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A word of caution

• Interceptive orthodontics does not eliminate comprehensive orthodontics.
• The treatment should not last more than a year and must usually address a specific problem

Objectives

• Discuss most common orthodontic problems in young patients
• Present different modalities of treatment
• Identify the proper timing of treatment
Topics to be addressed

1. Dental crowding
2. Eruption problems
3. Posterior crossbites
4. Increased overjet
5. Anterior crossbites
6. Oral habits
7. Sleep Apnea

1. Dental Crowding

- One of the most frequently asked questions by parents of young children during the examination procedure.

Even if interdental spacing is present, permanent teeth may still erupt ectopically.
If there is crowding in the primary dentition, severe crowding will occur in the permanent dentition.

1. Dental crowding
   
   A. Space maintenance
   B. Control of Leeway space
   C. Dental extractions

Dental neglect may cause space loss.
Space maintenance

Indications
Why maintain space?

- Allows optimal dental alignment
- Allows permanent teeth to erupt into their normal space
- Maintains acceptable occlusion

Bilateral Space maintenance: Lingual arch

The primary second molars were used as the permanent molars were not sufficiently erupted
Space maintenance on the upper arch: Fixed Nance appliance

B. Control of Leeway space

Very important in interceptive orthodontics
Most predictable way to reduce the need for bicuspid extractions

Lee Way Space
\[ a + b + c > A + B + C \]
Note the difference in width between #75 and #45

Lee-Way Space is almost identical to the E space

- When the Lee-way space is maintained, 75% of cases can be treated without extractions and without proclination of the lower incisors. (Dr Gianelly)

Premature loss of the deciduous cuspids
Passive lingual arch
Expansion of the maxillary arch done concurrently

Result.....

Premature loss of a primary canine
Lingual arch

12 month recall

24 month recall
36 months recall, E space still present

Reduction of mesial aspect of the second deciduous molars

- Another way to take advantage of the Leeway space
- Allows spontaneous alignment of the lower incisors
- Simple and efficient procedure (Cozzani: JCO 1994)

Indications

- Moderate crowding of the lower arch
  - Timing is most important
    - wait until there is almost total resorption of the roots of the deciduous second molars
Too soon!

Proper timing!

Results
We may also want to reduce the size of the primary canines.

C. If *Leeway space* is not sufficient for proper alignment
   - Selective or serial extractions

Example: Serial Extractions
1. Extraction of primary cuspids

2. Improvement in the position of the incisors

The incisors are well positioned
Ugly Duckling stage
To treat or not to treat?

8 Year old boy: Ugly Duckling stage

What would you do?
2008 Openbite tendency. Anterior tongue posture
Which treatment option was selected?

2009 9.5 year old

Observations only from the beginning

2013 13 years old

2. Dental Eruption Problems

A. Early or delayed eruption
B. Ectopic eruption
C. Missing teeth
D. Ankylosed teeth
E. Impacted teeth
A. Early or delayed eruption

A panoramic radiograph is indicated at the age of 8 to 9.

Abnormal sequence of eruption:

The sequence of eruption is wrong. Supernumerary upper central incisors, odontomas.

Impacted upper central incisors

- Most often caused by trauma to the deciduous tooth. Root can become dilacerated
- Infection of deciduous central incisor
- Cyst
- Supernumerary tooth
Delayed eruption

- Young patient presents to the MCH for swelling.
- Trauma is suspected but not confirmed.
- No swelling was present six months ago.

Intra oral view

- Central incisor is not visible.
- Lateral incisor is displaced.

Transverse view: CT scan
After surgery

- Main findings:
  - Altered sequence of eruption
  - Poor angulation of the 22

End of treatment

B. Ectopic eruption
Normal Labial Eruption of Posterior Teeth

Ectopic eruption

Management of ectopic eruption

- Regain the space
- Allow permanent tooth to erupt
- Maintain correction
Incomplete diagnosis...

