

# ORTHODONTICS

Stomatological specialisation dealing with prevention, diagnostics and therapy of irregular tooth position, relationship of tooth arches and jawbones

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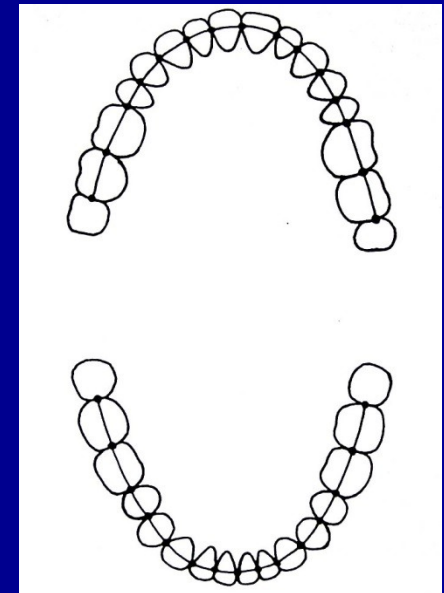
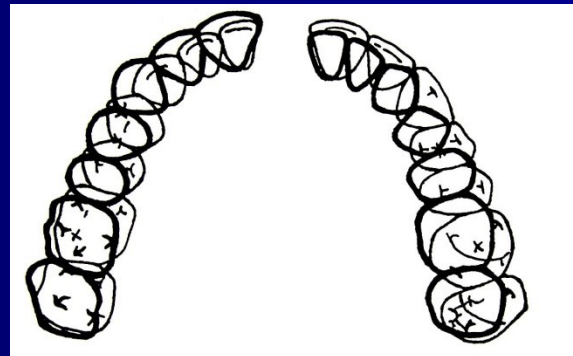
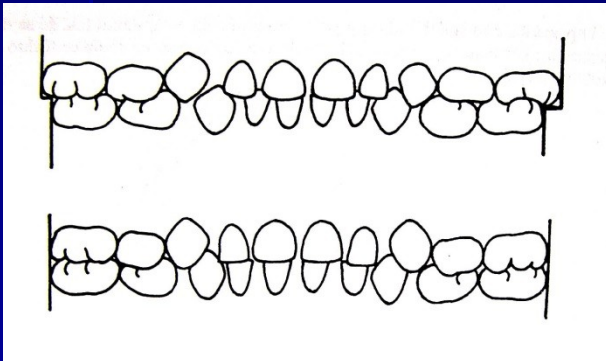
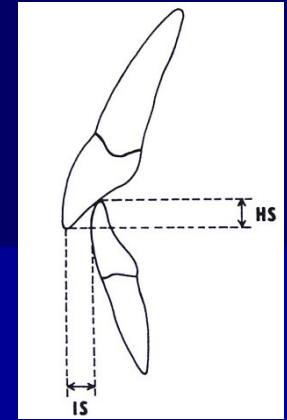
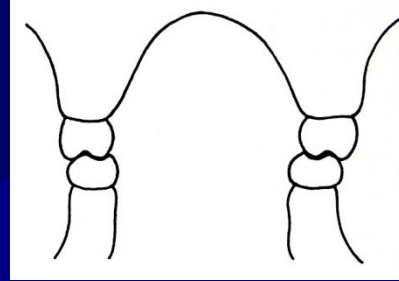
- **MALOCCLUSION** is a manifestation of genetic and environmental interaction on the development of the orofacial region

# GOALS OF TREATMENT:

- Ideal functional occlusion
- Ideal soft tissue proportions and adaptation
- Ideal jaw, skeletal and dental relationship

# Ideal occlusion

- correct relationship of molars
- correct overjet and overbite
- Correct intercuspitation of teeth
- Points of contact are lined in an regular arch
- Deciduous dentition is ended either by a small step or the posterior teeth facets are aligned



Correct dentition has 6 keys of correct occlusion- Andrews

# Ideal occlusion



# Ideal occlusion



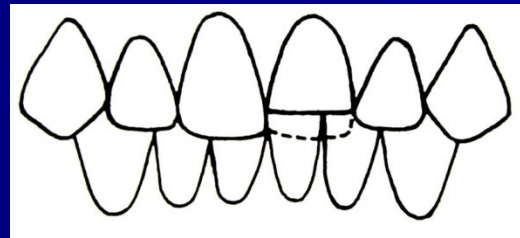
# Classification of orthodontic anomalies

## 1. Anomalies of single tooth

**Inclination** – tooth tipping  
mesially, distally,

vestibular = protrusion, oral = retrusion,  
vestibular, lingual, palatal eruption

**Vertical anomalies** - supraocclusion,  
infraocclusion



**rotation**





# Classification of orthodontic anomalies

## 1. Anomalies of single tooth

**Nonocclusion** – buccal, lingual, palatal  
upper teeth are not in contact with  
lower teeth

**Transposition** – change of sequence of  
teeth in one arch, eg. the canine  
and first premolar or canine and  
lateral incisor

# Classification of orthodontic anomalies

## 1. Anomalies of single tooth

**Rotation** - mesial, distal

**Retention** – the teeth is developed, but not erupted, most often: wisdom teeth, upper canine

**Ankylosis, reinclusion**

**Hyperodontia** – the number of permanent teeth is higher [supernumerary teeth, most frequently- mesiodens, upper incisors]

**Hypodontia** – the correct number of teeth is reduced because some teeth are absent due to agenesis of their germs [most frequently- upper lateral incisors, third permanent molars, premolars]

# Hypodontia





# Anomalies of the shape of teeth



# Palatal eruption



# Palatal eruption

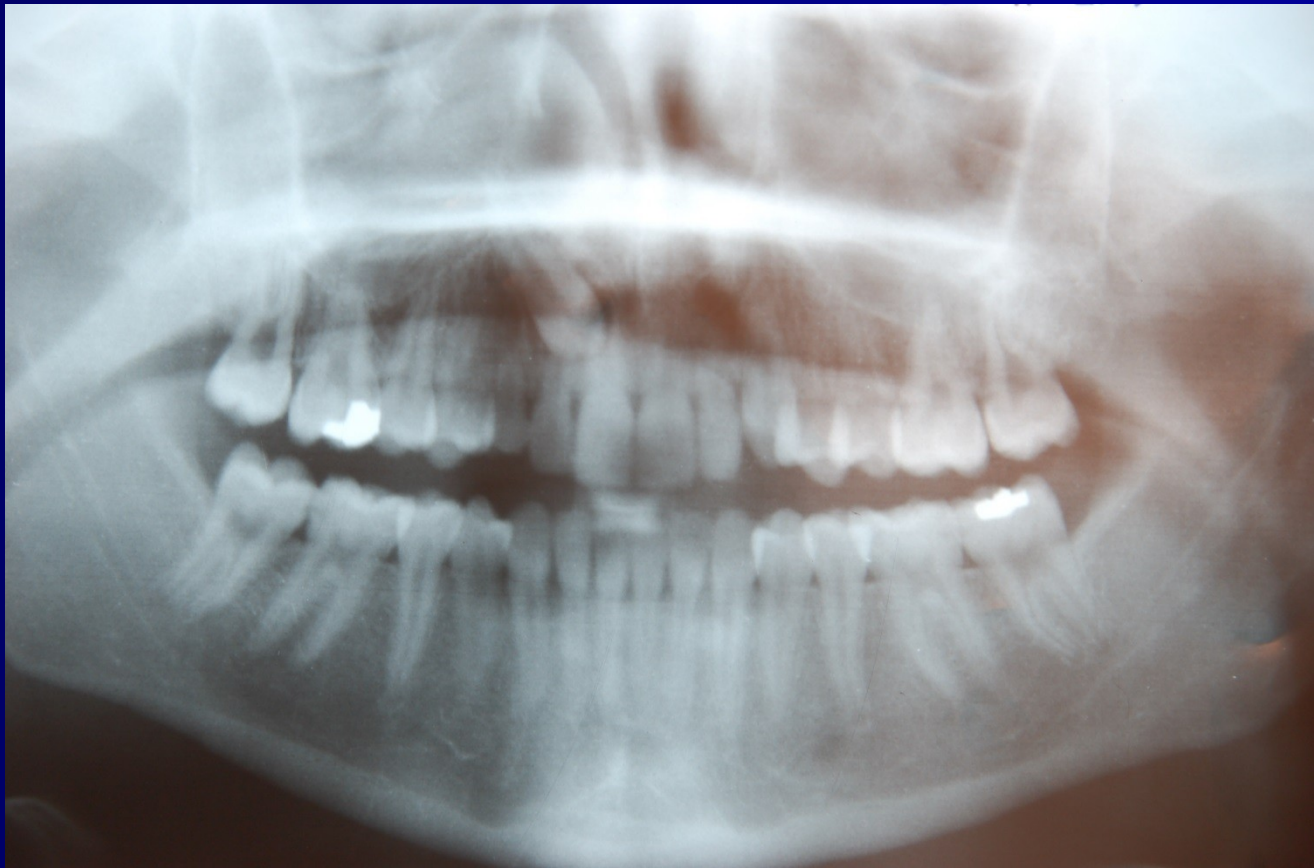


# Retention of canine





# Retention of canine



# Infraocclusion



# Buccal nonocclusion

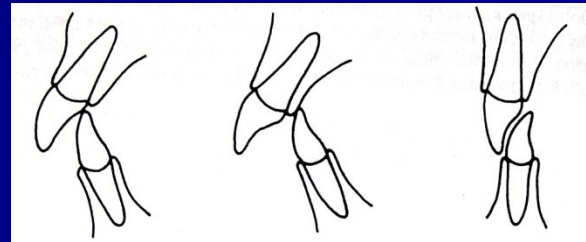


# Classification of orthodontic anomalies

## 2. Anomalies of groups of teeth

- groups of teeth are in irregular position

Protrusion, retrusion



**Inverted bite** – is in the frontal part –  
lower tooth is more anteriorly than the  
upper tooth

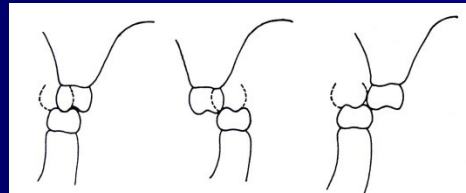
# Inverted bite



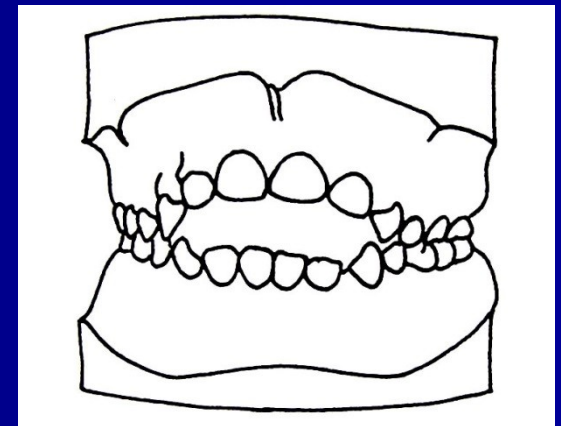
# Classification of orthodontic anomalies

