The etiology of orthodontic problems
Fifth session
Course Outline (5 sessions)

- Specific causes of malocclusion
- Genetic Influences
- Environmental Influences
- Etiology in contemporary perspective
# Causes of Malocclusion

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Specific causes of malocclusion

Disturbances in Embryologic Development
Skeletal Growth Disturbances
Muscle Dysfunction
Acromegaly and Hemimandibular Hypertrophy
Disturbances of Dental Development
Environmental Influences

- Equilibrium Theory and Development of the Dental Occlusion
- Functional Influences on Dentofacial Development
Etiology in contemporary perspective

- Changing Views of Etiologic Possibilities
- Etiology of Crowding and Malalignment
- Etiology of Skeletal problems
Part of the philosophy of the early orthodontists was their belief in the perfectibility of man.

Malocclusion was a disease of civilization and blamed it on improper function of the jaws under the "degenerate" modern conditions.

Changing jaw function in order to produce proper growth and change facial proportions was an important goal of treatment—which unfortunately proved difficult to achieve.
Changing Views of etiologic possibilities

- Classical (Mendelian) genetics developed rapidly in the first part of the twentieth century, and a different view of malocclusion gradually replaced the earlier one.
- This new view was that malocclusion is primarily the result of inherited dentofacial proportions, which may be altered somewhat by developmental variations, trauma, or altered function, but which are basically established at conception. With little hope of producing underlying changes.
Changing Views of etiologic possibilities

- In the 1980s, there was a strong swing back as the new theories of growth control indicated how environmental influences could operate by altering posture.
- The earlier concept that jaw function is related to the development of malocclusion.
- Clinical applications some already recognized as unfortunate, reflected extreme optimism about arch expansion and growth modification.
Changing Views of etiologic possibilities

- As the 21st century moves ahead, a more balanced view seems to be emerging.
- That there are no simple explanations for malocclusion in terms of oral function. Mouth breathing, tongue thrusting, soft diet, sleeping posture-none can be regarded as the sole or even the major reason for most malocclusions.
- It is fair to say that the research has not yet clarified the precise role of heredity as an etiologic agent for malocclusion.
- The relatively high heritability of craniofacial dimensions and the relatively low heritability of dental arch variations now have been established, but exactly how this relates to the etiologic process of malocclusions that have both skeletal and dental components remains unknown.
- Conclusions about the etiology of most orthodontic problems are difficult, because several interacting factors probably played a role.
Etiology of crowding and malalignment

- Crowding of the teeth, the most common type of malocclusion at present, undoubtedly is related in part to the continuing reduction in jaw and tooth size in human evolutionary development.
- Increased outbreeding can explain at least part of the increase in crowding in recent centuries.
- Outbreeding could lead to an increased prevalence of malocclusion even if independent inheritance of dentofacial characteristics did not occur.
- Jaw dimensions do seem to have a strong genetic control, and the transverse dimensions directly affect the amount of space for the teeth.
Etiology of crowding and malalignment

- There is no theoretical explanation of how a coarser diet and more powerful jaw function could significantly alter the dimensions of the dental arches.
- Perhaps the relatively recent alterations in diet, which without question have reduced the functional demands on the jaws, have accelerated the trend toward reduction in jaw size that was already occurring.
- Mouth breathing might conceivably contribute to crowding by altering the tongue-lip/cheek equilibrium as the mandible rotated down and back but obviously is not a major cause.
Etiology of crowding and malalignment

- The judgment that inherited characteristics contribute to small jaw size relative to the size of the teeth is an important one in planning orthodontic therapy, for it implies that a significant number of patients will continue to require extractions to provide space for aligning the remaining teeth.

- At present there again is great enthusiasm for expanding dental arches, on the theory that soft tissue adaptation will allow the expansion to be maintained.

- It seems clear that the truth—and the appropriate extraction percentage for children with crowded teeth—is somewhere in between.
Etiology of crowding and malalignment

- Forces from the lips, cheek, tongue, fingers, or other objects can influence tooth position both vertically and horizontally, if the pressures are maintained for a long enough time.

- Any individual tooth or all teeth in a section of the arch can be displaced buccally or lingually, or caused to erupt more or less by small amount of continuous forces.