More thorough investigation

Mesially erupting upper molars

- A fairly common problem:
  - Depending on the severity, several courses of actions can be taken
    - Observation
    - Extraction of 55 or 65
    - Space regaining
Problem

- Erupting first permanent molars are migrating mesially.
- Important to intervene as soon as possible

Appliance used

- Removable space regainer (ACCO) with heli coil springs
- Palate and anterior teeth are used as anchorage

Result after 6 months

- The space has been regained and the appliance is now used as a space maintainer
Nine year old patient presenting with #34 erupting ectopically

Patient complaint: my front teeth are too far ahead

Treatment: extract # 75 and place an active lingual arch

- Spring to tip the crown of # 34 mesially
- The cusp had already begun to drift distally
A. Retention

C. Missing teeth

• This problem is seen relatively frequently
• Which teeth are most often missing?
  – Third molars
  – Upper lateral incisors (Caucasian)
  – Lower central incisors (Asian)
  – Lower second premolars

Agenesis
Thirteen year old girl

Panorex

This case will require a combination of orthodontics and prosthodontics with extensive planning.

Treatment options:

- Extract the deciduous second bicuspids and protract the permanent molars or maintain the deciduous bicuspids long term. Replace absent #22 with an implant.
- Increase the width of #12 and reduce #23. Intrude and crown #24 to make it look like a cuspid.

It is also imperative to preserve the profile.
D. Ankylosed Primary teeth

Often found with congenitally absent permanent bicuspids

Ankylosed teeth should be extracted when...

- The permanent molar begins to tip mesially
- A periodontal problem begins to develop at the mesial of the permanent molar
- An open bite develops at the bicuspid and molar area

Ankylosed 85
Ankylosed deciduous second molar

#65 should have been removed a long time ago

PERMANENT DENTITION
Ankylosed teeth may be maintained...

- If the ankylosed teeth are in the plane of occlusion.
- Especially if the roots are not resorbing.

E. Impacted teeth

Difficult to treat. Prognosis is guarded.
Case treated at MCH

Nine year old patient presented at MCH for a routine dental exam. What would you do?

If the sequence of eruption is altered you need to ask questions and investigate radiographically.

Space maintenance was used
Oups!

- The upper right central incisor was impacted
- The parents did not recall a history of trauma...

Maintained for three months

E. Ectopic eruption of upper canines

Be attentive of buccally impacted upper cuspsids as resorption of the roots of the lateral incisors is seen frequently
Importance of panoramic radiograph

Impacted cuspids

- Upper cuspids are the teeth most often impacted (3 to 4%)
- Treatment is difficult and costly

- *Can we reduce the incidence of this problem?*

Theories for impaction

1. Narrow upper arch causes a strong probability of impaction. Not valid in the majority of cases
2. A combination of genetics and familial tendencies
3. Missing or small lateral incisors, but a normally sized arch
Good result but a lot of work required

Prevention of palatally impacted cuspids

- Early diagnosis: palpation at age 9. Should feel a bulge at the labial of the deciduous upper cuspids
- Screening Panorex at age 9 years
- Extraction of primary canines if necessary
- Extraoral traction in Class II cases
- Palatal expansion if the upper arch is narrow
**Potential Treatment Options**

1. Dr Kurol demonstrated that 65% of canines presenting with a mesial angulation will erupt normally once the deciduous cuspids have been removed.
2. Dr Taylor showed that 85% of canines will erupt normally if, in Class II cases, molars are distalized into a Class I relationship.
3. Dr Baccetti found similar results after palatal expansion.

**Importance of early detection**

8 months later: Mesial angulation is increasing.
Primary canines extracted

Teeth are now on the arch
3. Posterior crossbites

- Bilateral
- Unilateral
  - Functional
  - Non-functional

Maxillary Transverse Dimension

Management of a crossbite

1. Obtain a complete orthodontic record
2. Establish correct diagnosis
3. Explain the benefit to the parents
4. Time the correction
Transverse deficiency

• 30% of adults present with maxillary transverse discrepancy (Profitt-1990)

Etiology

• Lack of development of the whole maxilla (genetic)
• Lack of development of the dentoalveolar complex (functional)
  – Habits (thumb sucking)
  – Mouth breathing
  – Poor tongue posture