## 2. Anomalies of groups of teeth

**Cross bite** – in lateral part the buccal cusps of lower molars are more buccally than the intercuspidal line



**Open bite** - negativ overbite



# Cross bite



# Open bite





# Classification of orthodontic anomalies

## 2. Anomalies of groups of teeth

**Deep bite** – the overbite is increased, the upper incisors cover more than the incisal third of the lower incisors

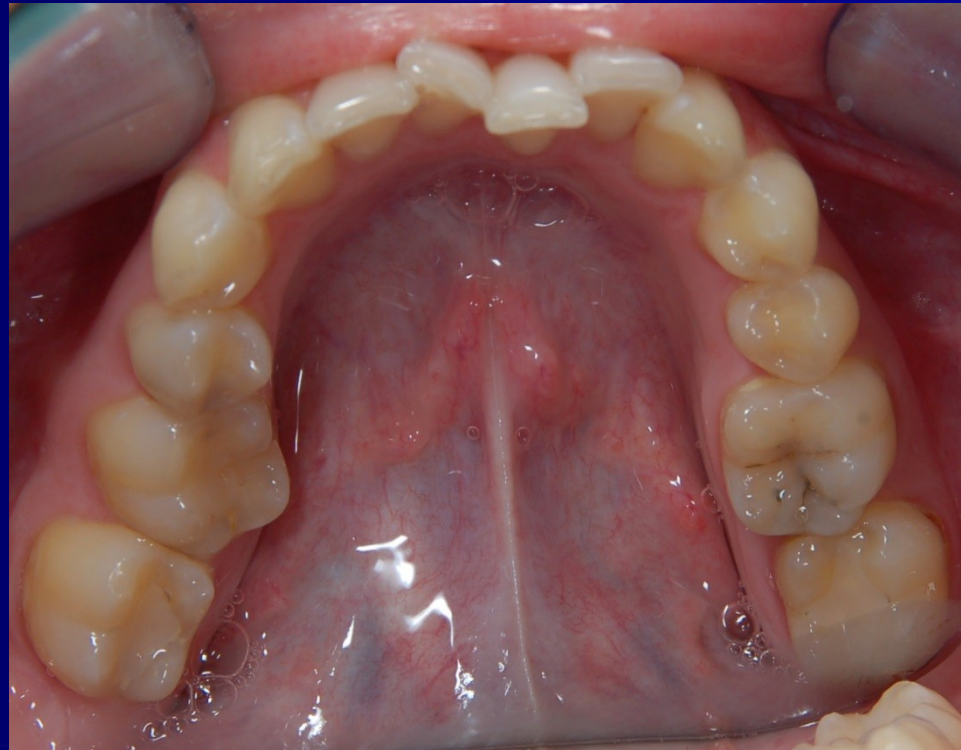
**Spacing, diastema**

**Crowding** – primary, secondary, tertiary

# Deep bite



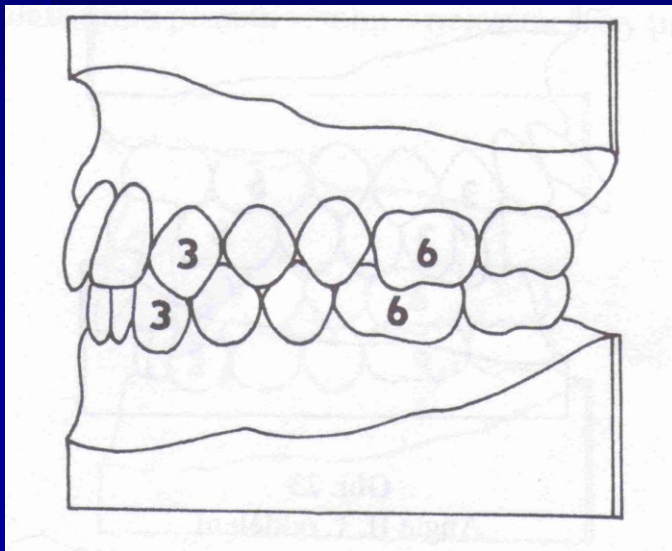
# Crowding



# Classification of orthodontic anomalies

3. Anomalies of the relationship of dental arches = Angles classification

Class I . normoocclusion



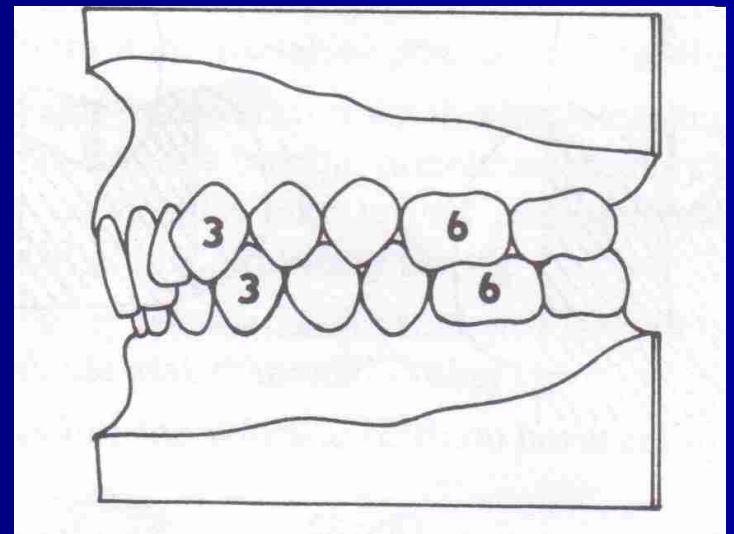
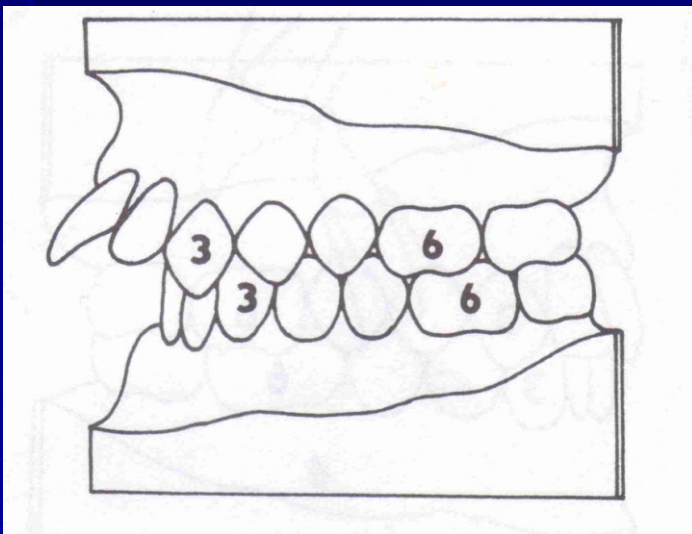
# Angle I