- That minor Class I problems, especially nonskeletal crossbites, often are caused primarily by alterations in function. Major problems usually have an additional genetic or developmental component.
Etiology of skeletal problems

- Inherited patterns, defects in embryologic development, trauma, and functional influences can and apparently do contribute to skeletal malocclusions.

- Specific genetic syndromes or congenital defects involving the jaws are rare, as are malocclusions caused primarily by trauma.

- The fact that ideal occlusion does not necessarily occur in primitive populations suggests that variations from an idealized occlusal scheme are quite compatible with normal function.

- Perhaps greater variations in the jaws are tolerated now, with the change in diet than were once compatible with long-term survival and reproductive success.
Etiology of skeletal problems (Cl II)

- It seems reasonable to view the majority of moderate skeletal malocclusions as being the result of an inherited pattern which, although not consonant with our concept of ideal occlusion, is compatible with acceptable function.

- Fifteen to 20% of the contemporary U.S. and northern European population have a Class II malocclusion, and it is likely that for most of these individuals, there is an inherited tendency toward retrognathic facial proportions.

- The more severe cases probably fall into this category of inherited tendencies made worse by environmental effects.
Etiology of skeletal problems (Cl III)

- There is a definite familial and racial tendency to mandibular prognathism.
- Excessive mandibular growth could arise because of mandibular posture, since constant distraction of the mandibular condyle from the fossa may be a stimulus to growth.
- Functional mandibular shifts affect only tooth position, but constant posturing because of respiratory needs, tongue size or pharyngeal dimensions may affect the size of the jaw.
- Why maxillary deficiency occurs is almost entirely unknown, but a simple environmental cause appears unlikely, and like Class II problems, the majority of Class III problems are related to inherited jaw proportions.
Etiology of skeletal problems (openbite)

- Altered function has traditionally been associated with vertical growth problems, especially anterior open bite. A child with an anterior open bite of moderate severity should be presumed to have a sucking habit until proved otherwise.

- Open bite also may be related to tongue posture, although not to tongue activity during swallowing.

- The postural changes dictated by partial nasal obstruction may also play a role. Excessive eruption of posterior teeth predisposes any individual to anterior open bite, and downward posturing of the mandible and tongue can allow excessive posterior eruption.

- However, vertical jaw proportions are inherited just as are anteroposterior proportions, with very similar heritability.

- Anterior open bite is much more common in blacks than whites, whereas deep bite is much more common in whites. It seems reasonably clear that this reflects a different inherent facial morphology rather than environmental influences perhaps posture and the associated equilibrium effects interact with inherited jaw proportions to produce open bite or deep bite in some individuals.
A final word on etiology

- Whatever the malocclusion, it is nearly always stable after growth has been completed.
- If an orthodontic problem is corrected in adult life, which can be difficult because so much of treatment depends on growth, a surprising amount of change is also stable.
- The etiologic agents, in other words, are usually no longer present when growth is completed.
- Malocclusion, after all, is a developmental problem.
From the above mentioned facts it is obvious that the adjustment of the cranio-facial growth is under a less strict genetic control; on the other hand, it seems to highly depend on the influence of several oro-facial functions, especially during the post birth period. The factors related to masticatory, respiratory, vicious habits modifications or combination thereof are responsible with the emergence and the increase of the malocclusions. Clinically, the most important element of the new approach resides in the fact that, most of the anomalies that orthodontics treats today are induced by environment and functional factors that could, at least theoretically, be prevented.
Association between allergic rhinitis, bottle feeding, non-nutritive sucking habits, and malocclusion in the primary dentition

What is already known on this topic
Results from previous studies on the effect of allergic rhinitis on malocclusion development have been inconclusive
Previous reports have suggested that non-nutritive sucking and bottle feeding may be responsible for certain forms of malocclusion

What this study adds
Data show that allergic rhinitis, alone or combined with non-nutritive sucking habits, is a significant risk factor for the development of anterior open bite in children under 5 years old
Non-nutritive sucking habits and bottle feeding seem to be the most important risk factors, rather than allergic rhinitis, for posterior cross-bite
In children with non-nutritive sucking activity and in those bottle fed, the different involvement of oro-facial muscles and the different impact to the palate is presumably responsible for the poor alignment of teeth and the anomalous transversal growth of the palate, conditions which lead to a posterior cross-bite.

Breast feeding is the ideal stimulus for the physiological development of both the muscular and skeletal components of the oro-facial complex.
Any questions?