Transverse discrepancy

• May be present in any type of malocclusion
  – Class II div 1: In centric occlusion, transverse discrepancy is not apparent
    • Once the AP correction is applied the transverse discrepancy becomes apparent.
  – Class III: Lack of development and projection of the maxilla in the AP and transverse dimensions are some of the main etiologies of this malocclusion.
8 year old female patient

Posterior crossbite

- Functional
- Non functional: True asymmetry of the maxilla or mandible (rare, best example is cleft lip and palate patient)

Functional Posterior Crossbite

- Posterior teeth are in crossbite
- Lower midline deviated in the direction of the crossbite
Facial analysis

Midlines

- Skeletal
  - Facial
  - Mandibular
- Dental
  - Upper
  - Lower

Arrows rule:

- Deviated midline: The aetiology is usually in the direction of the arrow
- Exception?
Midlines

- Aligned midlines do not guarantee the absence of a crossbite

Functional or non functional crossbite?

Centric occlusion
Functional crossbite

- Crossbite is present in centric occlusion
- Cusp to cusp relationship in centric relation
- Bi manual manipulation of the mandible will result in centered midlines and cusp to cusp occlusion

Centric relation

Etiology of the functional crossbite

- Asymmetry
- Lack of transverse development of the maxilla
- Overdevelopment of the mandible
The lingual cusp of the upper molar must fit in the central fossa of the lower molar. The upper intercanine distance must be 3 mm wider than the lower intercanine distance.

Most common etiology of a functional crossbite

- Maxilla is slightly narrower than the mandible.
  - This explains the cusp to cusp occlusion in centric relation.
Treatment of unilateral functional crossbites

Timing

• Success rate is age dependent (suture maturation)
  – 7 to 12 years of age brings the best prognosis
• Explanation to parents is important

Possible Appliances

• Palatal expansion
  – Rapid (rapid palatal expander)
  – Moderately rapid (Quad Helix)
  – Slow (appliance activated once or twice a week)
**Fixed rapid palatal expander**

- Sutural expansion with the least amount of dental tipping
- Rapid or moderately rapid
  - One activation per day (a quarter turn of the microscrew) or one activation every second day

**Effects on Mx complex**

- So we get 2 triangles:
  - The frontal view shows lateral rotation of the alveolar rails such that a triangular expansion takes place with the base near the incisors and the apex forward of the nasal area – the fulcrum of rotation is approximately at the frontomaxillary suture
  - The 2nd triangle is in the transverse plane with triangular expansion occurring with the base at the incisors and the apex posteriorly

_Bell, 1982_

**Hyrax**
Haas

Activations

- Usually 24 to 32 activations will be necessary
- Lingual cusps of the upper first molars should be in contact with the buccal cusps of the lower molars
- Overcorrection at the level of the permanent molars (20%).

Sutures affected

- Wedge shape expansion
- More intercanine expansion than intermolar expansion
Rapid Palatal Expander

- The best method to open the midline palatal suture and increase the width of the maxilla orthopedically
- Maxillary expansion is now being prescribed in younger patients
  - Some authors are proponents of RPE therapy in the primary dentition.....

Correction of a posterior unilateral crossbite

At the 24 month follow-up this patient will most likely not require further orthodontics
Expansion without a crossbite

- Potential Indications:
  - Narrow and triangular maxilla
  - Lack of transverse development
  - Moderate crowding
  - Teeth of normal width

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Arch perimeter increase is 0.7 times the increase in arch width (Adkins et al., 1990)

Example:

- Arch width increase: 7.0 mm

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Ugly Duckling Stage: What would you do?

1. I don’t know much…
2. Extraction of deciduous canines?
3. Expansion of the maxilla?
Rapid Palatal Expansion
(18 months later)

No treatment on the lower arch

4. Oral habits

• Thumb sucking
• Low tongue posture
• Oral respiration

Photographer: Dr. Stéphane Schwartz MCH

Deformation of the alveolar processes even in the deciduous dentition
Treatment options

• Psychology
• Speech therapy
• Treatment
  – Fixed appliance
  – Removable appliance

Anterior position of the tongue.
Mother wanted something fixed….

