Identifying a Malocclusion

Etiology of Malocclusion

Identifying a malocclusion

• Chapters 1 and 5
• “Contemporary orthodontics” by Proffit, WR, 4th ed.
• http://ohsu-eres.lib.pdx.edu/courseindex.asp
• www.ohsu.edu/library → Electronic resources → Electronic reserves (ERes) → Electronic reserves and course materials → select “school of dentistry” → select SODORD732
• No Password is set

History of Orthodontics

• Norman Kingsley: In 1866, first to use extraoral force to correct protruding teeth

Classification of teeth

• According to Angle: the key to occlusion was the maxillary 1st molar
• Class I (normal occlusion)
• Class I malocclusion
• Class II malocclusion
• Class III malocclusion

History of Orthodontics

• Late 1800’s: concept of occlusion was developed to make good prosthetic teeth
• Edward H. Angle:
  – Father of modern orthodontics.
  – Took the concept of prosthetic occlusion and extended it to the natural dentition.
  – Developed the classification system used today.
Mixed dentition Class I

End-on Class II molar

Full cusp Class II molar

Class III molar, Class II canine

History of Orthodontics

- 1930’s: extraction of teeth was suggested as a method to enhance facial esthetics and achieve stability
- After WWII: Cephalometric radiology allowed orthodontist to measure growth and treatment changes and define skeletal malocclusions
Goals of modern orthodontists

- The creation of the best possible occlusal relationship within the framework of acceptable facial esthetics and stability of the result

Components of malocclusion

- Crowding: the most significant contributor to malocclusion
- A-P problems: 2nd most prevalent finding
- Vertical problems: open bites (black: white or Hispanic = 5:1) or deep bites (black: white or Hispanic = 1:2)
- Transverse problem: relatively rare

A-P Problems

Vertical Problems

Deep bite

Open bite

Transverse Problems

Overjet: Horizontal overlap of incisors

Overbite: vertical overlap of the incisors
Prevalence of malocclusion in Angle’s classification

- Class I normal occlusion: 30%
- Class I malocclusion: 50-55%
- Class II malocclusion: 15%
- Class III malocclusion < 1%
- More class II in whites and more class III in Asians.
- Class III and open bite are more frequent in African than European populations

Need for orthodontic treatment

- 3 types of problems from protruding or malposed teeth:
  - Discrimination because of facial appearance
  - Problems with oral function: jaw movement, TMD, mastication, swallowing or speech
  - Greater susceptibility to trauma, periodontal disease, or tooth decay

Etiology of orthodontic problems

- Disturbances in embryological development
- Skeletal growth disturbances
- Muscle dysfunction
- Acromegaly and hemimandibular hypertrophy
- Disturbances of dental development

Specific causes of malocclusion

- Disturbances in embryological development
- Skeletal growth disturbances
- Muscle dysfunction
- Acromegaly and hemimandibular hypertrophy
- Disturbances of dental development

Disturbances in embryological development

- Causes: range from genetic disturbances to specific environmental insults
- Teratogens: chemical and other agents capable of producing embryologic defects if given at the critical time
- <1% of children who need orthodontics had a disturbance in embryologic development as a major contributing cause.

Disturbances in embryological development

<table>
<thead>
<tr>
<th>Teratogen</th>
<th>Effect</th>
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<tbody>
<tr>
<td>13-cis Retinoic acid (Accutane)</td>
<td>Retinoic acid syndrome, malformations virtually same as hemifacial microsomia, Treacher Collins syndrome</td>
</tr>
<tr>
<td>Agents</td>
<td>Cleft lip and palate</td>
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<tr>
<td>Cigarette smoke (tobacco)</td>
<td>Cleft lip and palate</td>
</tr>
<tr>
<td>Ethanol</td>
<td>Cleft lip and palate</td>
</tr>
<tr>
<td>Ethyl alcohol</td>
<td>Cleft lip and palate</td>
</tr>
<tr>
<td>Rubella virus</td>
<td>Microphalangea, cataracts, deafness</td>
</tr>
<tr>
<td>Thalidomide</td>
<td>Malformations similar to hemifacial microsomia, Treacher Collins syndrome</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>Cleft lip and palate</td>
</tr>
<tr>
<td>Vitamin D-oxide</td>
<td>Premature closure and microphalangea</td>
</tr>
<tr>
<td>X-radiation</td>
<td>Microphalangea</td>
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Thalidomide

- Introduced from Germany in 1957 but was never approved by FDA.
- Prescribed to pregnant women to combat morning sickness
- When taken in the 1st trimester, the child has various defects, including short limbs, hemifacial microsomia
- Banned in 1960s

Phocomelia caused by thalidomide

Hemifacial microsomia

Skeletal growth disturbances

- Fetal molding and birth injuries
  - Intrauterine molding: pressure against the face
  - Birth trauma to the mandible: use forceps in delivery

Intrauterine molding

- an arm is pressed across the face in uterus, resulting in severe maxillary deficiency at birth
- a fetus' head is flexed tightly against the chest in uterus, preventing the mandible from growing forward normally.
  - related to a decreased volume of amniotic fluid.
  - extremely small mandible at birth, usually accompanied by a cleft palate

- Childhood fractures of the jaw
  - 75% of children with early fractures of the mandibular condylar process have normal mandibular growth
Fracture of the right condylar process at age 2

Mandibular growth was normal until age 6

Muscle dysfunction

• Damage to motor nerve → underdevelopment of that part of the face

• Excessive muscle contraction of neck on one side (torticollis) → facial asymmetry

Asymmetry caused by missing masseter muscle

Acromegaly and hemimandibular hypertrophy

• Anterior pituitary tumor secretes excessive amounts of growth hormone → excessive growth of the mandible → long mandible

• Even if the tumor is removed, the skeletal deformity persists and jaw surgery is necessary.

Disturbances of dental development

• Congenitally missing teeth

• Malformed or supernumerary teeth

• Fusion, gemination
  – Fusion: teeth with separate pulp chambers joined at the dentin
  – Gemination: teeth with a common pulp chamber
Supernumerary teeth

Fusion

Disturbances of dental development
- Interferences with eruption:
  - supernumerary teeth, sclerotic bone, heavy fibrous gingiva
  - 5-10% has at least one primary molar ankylosis
- Ectopic eruption: most likely occur in upper first molar
- Early loss of primary teeth: premature loss of primary canine or primary first molar → distal drift of incisors

Premature lost of primary canine

1.5 years later of the same patient

Disturbances of dental development
- Traumatic displacement of teeth:
  - Damage to permanent tooth buds from an injury to primary teeth
  - Drift of permanent teeth after premature loss of primary teeth
  - Direct injury to permanent teeth
Genetic influence

- Inherited in 2 major ways:
  - Disproportion between the size of the teeth and the size of the jaws (Teeth vs. Jaw)
  - Disproportion between size or shape of the upper and lower jaws (Upper vs. Lower)

Environmental influences

- If a habit like thumb sucking created pressure against the teeth for more than the threshold duration (6 hours or more per day), it certainly could move teeth.
- The transseptal fiber was stretched elastically during orthodontic treatment and tends to pull the teeth back toward their original position.

Thumb sucking

- During primary dentition: no influence
- If it persists beyond the time that the permanent teeth begin to erupt:
  - Flared and spaced maxillary incisors
  - Lingually positioned lower incisors
  - Anterior open bite
  - A narrow upper arch

Etiology

- The etiologic agents are usually no longer present when growth is completed.
- Whatever the malocclusion, it is nearly always stable after growth has been completed.
- If an orthodontic problem is corrected in adult life, a surprising amount of change is also stable.