# Classification of orthodontic anomalies

## ■ Class II : distal occlusion

- with protrusion of upper incisors
- with retrusion of upper incisors

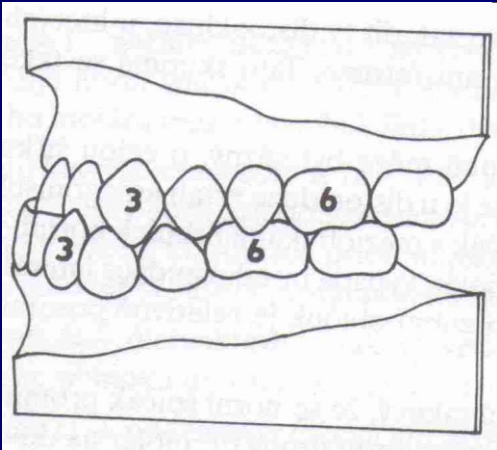


# Angle II



# Classification of orthodontic anomalies

- **Class III** : mesial occlusion



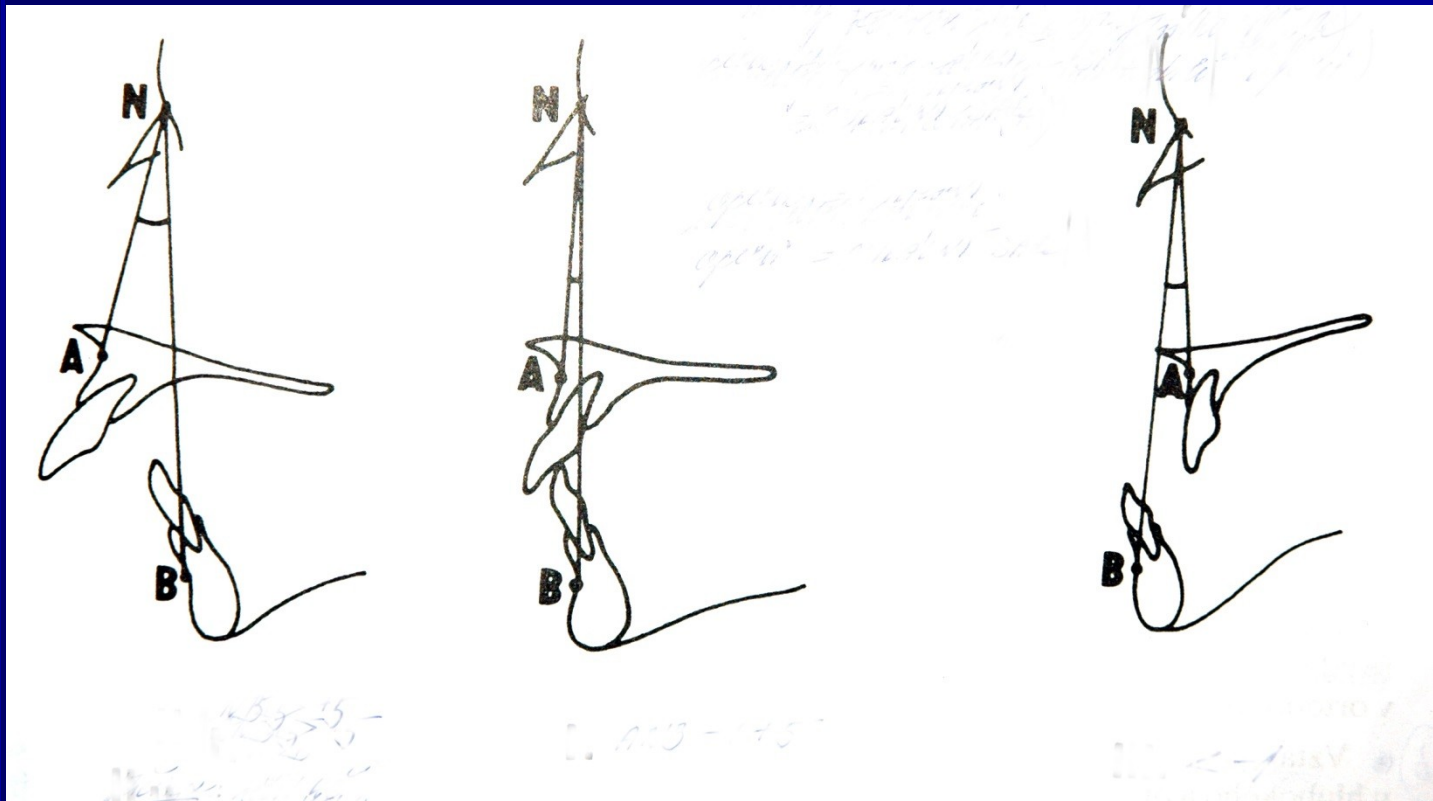


# Angle III



# Classification of orthodontic anomalies

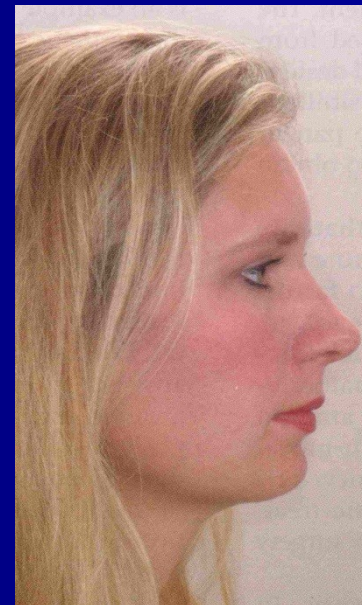
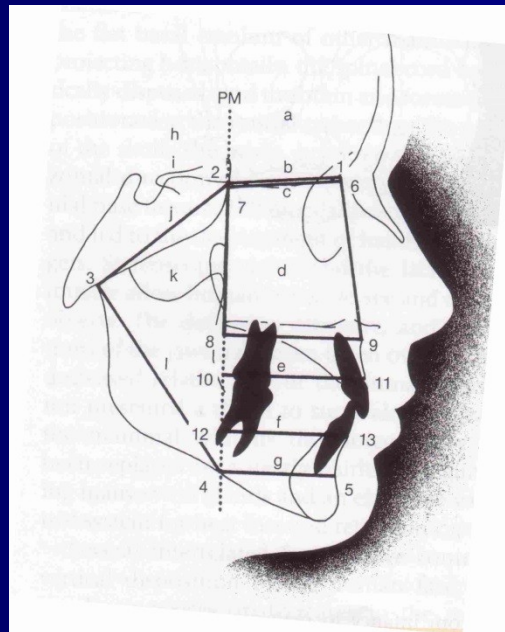
- 4. Anomalies of position, size and relationship of the jaws-bones



# Classification of orthodontic anomalies

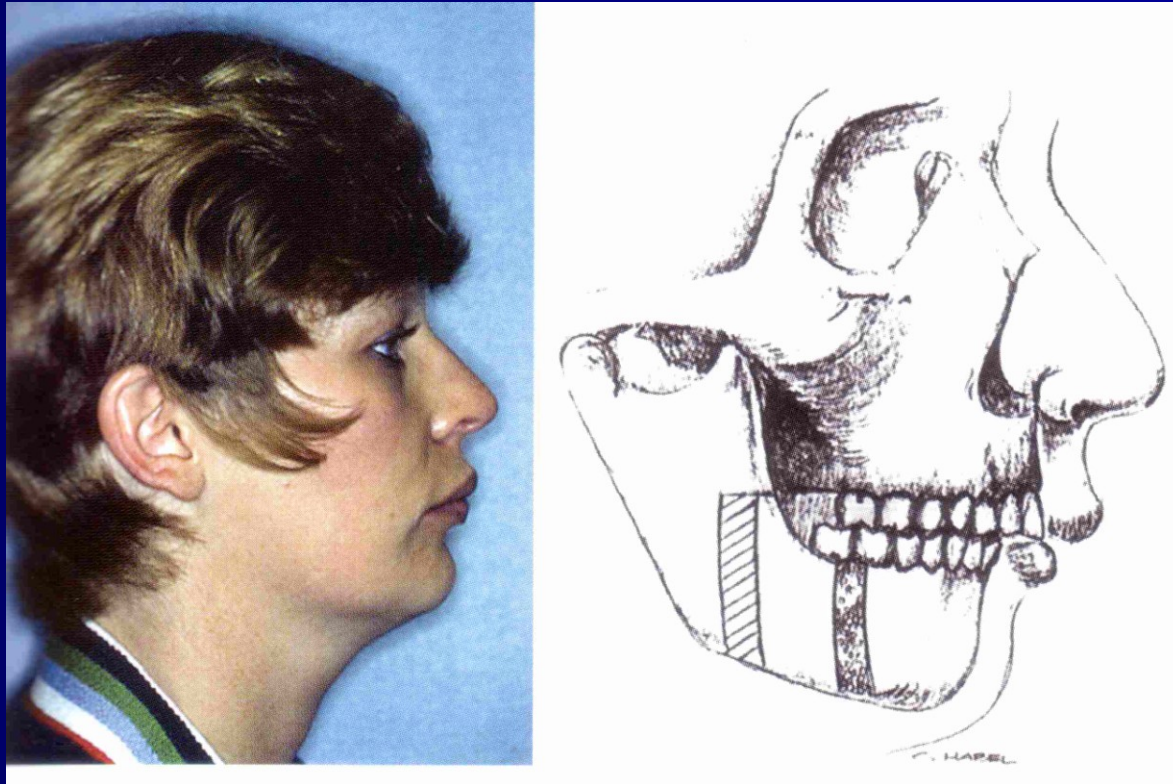
## 4. Anomalies of position, size and relationship of the jaws-bones

**Skeletal class I** : relationship of jaws without any deviation



# Classification of orthodontic anomalies

- **Skeletal class II** : the lower jaw is more distally to the upper jaw (small lower jaw, large upper jaw)