Four months of treatment with a palatal expansion appliance and a tongue crib
The occlusion and smile have improved including in the vertical dimension (smile line)

5. Excess overjet

- The second most common chief complaint (overbite)
- Etiology:
  - Oral habits: upper incisors proclined and spaced
  - Class II skeletal with dentoalveolar factors
    - Growth modification
      - HS
      - Twin block, headgear
      - Forsus
  - Genetic origin. Patient in which growth is or has been unfavourable
    - Surgery or camouflage

Cephalometric analysis is very important

Differential Diagnosis

- Skeletal relationship
  - Maxillary
  - Mandibular
  - Vertical
- Dentoalveolar relationship
  - Inclination of the upper and lower incisors
Dentoalveolar protrusion or skeletal dysplasia?

Dentoalveolar Protrusion:
- Normal skeletal measurements
- Excess overjet
- Space between the upper incisors
- Proclined upper incisors

Skeletal dysplasia:
- Abnormal skeletal measurements
- Excess overjet
- No space present between the upper incisors
- Full cusp Class II molars

Dentoalveolar Protrusion Case

- 10 mm overjet
- Mainly of dentoalveolar origin (ANB=3.5)
Treatment

• Interceptive treatment
• Bands on permanent molars
• Brackets on the 6 upper anteriors
• Cervical extra oral traction

It is important to avoid the use of a removable appliance because the upper incisors would extrude, an unfavorable result even if the overjet is reduced.

Extra oral traction appliance

• Efficient
• Controls the forward growth of the maxilla and allows the growth of the mandible to fully express

• «Cool factor»: zero
  — Compliance can be a problem
  — However, a very efficient appliance

Cool factor = 0!

12 months post treatment
• Should we intervene at a young age?
  – Two phase treatment vs single phase
    • Scientific literature supports a single phase treatment
    – However many clinicians still practice 2 phase treatment
    • Clinical judgment is important because each case is different

11 year old female patient
Class II division1
Retrusive mandible

- Deficient lip seal
- Good facial proportions
- Favorable growth potential

Myofunctional Appliances

- Promote
  - Repositioning of the mandible
  - Maximum expression of mandibular growth
  - Bite opening
  - Maxillary expansion

Twin Block Appliance

- Appliance to protract the mandible
- Maxillary expansion
- Bite opening

- Other myofunctional appliances perform essentially the same functions
Excellent response by the patient

- Compliant patient
- Favorable mandibular growth
- Good dentoalveolar response

Same type of response in our patient
(12 months of Twin Block)

Types of treatment

- «Timing is almost everything»
- Dentoalveolar compensations must be favorable
- Optimal mandibular growth in volume and direction is primordial
- Disclusion of the dentition is extremely important
Fixed appliances

- Type «Herbst» or Forcus...
- Pistons position the mandible in an anterior position
- Generally slightly more efficient than myofunctional appliances
- Correction is mainly dentoalveolar

Genetic mandibular retrusion

- Regardless of the type of appliance used, the probability of success is guarded.
- The family must be aware that mandibular advancement surgery will most likely be necessary if a reasonable result is to be obtained

A word of caution: Class II of genetic origin will not respond to conventional orthodontic treatment
Panoramic radiograph

SEVERE ROOT RESORPTION

Treatment limited to lower arch at the moment

Patient refused lower premolar extractions.

Microimplants were used to distalize lower teeth as much as possible.
Results

Profile improvement
6. Anterior crossbite

- Functional origin
  - Easily corrected with a removable appliance
- Dentoalveolar origin
  - Palatal expansion and traction
- Skeletal origin
  - Surgery may be required if bony bases are too far apart

Differential diagnosis

- Anterior crossbite:
  Class III vs pseudo Class III
  - Manipulation:
    centric occlusion – centric relation
  - Facial profile (concavity of middle third of face)
  - Dentoalveolar compensations :
    • Verify the angulation of the upper and lower incisors
Functional anterior crossbite

Centric occlusion  Centric relation

Manipulate the condyles in their physiologic rest position. If the occlusion is end to end it is probable that the crossbite is functional.

