Aetiology of malocclusion

Dr. Sara El-kilani
Specialist orthodontist
Intended learning outcomes:

- To know the evolutionary trends theory.
- To have deep understanding of the genetic and environmental factors behind the development of malocclusion.
- To understand the relationship between habits and associated malocclusion.
Malocclusion

- It is any deviation from the ideal occlusion, which might be considered aesthetically or functionally unsatisfactory.

- In the majority of cases, a malocclusion does not in itself represent a disease state, but rather a variation from what is considered ideal.
Although in certain cases specific factors and pathologies can be identified as the cause of a malocclusion; in the majority, the aetiology is less clear.
Malocclusion is considered as a disease of civilization. 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 food, has resulted in less interproximal wear between the teeth.
Lack of interproximal wear could be a cause of malocclusion, particularly crowding. However, the amount of tooth material lost in each quadrant by interproximal wear is not more than 2 to 3-mm.

We can notice the lack of crowding and diet-related interproximal wear in stone aged population.
A soft diet may also result in underdevelopment of the jaws and a lack of arch space, leading to crowding.

Experimental studies have shown that dietary consistency and masticatory activity affect not only the masticatory muscles, but also many aspects of bone growth, including bone size and mass, internal bone structure, and craniofacial size and morphology.
With the greater understanding of genetics it becomes relatively straightforward to trace the inheritance of some syndromes.

Many dental anomalies have been shown to occur together and have a strong familial trend, for example the palatally impacted maxillary canine, which is more common in females and certain ethnic groups and is often associated with microdont or absent lateral incisors.
Similarly, jaw growth appears to be mostly genetically determined.

Mandibular prognathism seems to have a high genetic predisposition; an example of this is the class III malocclusion in the Hapsburg royal family duo to inbreeding.
Malocclusion can be oral clinical manifestation of certain syndromes:

- Anodontia in Ectodermal Dysplasia.
Severe class II malocclusion with anterior open bite in Treacher Collins syndrome.
Supernumerary teeth and delayed eruption in cleidocranial dysostosis.
Environmental aetiological factors:

1. Pathology.
2. Abnormal soft tissue pattern.
3. Oral habits.
1. Pathology

- A number of pathological conditions can contribute directly to a malocclusion, for example:

  - Early loss of deciduous teeth can result in space loss, increased crowding and deviations of the dental centre lines.
Trauma to the primary maxillary incisors can result in displacement of the tooth into the developing tooth bud of the permanent successor. Damage to the crown or dilaceration of the root can occur, resulting in failure of eruption and impaction of the tooth. Loss of a permanent incisor due to trauma can result in space loss and shift in the dental centre line in crowded dentitions.
Periodontal diseases and alveolar bone loss can lead to mobility of teeth which become more susceptible to influence from the soft tissue envelope that surrounds them. Any change in this balance that occurs with age can result in tooth movement. This is commonly seen when upper incisors escape control of the lower lip, resulting in an increase in the overjet and spacing.
Fracture of the mandible at the condyle can lead to asymmetry, with an ipsilateral decrease in ramus height and deviation of the chin point to the affected side. The severity of outcome is in part related to the age at the time of injury.
Juvenile rheumatoid arthritis involving the temporomandibular joints can result in the development of a severe class II malocclusion due to restricted growth of the mandible.
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.
Conditions associated with a loss of muscle tone, such as muscular dystrophy and certain types of cerebral palsy, result in a downward and backward rotation of the mandible, an increased lower face height and an anterior open bite.
2. Abnormal soft tissue pattern.

- The zone of balance between the lips and cheeks and tongue (soft tissue envelope) can in part dictate where the teeth sit. If the forces are imbalanced it can result in tooth movement.