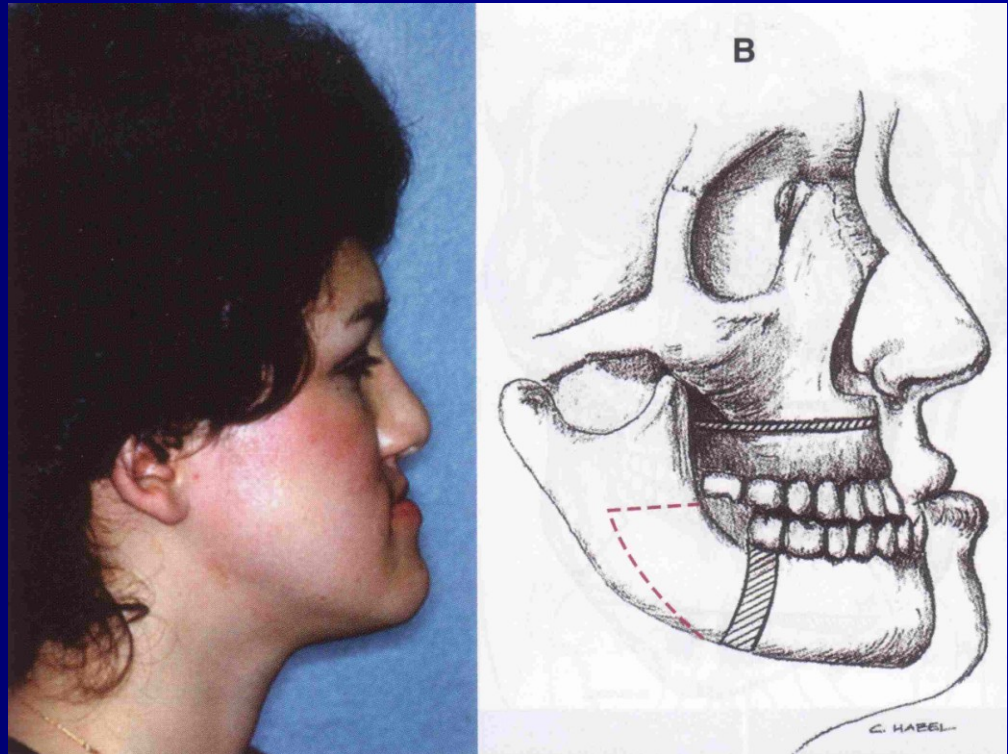


# Angle II



# Classification of orthodontic anomalies

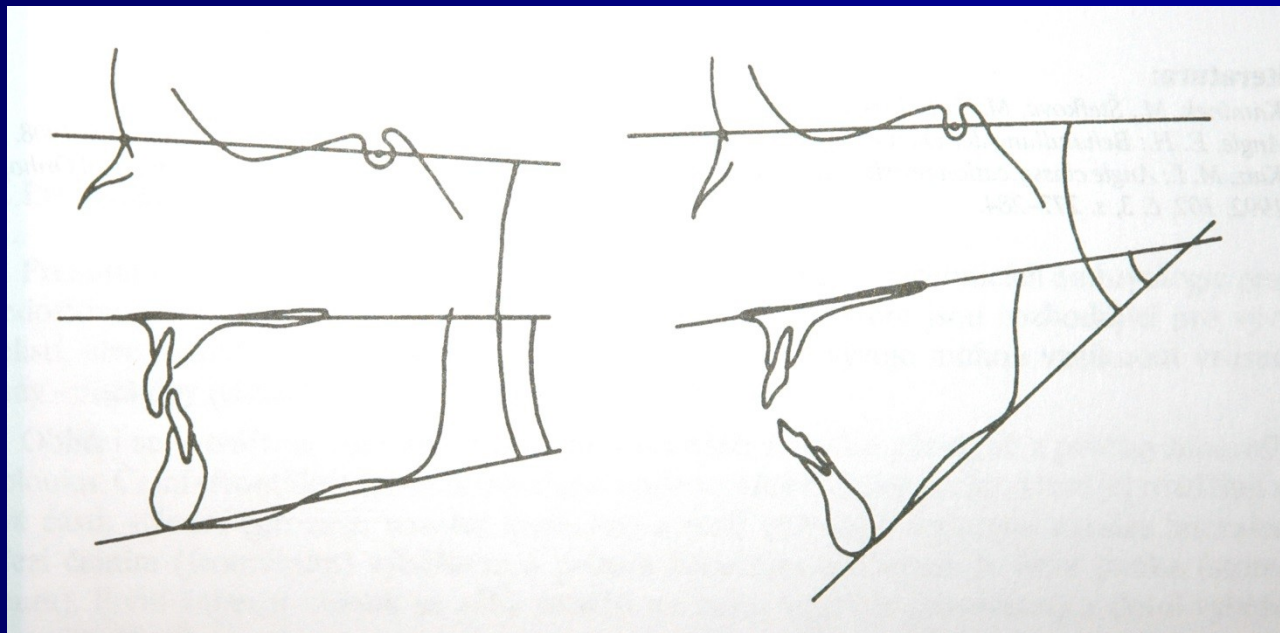
- **Skeletal class III** : the lower jaw is ventral to the upper jaw (progenia – large mandible, pseudoprogenia – small maxilla)



# Angle III - TLR



# Classification of orthodontic anomalies







Deep bite

V



Deep bite,  
skeletal class II

V

st pixelu: 0.127 mm



Protrusion ,  
skeletal class II

st pixelu: 0.127 mm



Inverted bite,  
skeletal class III

ixelu: 0.127 mm

128

F



Skeletal, dental  
open bite

V

st pixelu: 0.127 mm

6 L: 128

F



Skeletal open bite,  
class III.

st pixelu: 0.127 mm

V

# Diagnostic examination

## 1. ANAMNESIS

### a] Family anamnesis

- dental problems of parents
- orthodontic anomalies of parents
- genetic health problems

# Diagnostic examination

## 1. ANAMNESIS

### b] health anamnesis of the patient

- medicaments
- allergy
- facial and dental injury
- contagious disease

# Diagnostic examination

## 1. ANAMNESIS

### c] special anamnesis of the patient

- frenulectomy
- adenotomy
- habits
- mouth breathing

# Diagnostic examination

## 2. CLINICAL EXAMINATION

### a] extraoral examination

- profile [convex, concave, straight]
- face symmetry
- temporomandibular joints

# Diagnostic examination

## 2. CLINICAL EXAMINATION

### b] intraoral examination

- Status of dentition, caries, fillings
- Anomalies of the relationship of dental arches – Angles classification
- Overjet, overbite
- Status of oral soft tissues, frenulum
- Functional examination, centric occlusion
- hygiene

# Diagnostic examination

## 3. MODEL EXAMINATION

- space analysis, discrepancy
- arch form
- dental anatomy
- intercuspidation

# Diagnostic examination

## 4. RADIOGRAPHS

### a] Panoramic

- detection of congenital absences of teeth
- detection of supernumerary teeth
- evaluation of the dental health of the permanent teeth
- assessment of trauma to the teeth after injury
- determination of dental age of the patient
- calculation of root resorption
- condyles





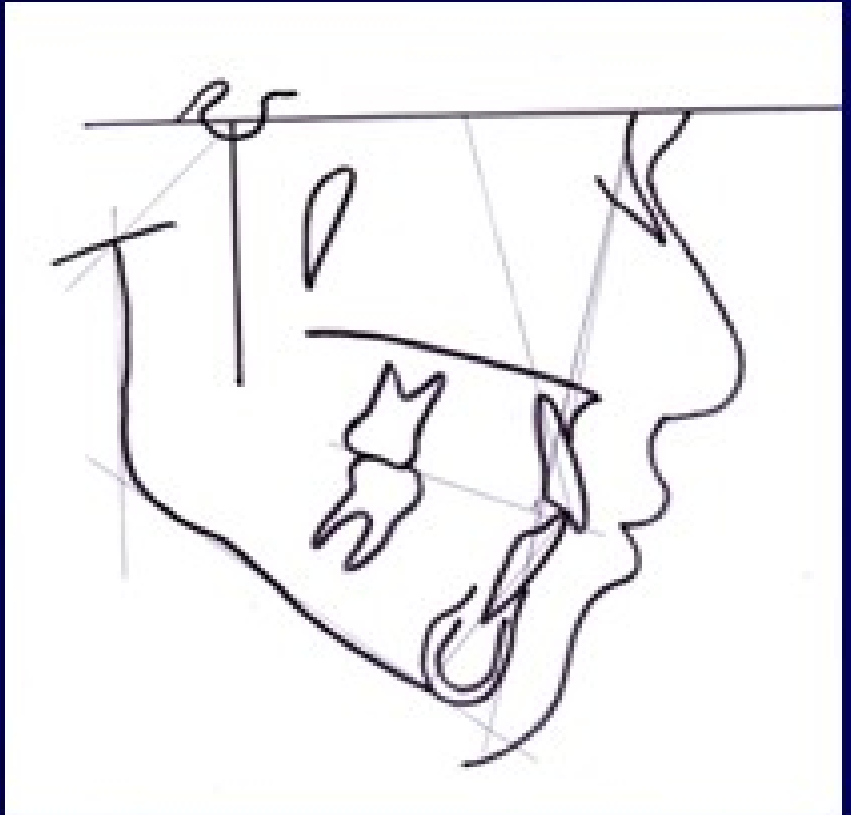


# Diagnostic examination

## 4. RADIOGRAPHS

### b] Cephalometric radiographs

- evaluation of craniofaciodental relationship
- assessment of the soft tissue matrix
- determination of mandibular position
- prediction of growth and development
- detection of skeletal age



# Cephalometric analysis

N - nasion (1)

S - sella (2)

a - articulare (3)

Me - menton (6)

Po - pogonion (7)

SpA - spina nasalis ant. (9)

SpP - spina nasalis post. (10)

A - bod A (11)

Is - apex horního středního řezáku (12)

Is - incisale superius (13)

Ii - incisale inferius (14)

Ii - apex dolního řezáku (15)

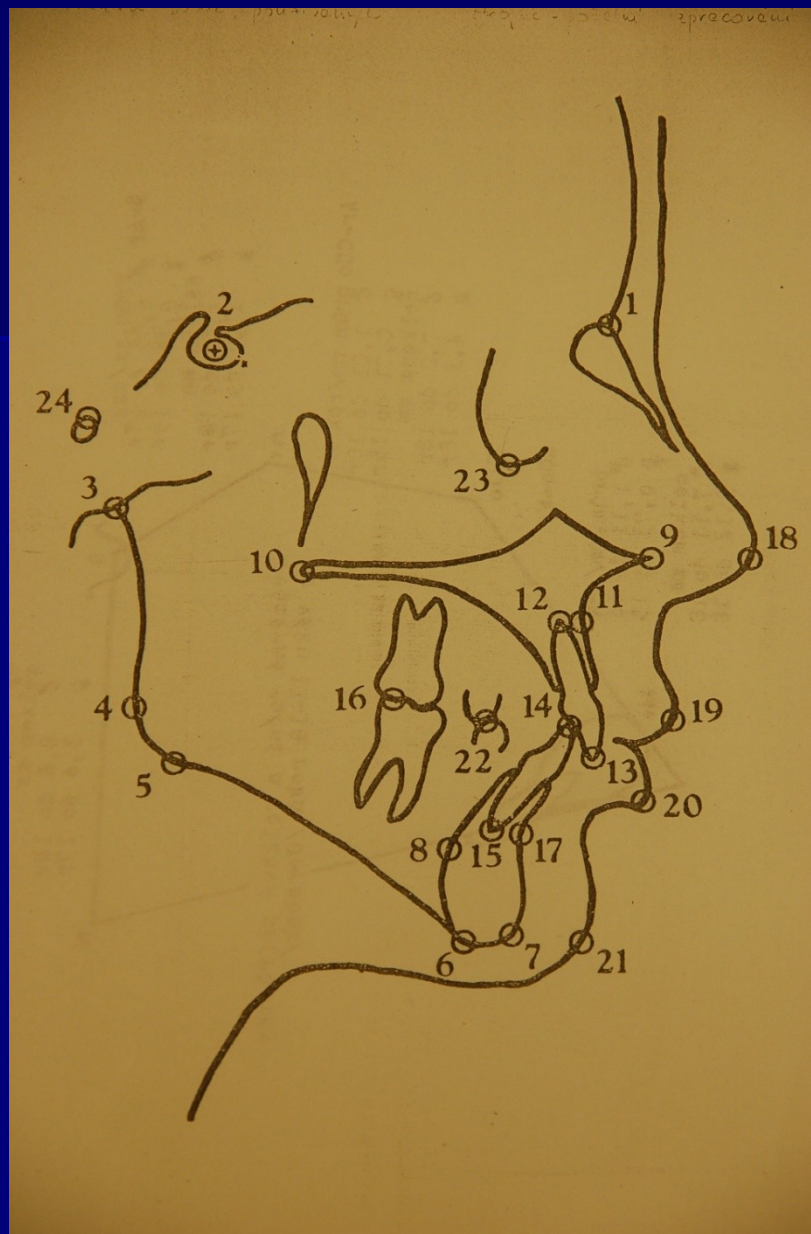
B - bod B (17)