A case presenting with a functional anterior crossbite

History:
- Nine year old girl in good health
- No history of skeletal Class III in the family
- Mixed dentition
- #21 in crossbite

A case presenting with a functional anterior crossbite

A case presenting with a functional anterior crossbite

A case presenting with a functional anterior crossbite
Appliance of choice to correct a functional anterior crossbite

- Hawley with posterior bite pads
- Finger springs or microscrews on the lingual of the upper incisors
Skeletal Class III Treatment

**Examination**

1. Analysis of records
2. Estimation of the severity of the malocclusion
3. Prediction of growth
   - Direction
   - Potential, amplitude

**Treatment**

- Rapid maxillary expansion
- Maxillary traction with Delaire facemask or bone plates (new approach)
- Brackets on upper incisors
- Long term retention

**History:**
Nine year old female patient, in good health
Uncle has a skeletal Class III malocclusion
Mother concerned about the anterior position of the chin

2008
Mainly, a retruded maxilla
The lower incisors are not retroclined
Rapid Palatal Expansion

21 to 28 days of activation, 1 turn of screw per day

Maxillary traction appliance.
(Delaire facemask)

To be worn 12 hours per day for one year

Result

Treatment 12 months
Retention 12 months
Genetic Class III:
"Patient who would not stop growing"

When nature does not want to help us....
Wits Analysis

(Alignment of the maxillary and mandibular osseous bases relative to the plane of occlusion)
The patient and his parents agreed that orthognathic surgery would be necessary at the end of growth.
Sleep Apnea in the child and adolescent

A multifactorial problem with no easy solution

Snoring: Benign condition and annoying but without danger (snoring)

UARS: Disturbance of sleep without oxygen desaturation (no cardiopathy)

OSA: Trouble sleeping + oxygen desaturation of (cardiac disorders, vascular accidents, hypertension, arrhythmias, death)

Most frequent contributing factors

1. Environment
   - Diet = Obesity
   - Allergies
2. Genetic
   - Skeletal malocclusion
3. Combination

Sources:
- CT Scan A, Report: Radiol. 2015, 40:3. 20H. 03-24
- Radiol. 2015, 40:3. 20H. 03-24
- www.crystalinks.com/overweightkids.html
- www.saberycuidar.org/allergies#in#children.html
Observations frequently seen

- Hypertrophied tonsils and adenoids seen in young patients presenting with UARS or OSA

Obesity

Typical appearance of a child who suffers from sleep apnea

1. Extraoral exam
   - Facial type
   - Dark rings under the eyes
   - Retrusive mandible (Class II malocclusion)
   - Retrusive maxilla?
Role of the dentist:

1. Rapid palatal expansion

- Literature supports RPE at a young age for OSA
- A **skeletal** expansion of an average of 4.5 to 6 mm is obtained
- **The earlier the intervention, the greater the benefits**

CROSSBITE and OPENBITE CORRECTIONs

TB – DN: 05-2005
Extra-oral examination

• Parents’ complaint: His tongue is between his teeth all the time.
• He snores at night.

Intra-Oral Examination

TB 6 years old

• Clinical findings:
  – Erupting permanent molars
  – Severe openbite
  – Anterior tongue posture
  – Posterior crossbite
  – Lower mandibular midline deviation
  – Reverse smile line

Intra-Oral Examination

TB 7 years old

Clinical findings:
  – Openbite
  – Midline deviation
  – Distal terminal plane of occlusion
  – Narrow and tapered upper arch
Intra-Oral Examination
TB 8 years old

Clinical findings:
- Class II molar relationship
- Reduced overbite
- Posterior crossbite

Intra-Oral Examination
TB 8 years 9 months old

Clinical findings:
- Diastema between upper incisors
- Midlines corrected
- Anterior openbite
- Minimal snoring

Rapid palatal expander: 30 activations
Intra-Oral Examination
TB 10 years old

Clinical findings:
- Class II molar relationship
- 15% overbite
- Improvement of occlusal relationship
- No more snoring
- Anterior tongue posture has subsided

Conclusions

• A detailed orthodontic examination is essential for every child
• Interceptive orthodontics is one of the most important aspects of paediatric dentistry
• Simple, well coordinated interventions, will be very beneficial for your patients.
• This presentation is only an overview of interceptive orthodontic interventions. Hopefully it has given information to allow better communication with your patients, parents and friendly orthodontist!