- Following are few examples of environmental causes of malocclusion:
If the lower lip rests behind the upper incisor, this may predispose to an increased overjet and is described as a lip trap.
Hyperactivity of the mentalis muscle results in retroclination of the lower incisors and described as a strap-like lower lip.
High lower lip position is thought to contribute to retroclination of the upper incisors in a class II division 2 relationship.
Thick, highly placed frenum attachment can cause midline diastema
3. Oral habits.

- A habit is a tendency towards an act that has become a repeated performance.

- Habits can be classified as:
  1. Pressure habits: like tongue thrusting, thumb or finger sucking and lip sucking
  2. Non pressure habits: like mouth breathing.
Tongue thrusting habit.

- It is a condition in which the tongue makes contact with anterior teeth during swallowing. It is considered a retained infantile pattern of swallowing.
Tongue thrusting habit can be primary or secondary. The primary tongue thrusting starts first then it causes an anterior open bite while secondary tongue trusting is a kind of adaptation to an existing malocclusion. In cases with anterior open bite, an anterior oral seal on swallowing is created by the tongue coming forward to fill the gap.
Aetiology:

3. Learned behaviour: following another habit like improper bottle feeding.
4. Compensatory: to an existing anterior open bite.
5. Psychological: sometimes as a result of forced discontinuation of other habits.
Clinical features:

1. Anterior open bite
2. Proclination of upper and lower anterior teeth
3. Bimaxillary proclination
Thumb sucking or dummy sucking habit.

- These are non-nutritive sucking habits.

- A normal child is expected to automatically stop thumb sucking by 1.5–2 years.

- It is believed that the malocclusion caused by digit sucking will be self corrected if the habit is discontinued before 3.5 – 4 years of age.
Aetiology:

1. **Physiological**: this habit is considered normal during early stages of life as the child is exploring his surrounding by placing fingers or objects into the oral cavity. It also gives the child a sense of emotional security.

1. **Psychological**: some children try to get the attention of their parents by doing this habit, others respond to feeling insecure or being under stress and anxiety by doing this habit.
Clinical features:

- The severity of the effects is related primarily to the type, frequency, intensity and duration of the habit:
Clinical features:

1. Increased maxillary arch length and prognathism.
2. Narrowing of the maxillary arch and widening of mandibular arch width.
3. Posterior crossbite.
4. Maxillary incisor proclination, spacing and increased overjet.
5. Reduced overbite and anterior open bite.
Lip sucking habit

Involves:
- Wetting the lips with the tongue
- Pulling the lip into the mouth between the teeth.

The habit may be:
- Associated with excessive overjet as in class II malocclusion.
- Secondary to thumb sucking.
Clinical features:

- Increased overjet.
- Proclined upper incisors and retroclined lower incisors.
Normally breathing should be through the nose. Mouth breathing can alter the position of tongue, jaw and head. These postural changes can cause malocclusion.
Aetiology:

1. Obstructive: due to partial or complete nasal obstruction e.g. nasal polyp, deviated nasal septum.


3. Anatomic: the child breath through the mouth because of lack of complete oral seal e.g. short upper lip, incompetent lips.
Tests to diagnose mouth breathing:

1. Mirror test: place a double sided mirror between nose and mouth and check for fogging.
2. Cotton test, also called (butterfly test): place piece of cotton over the upper lip and below nostrils, if the cotton flutters down it indicates nasal breathing.
3. Water test: ask the patient to fill water in his mouth and retain it for a period of time. If he is mouth breather he will find it difficult to do so.
Clinical features:
1. Extra orally the patient has the characteristic long face syndrome or adenoid facie i.e. long and narrow face, narrow nose and nasal passage, short flaccid upper lip.
Intra orally posterior cross bite presents due to the lowered tongue position and the subsequent change in the soft tissue balance, anterior open bite due to extrusion of molars to compensate for dropping down of the mandible and lack of contact between molars. Anterior marginal gingivitis is also noted due to dryness of the mouth.
Bruxism, nail or object biting are among the abnormal oral habits.

They can cause attrition or wear of the incisal edges rather than causing a malocclusion.