Go - gonion (kontr. bod: 1. a-4, 2. ML)

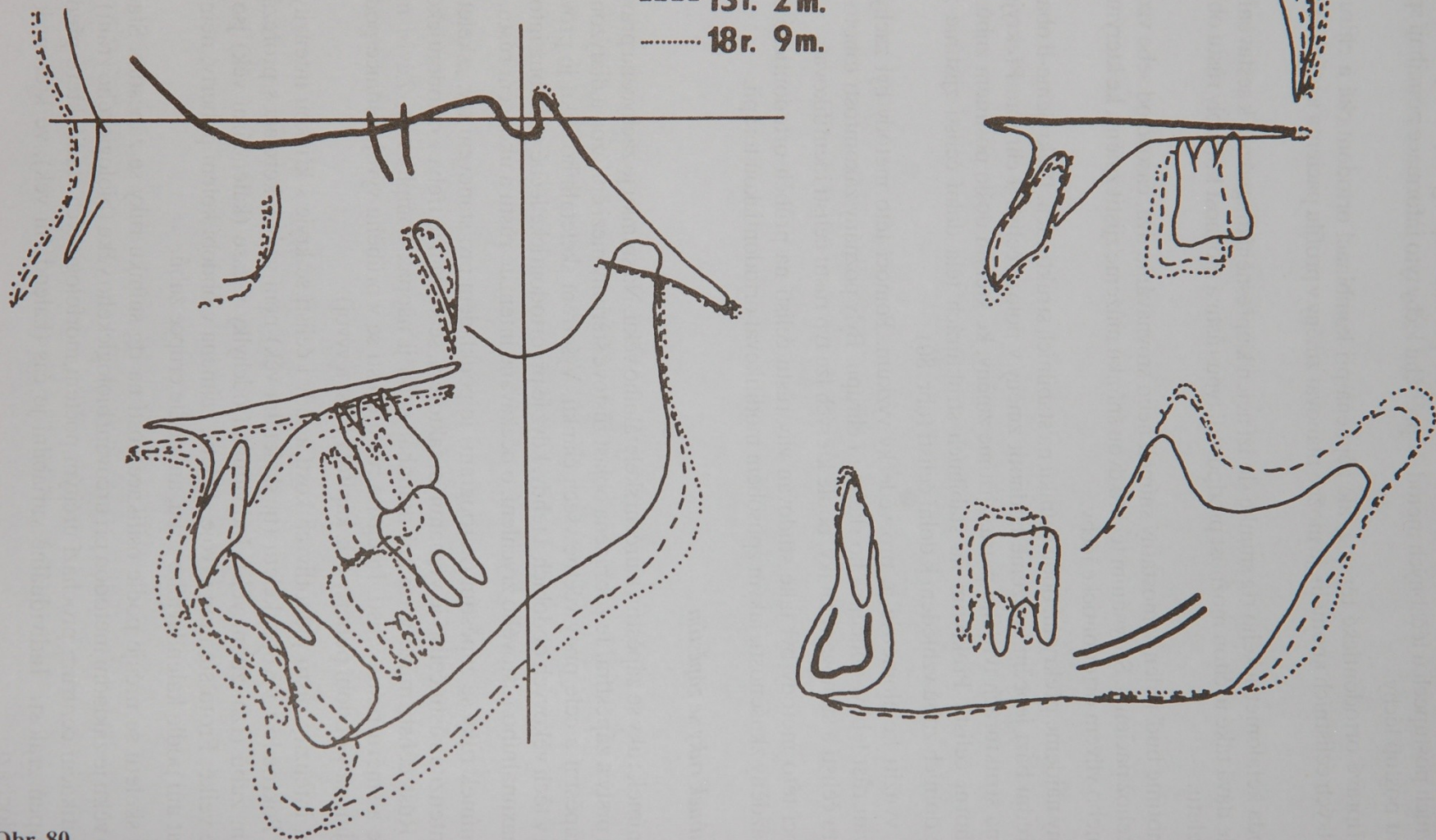
Gn - gnation (konstr. bod: 1. N-Po, 2. ML)

ML - mandibulární linie (Me-5)

FOL - funkční okluzální linie



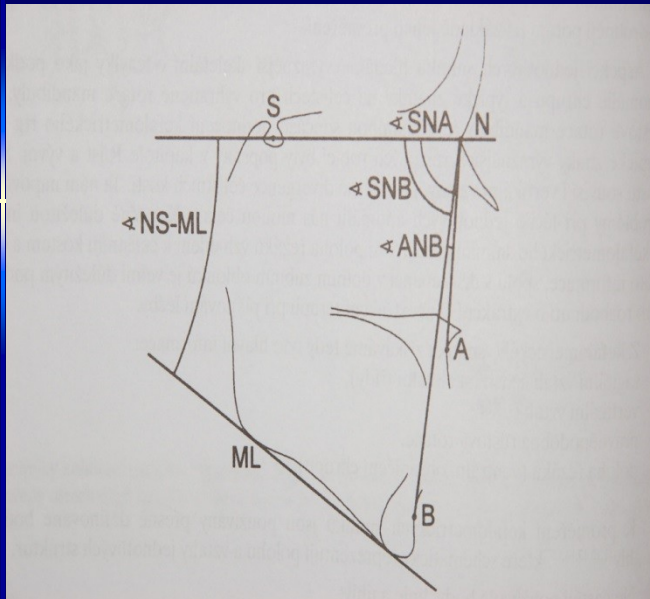
— 9r. 2m.  
- - - 13r. 2m.  
· · · · 18r. 9m.



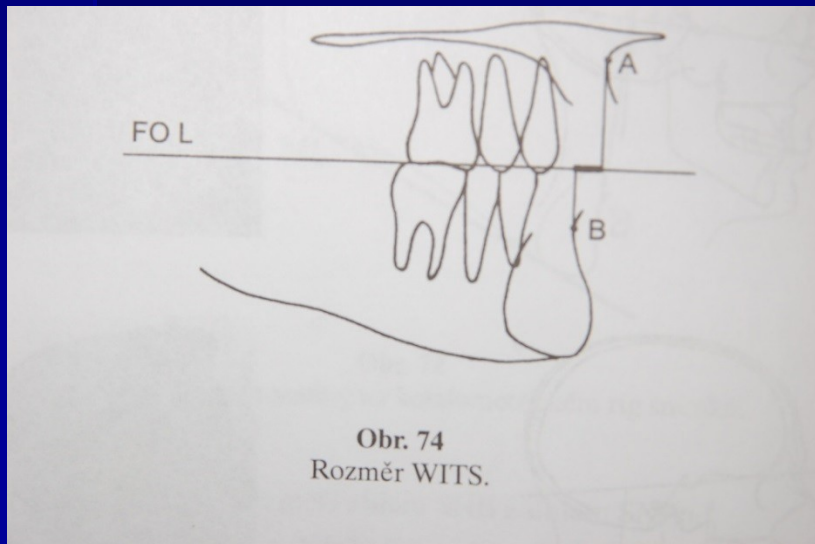
Obr. 80

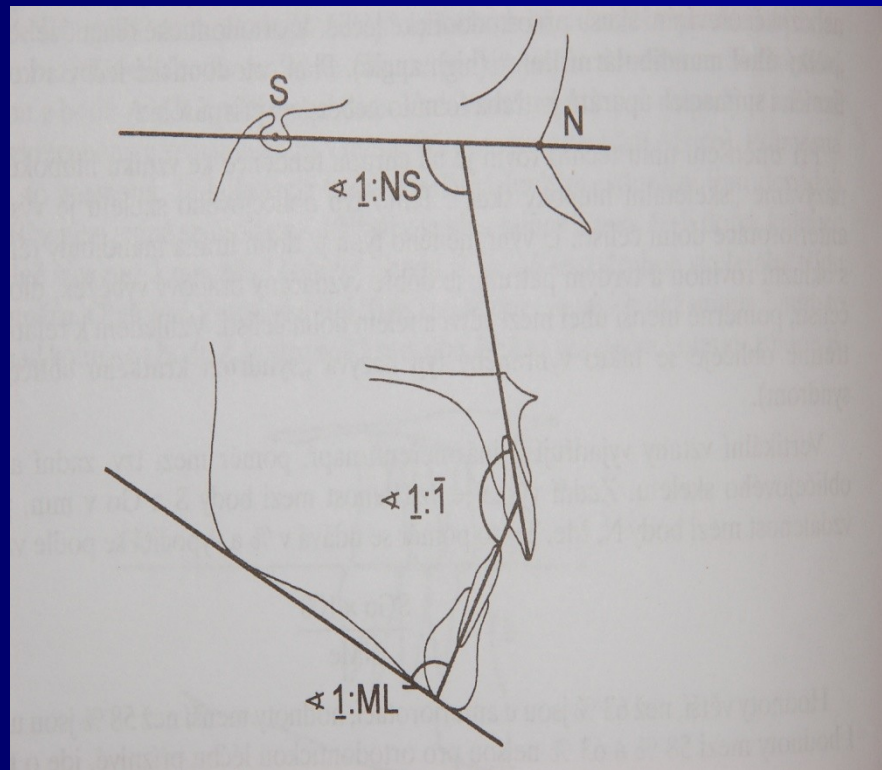
Fig. 80. Mandibles of *Stenobothrus* sp. (left) and *Stenobothrus* sp. (right) showing the development of the mandible from the 9th to the 18th instar.

