity, and has only a minor effect on tooth alignment

Modern theory

The environment exerts its influence mainly through change on the soft tissue matrix which has an influence on the skeletal and dental development leading to malocclusion.

1. Functional matrix effect (Epi-Genetic theory)
2. Soft tissues stretching theory

CL II lip Sucking



Tongue thrust



Environmental factors could be classified into:

1. Intra-uterine developmental pathology influencing facial development

Teratogen like aspirin or smoking causing cleft lip & palate



2. Postnatal factors :

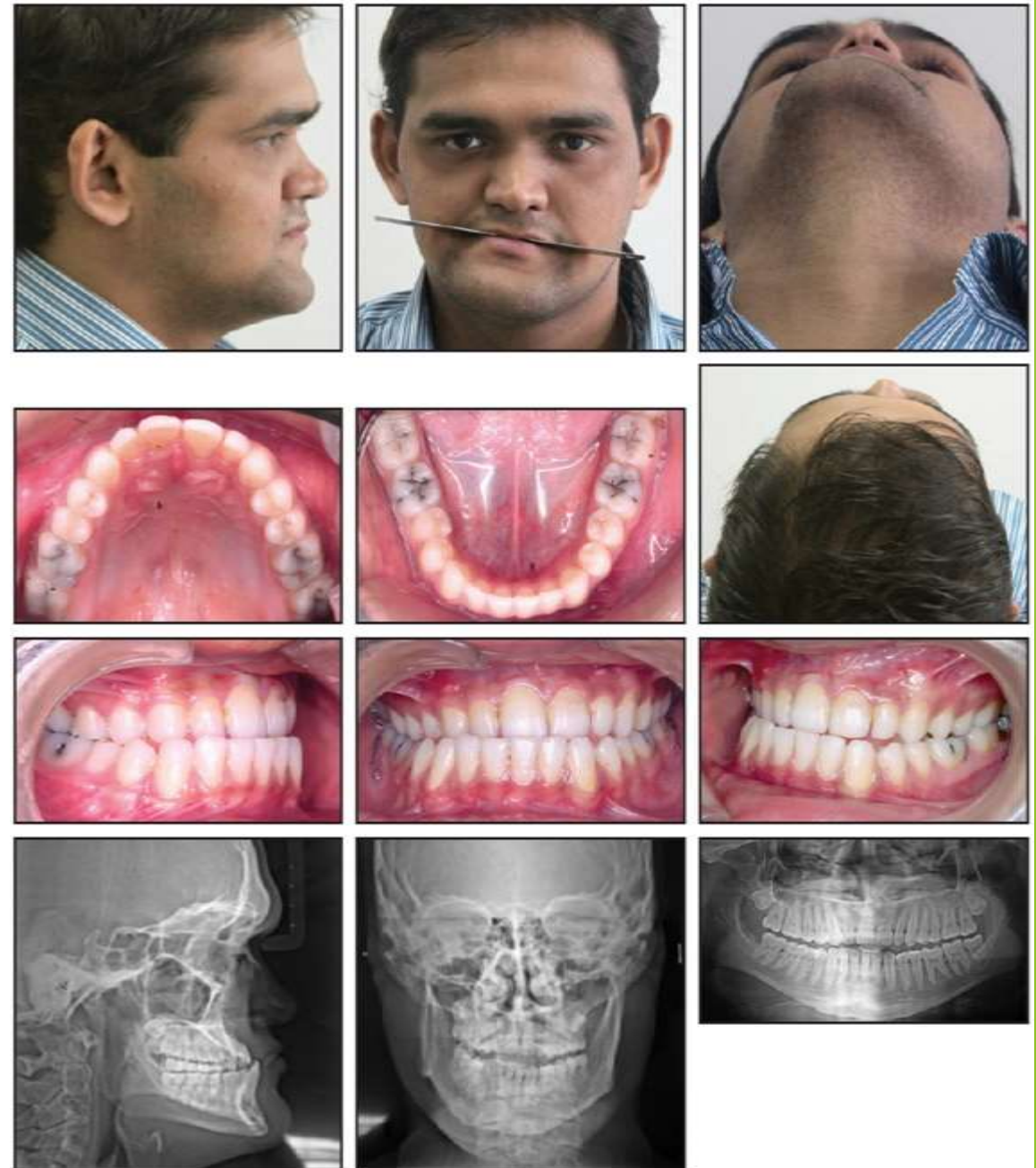
i. Habitual (Sucking habits)



ii. Pathology

1. Traumatic:

The condyle is the commonest site of fracture in the mandible during childhood and many go undiagnosed. In severe cases with bilateral fracture and dislocation from the glenoid fossa, an anterior open bite can be one of the presenting features due to a loss in ramus height.