# skeletal analysis



- ANB (-1 to +5 degree)
- WITS (-2 to +2 mm)







# Skeletal class I



## Skeletal Class II

With protrusion of upper incisors



With retrusion of upper incisors



## Skeletal Class III.

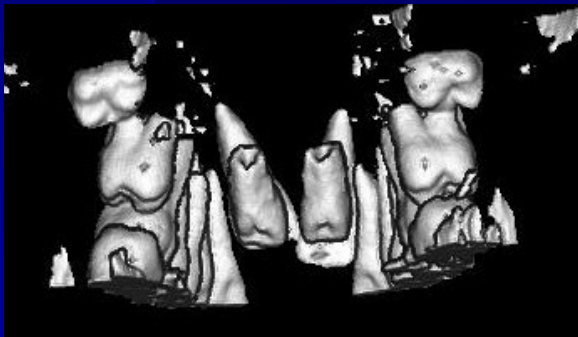
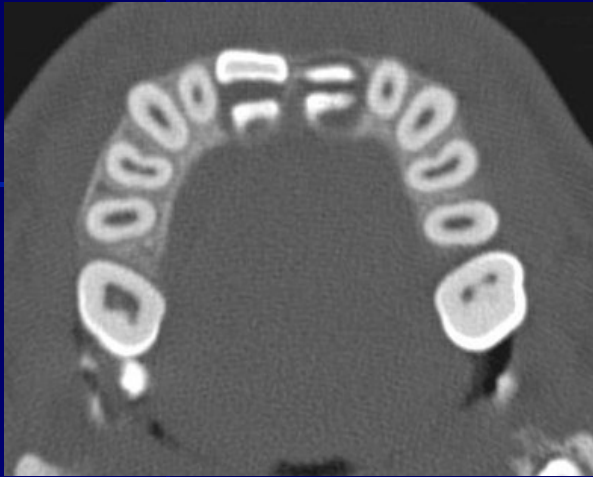


# Diagnostic examination

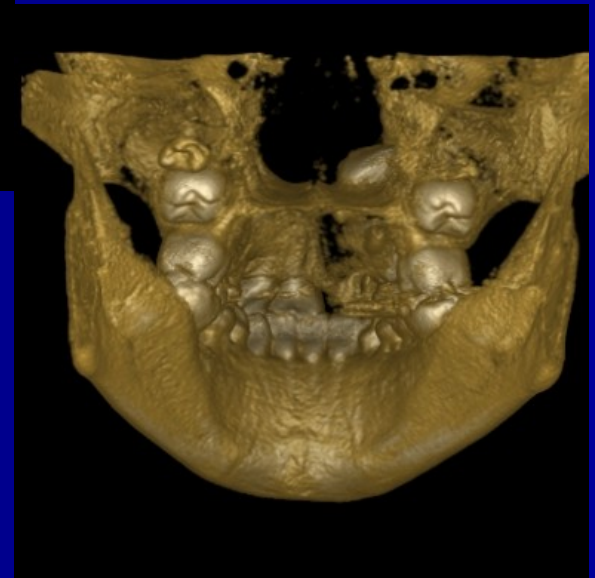
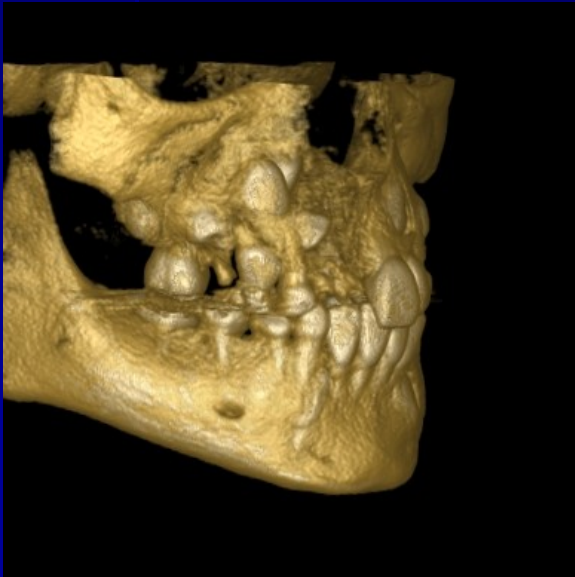
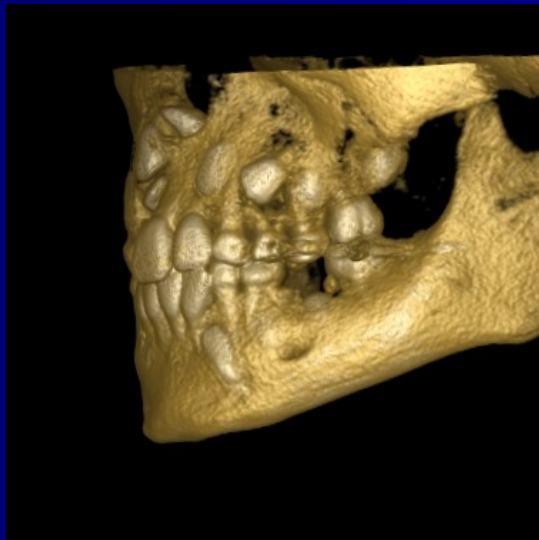
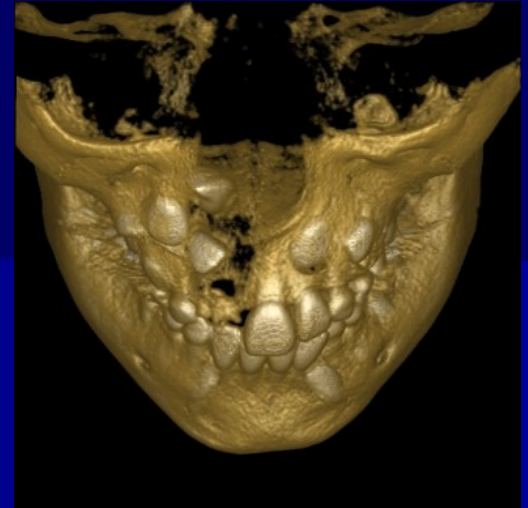
## 4. RADIOGRAPHS

### c] Other radiographs

- Bitewing – caries detection
- Hand wrist – detection of skeletal age
- Computer tomography –CT scan [impacted tooth, ankylosed tooth, difficult skeletal anomalies
- Digital imaging – computer generated model reconstructed from the initial imaging data







# Diagnostic examination

## 5. PHOTOGRAPHS

- extraoral photographs - frontal
  - profile
  - smile
- Intraoral photographs - frontal teeth
  - right and left side
  - upper and lower arch



# Etiology of orthodontic anomalies

- Ideal set of teeth can be seen in aprox. 25% of population
- 40% need treatment



# Etiology of orthodontic anomalies

- Malocclusion is a manifestation of genetic and environmental interaction on the development of orofacial region



# Etiology of orthodontic anomalies

- The etiological factors:

1. genetic influences
2. prenatal factors
3. postnatal, environmental influences

# Etiology of orthodontic anomalies

- Hereditary are mainly:
  - Shape and size of tooth
  - Teeth number
  - Shape and size of jawbones
  - Time of teeth eruption
  - Time and type growing jawbones

# Etiology of orthodontic anomalies

- Mainly hereditary anomalies:
  - True mandibular prognathia
  - Skeletal open bite
  - Skeletal deep bite
  - Primary crowding
  - Skeletal class II and III
  - Hypodontia, hyperodontia
  - Deep bite with retrusion of incisors
  - Retention or impaction of teeth
  - clefts

# Etiology of orthodontic anomalies

## ■ 2. Prenatal factors

### A.- teratogens

influence of physical, chemical and infectionals effects during gravidity- if acting in critical time

# Etiology of orthodontic anomalies

## ■ A. teratogens affecting dentofacial development

### Teratogens

### Effect

Aspirin, Valium

cleft lip and palate

Cigarette smoke[hypoxia]

cleft lip and palate

Cytomegalovirus

microcephaly, hydrocephaly

Ethyl alcohol

central mid-face deficiency

6-Mercaptopurin

cleft palate

Rubella virus

microftalmia, cataracts

Thalidomide

hemifacial microsomia

Toxoplasma

microcephaly, Hydrocephaly

X-radiation

microcephaly

Vitamin D excess

premature suture closure

# Etiology of orthodontic anomalies

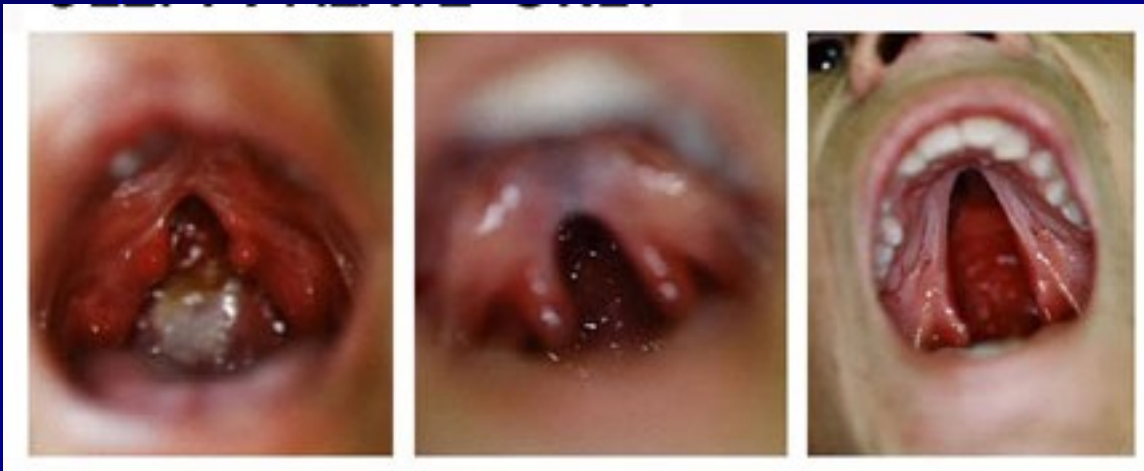
- Anomalie -Developmental defects - amelogenesis