2. Inflammatory:

Juvenile rheumatoid arthritis is an inflammatory arthritis occurring before the age of 16 years and involving the temporomandibular joints can result in the development of a severe class II malocclusion due to restricted growth of the mandible



**Juvenile
rheumatoid arthritis**

3. Hormonal:

Excessive growth hormone resulting in overproduction of growth hormone from an anterior pituitary tumour causes gigantism in children and acromegaly in adults. In both circumstances, the patient presents with a worsening class III malocclusion characterized by mandibular excess



The factors of malocclusion :-

Skeletal factor

Dental factors

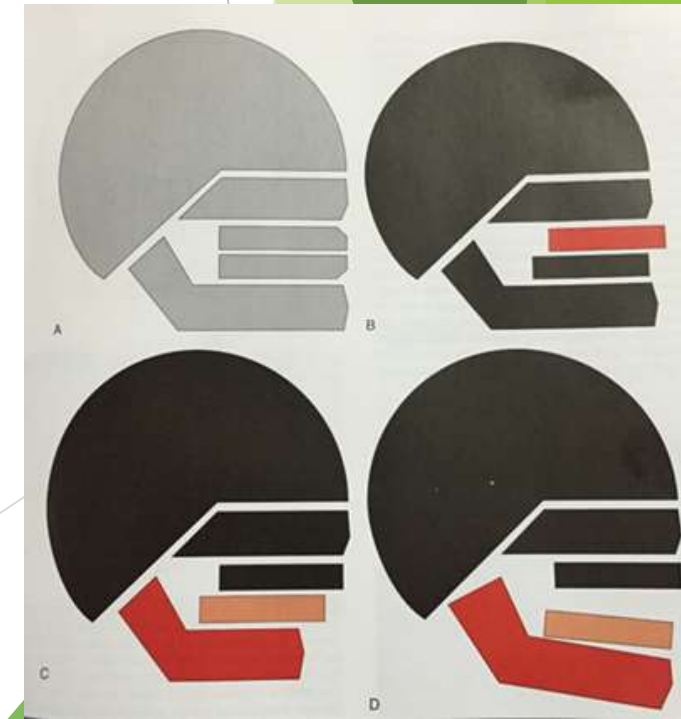
Soft tissue factors

Habit factor

Skeletal factor:

The maxilla grows downwards and forward from the anterior cranial base in part as a result of growth at circummaxillary suture system and in part as a result of extensive surface apposition and remodeling of the bone.

The mandible grows downward and forward from its articulation with the middle cranial fossa faster than does the maxilla.



Dental factors:

- a- Abnormalities of numbers
- b- Abnormalities in size
- c- Abnormalities in tooth shape
- d- Premature loss of deciduous teeth
- e- Prolonged retention of the deciduous teeth

a- Abnormalities of numbers:

1- Supernumerary tooth:

The most commonly seen supernumerary tooth is the mesiodense. It is usually suited between the maxillary central incisors. It may cause impaction of the permanent teeth or delay in eruption of the adjacent teeth or defect in the position and it may cause crowding.

2- Missing teeth (hypodontia) :

The most commonly congenitally missing teeth are the third molars followed by maxillary lateral incisors. (spacing)



b- Abnormalities in size:

1- Microdontia:

Where the tooth is smaller than the normal tooth size.

Usually maxillary lateral incisor (peg-shaped) it may cause spacing

2- Macrodontia:

Where the tooth is larger than normal tooth size. It may cause crowding



c- Abnormalities in tooth shape:

1- Gemination:

Geminated teeth are the anomalies which raised from division of single tooth germ by invagination leading to the formation of two incomplete teeth.

2- Talon cusp:

Is an anomaly structure projecting lingually from the cingulum area of the maxillary or mandibular permanent incisors.





d-Premature loss of deciduous teeth

The premature loss of deciduous tooth may effect on the eruption of the permanent successors. This lost may lead to decrease in the overall arch length as the posterior teeth have a tendency migrate mesially or shifting in the midline (in the anterior teeth case)

Early loss of primary teeth: the effects depend on:

- Presence of crowding
- Which Tooth lost
- Timing / Age of loss
- Which Arch

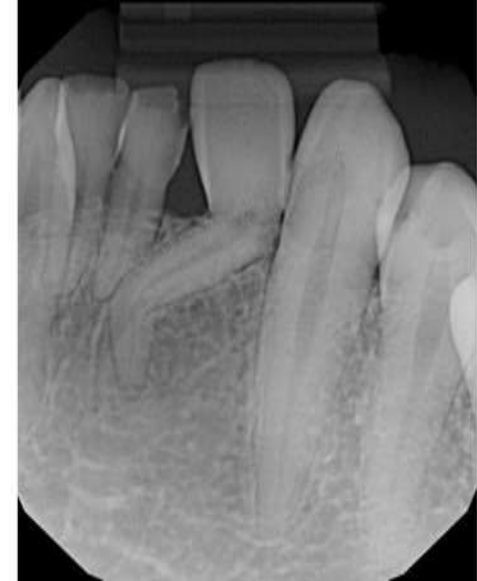
e- Prolonged retention of the deciduous teeth

The retained deciduous tooth may cause impaction of the permanent successor. The malocclusion usually crowding :

- Retained incisors (A`s + B`s)
- Retained molars

Delayed eruption of permanent teeth

- Impaction
- Ectopic Crypt Position
- Dilaceration



Soft tissue factor

The equilibrium theory?

The equilibrium theory was described first by Weinstein in 1963 and then popularized by Proffit 1979, he divided the force of equilibrium into:

- Intrinsic forces by tongue and lips
- Forces from dental occlusion
- Forces from the periodontal membrane.
- Extrinsic forces: habits (thumb sucking, etc.), orthodontic appliances

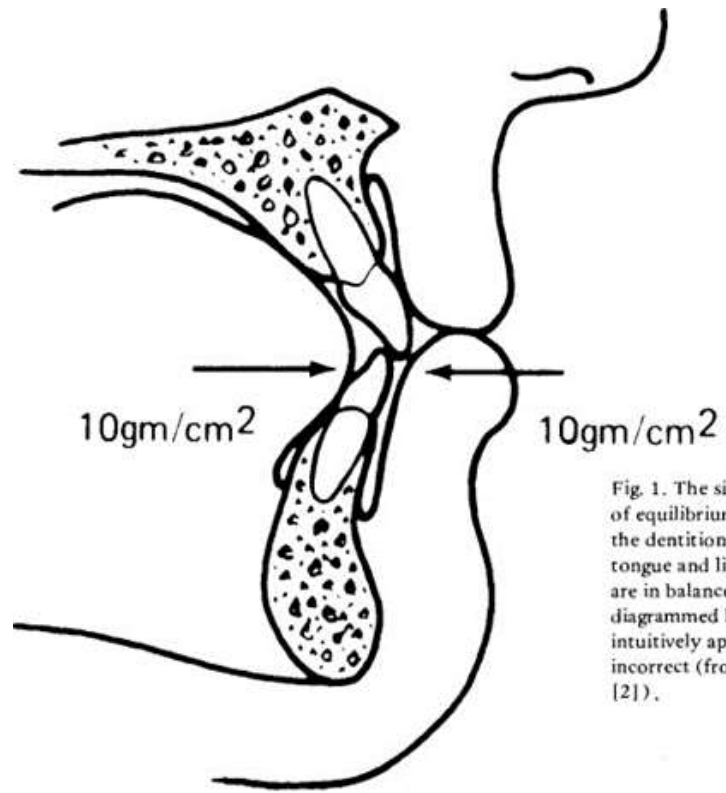
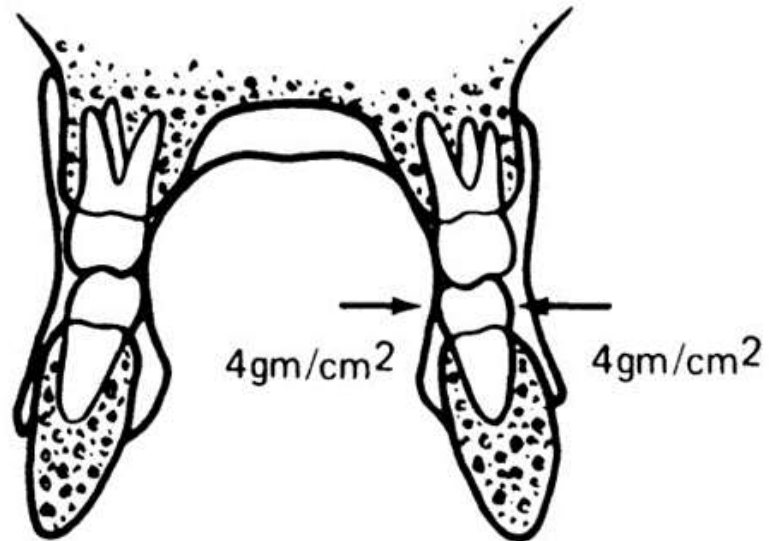


Fig. 1. The simplest view of equilibrium related to the dentition is that tongue and lip processes are in balance, as diagrammed here. This is intuitively appealing, but incorrect (from Brader [2]).



Soft tissue factors :

i.Abnormal frenum :

At birth the labial frenum is attached to the alveolar ridge with some fiber crossing over and attaching with lingual dental papilla. In some cases these frenum become thick fiber which may prevent the two central incisor from become close together and this will lead to forming a space it called (diastema)



ii. Macroglossia

Increase in the size of the muscle of the tongue and
Tongue thrust



iii. **Hyperactive lip** or “strap- like” lower lip

- It mainly cause retroclination of the lower incisor with associated Lower labial segment crowding
- It might cause increase in the OJ and OB.



Adenoids Facies

- **Sunken eyes**
- **Narrow pinched nostrils**
- **Open mouth**
- **High-arched palate**
- **Crowded teeth**
- **Dull mask-like face**
- **Protruding teeth**
- **Drooling saliva**
- **Everted upper lip**
- **Rhinorrhoea**
- **Loss of nasolabial fold**



iv . **Adenoid** : mouth breathing