# Etiology of orthodontic anomalies

- Clefts lip and palt



# Etiology of orthodontic anomalies

## Syndromes – Pierre Robin syndrome



# Etiology of orthodontic anomalies

## ■ 3. Postnatal influences

- Trauma – undiagnosed fractures of the mandibular condyles can cause disorders of the growth of the mandibular ramus  
=asymmetry
- Hormonal disorders – growth hormone deficiency, thyroid hormone deficiency – can contribute to the origin of acquired anomalies

# Orthodontic treatment

## Objectives of orthodontic treatment

- Aesthetics
- Treatment of impacted teeth
- Prevention of dental injuries
- Before prosthetic treatment
- Decay prevention
- Prevention and treatment of chewing malfunction and jaw joint disorders

# Methods of orthodontic treatment

- Orthodontics movement of teeth
- Orthopedic movement – effects of growth
- Myofunctional therapy
- Serial extraction, controlled extraction
- Ortho – prosthetic treatment
- Ortho – surgical treatment

# Orthodontic treatment

## 1. Orthodontic treatment by infants

- clefts
- syndromes and defects that complicate nutrition and breathing

We use - individual removable plates

# Orthodontic treatment

## 2. Deciduous teeth

We treat - bite defects

inverted bite

cross bite

- bad habits

We use – removable appliances



# Orthodontic treatment

## 3. 6-9 years [ 1. phase of mixed dentition]

The best time for treatment :

- cross bite
- inverted bite
- impacted incisors
- diastema more than 3 mm
- big primary crowding

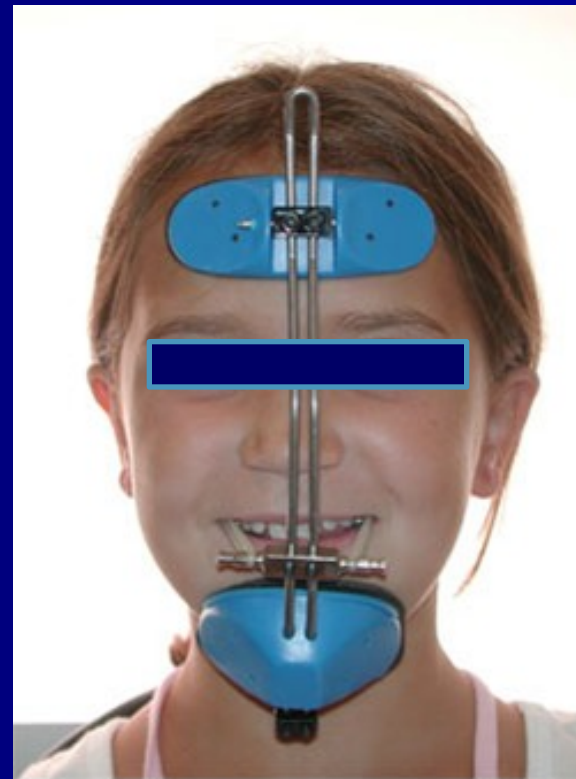
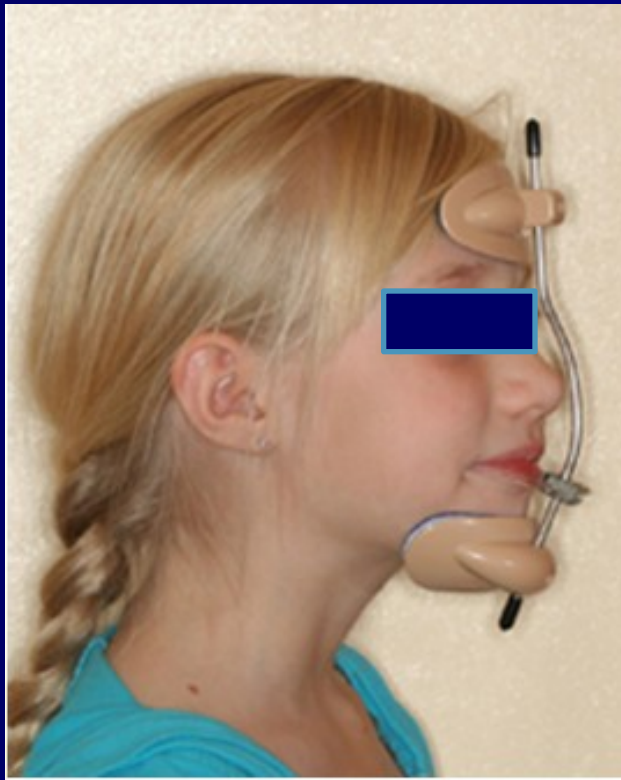
We use : removable appliances

small fixed appliances

face mask for inverted bite by class III



# Face mask



# Orthodontic treatment

## 4. 9-12 year [second phase of mixed dentition]

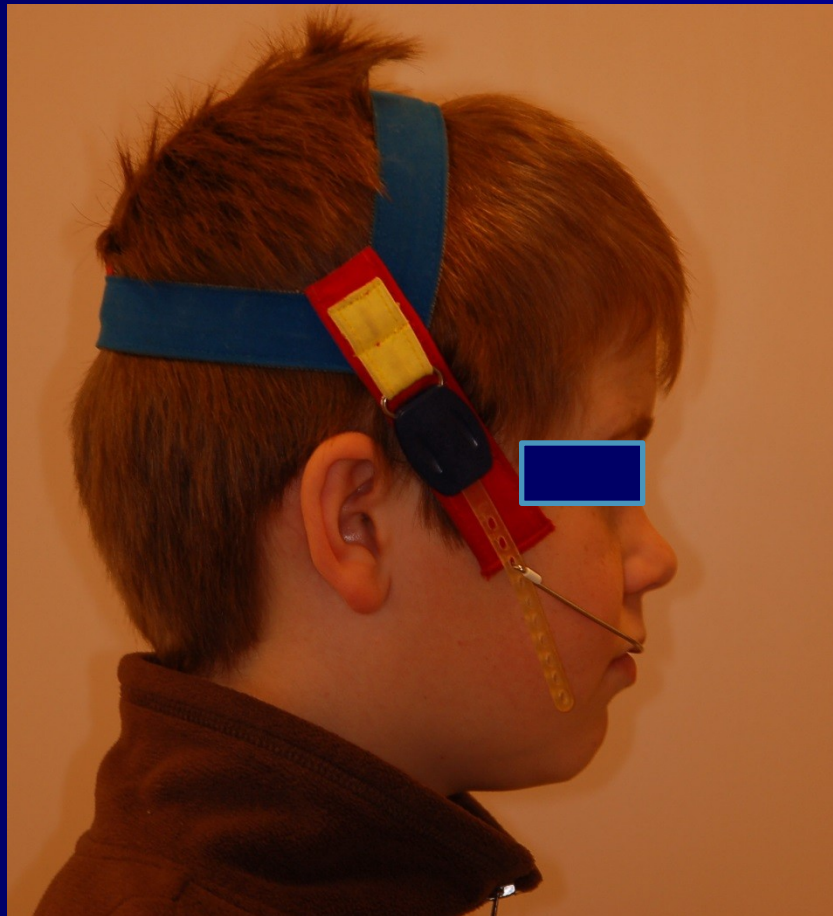
- Large forming ability of the tissues
- We can use and influence the growth
- Growth mandible from the joints

- We treat:
- previous untreated anomalies
  - crowding
  - Angle class II – div. 1 and 2
  - overjet more than 5 mm
  - deep bite
  - movements teeth after the early loss of teeth and anodontia
  - Controlled tooth eruption
  - Suspected retention of canines, premolars

### The best time for functional appliances

- removable appliances
- Small fixed appliances
- Headgear appliance

# headgear



# Orthodontic treatment

## ■ 5. Permanent teeth

We treat:

- All anomalies, previous untreated anomalies,
- Angle class III
- Crowding
- Open bite, deep bite
- Impacted tooth
- Skeletal anomalies

Adult therapy – periodontics problems, preprosthetic therapy

- problems with TMJ
- bruxism

We use : fixed appliances

extraction

surgical treatment by big skeletal anomalies

# Othodontic treatment

- Removable appliances:
  1. Active
  2. Passive
  3. Functional

# Therapy of ortodontical anomalies

- **Conservativ**
- orthodontical appliances :
  - removable
  - fixed
- **Surgical**
- extraction of teeth
- surgical expositions of crowns of retined tooth
- surgical movements of maxila, mandible

## ■ Active removable appliances

- Treatment of anomalous position of teeth [inclination, rotation of incisors]
- Treatment the dental arch shape
- Individual resin plates
- Active elements : springs, screws, wire bows

# Removable active appliances





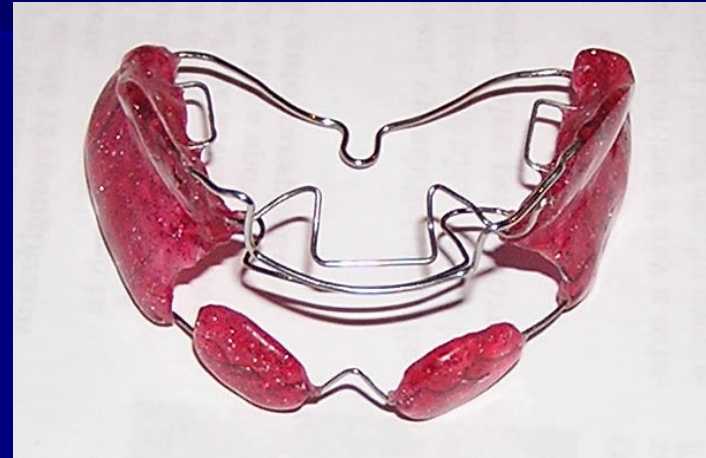
# Removable appliances - active



# Functional appliances

- modifying extent and direction of orofacial growth
- exploit muscular activity and soft tissue stretch to stimulate dental and bone changes
- operates at the time of maximum growth of orofacial region = 9-12 years old children
- We need **construction bite**
- Type of functional appliances :
  - Bionator, Klampt, Maxilator – class II and open bite
  - Fränkel appliance – class III

# Removable functional appliances

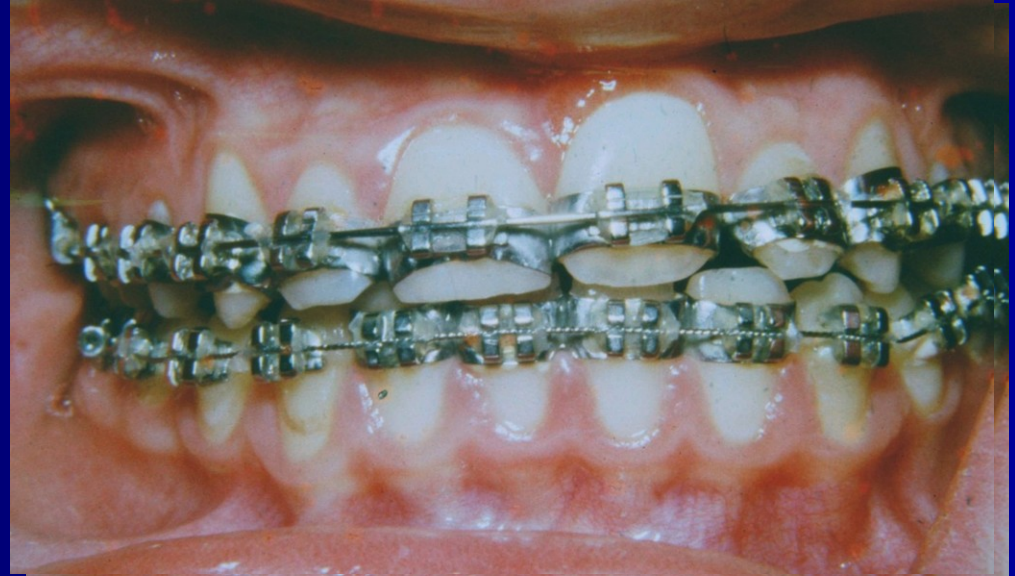


# Removable appliances- passive



# Fixed appliances

## -History



# Orthodontics brackets

## Stainless steel brackets



### Advantages

- strong, do not crack
- smooth, low profile
- recyclable
- low friction
- price

### Disadvantages:

- Aesthetic



# Stainless steel brackets



# Orthodontics brackets

## Ceramic brackets



### Advantages:

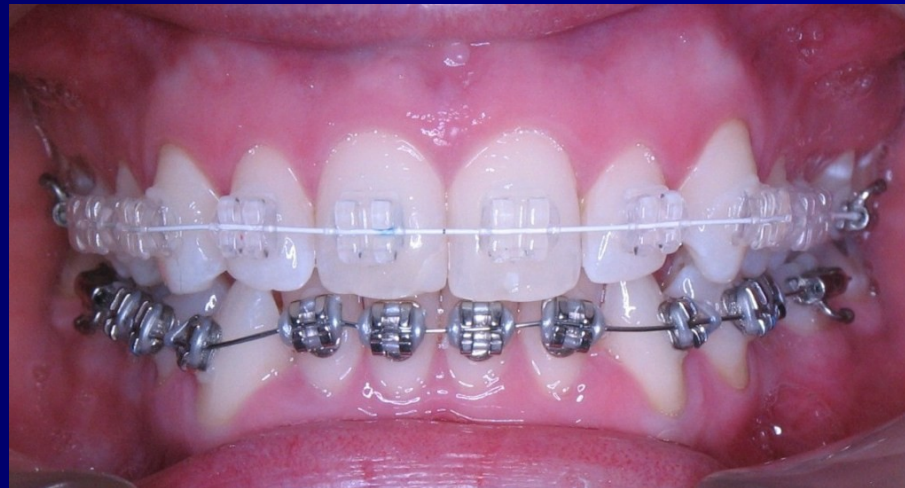
- Aesthetics

### Disadvantages:

- repeated bonding problem
- robust
- crack
- higher friction (avoid metal slot)
- price



# Ceramic brackets



# Orthodontics brackets

## Sapphire brackets



### Advantages

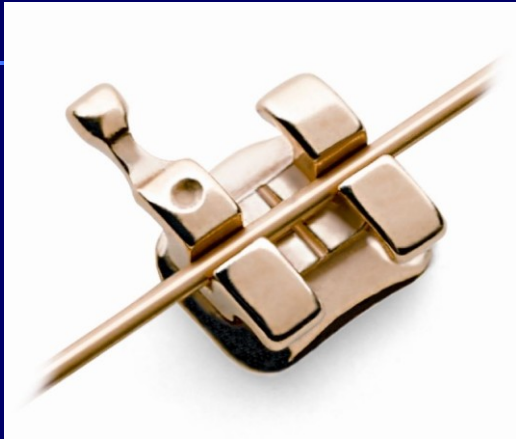
- aesthetic

### Disadvantages:

- repeated bonding problem
- robust
- crack
- higher friction (avoid metal slot)
- price

# Orthodontics brackets

## Gold-coated brackets



### Advantages:

- suitable for allergy sufferers
  - strong, do not crack
  - smooth, low profile
  - recyclable
  - Low friction
  - Aesthetics

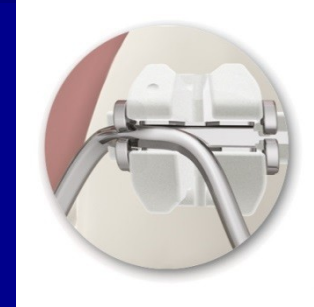
### Disadvantages:

- price



# Orthodontics brackets

Selfligating brackets – metal and ceramic



## Advantages:

- minimum friction
- low power
- faster treatment
- Fewer office visits

## Disadvantages:

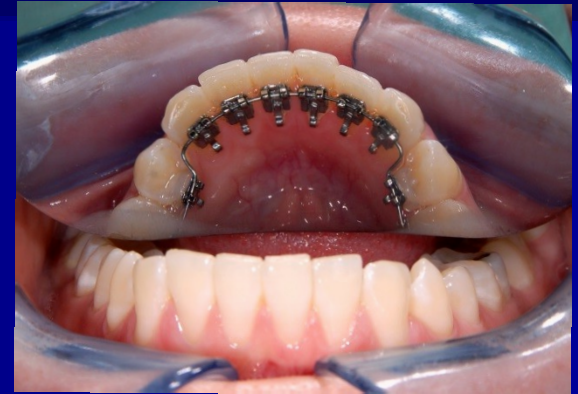
- not suitable for all types of defects

# Selfligating stainless steel brackets



# Orthodontics brackets

## Lingual brackets – 2D,3D



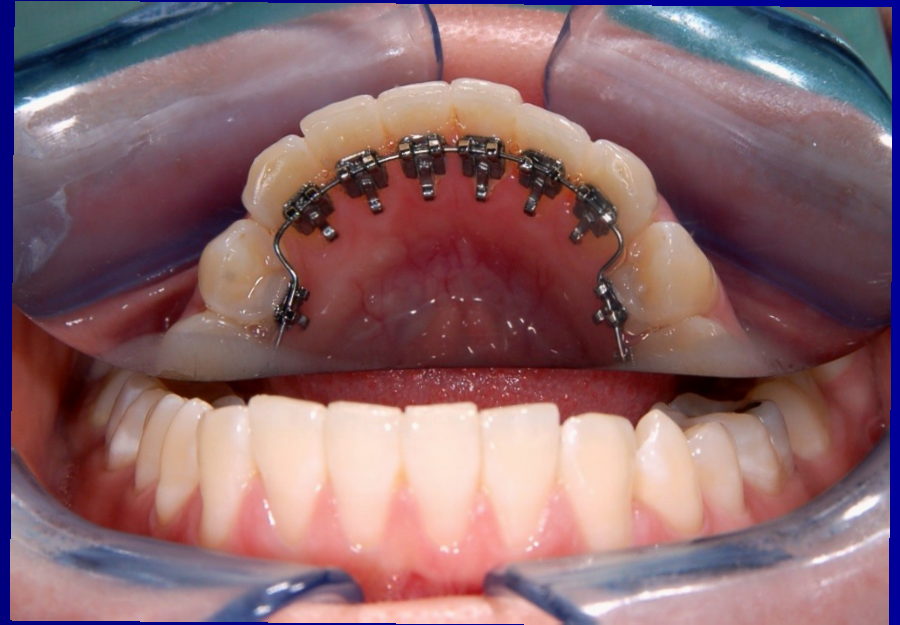
### Advantages:

- Aesthetics

### Disadvantages:

- unsuitable for all types of defects
- Difficulty hygiene
- (patient discomfort)

# Lingual bracket



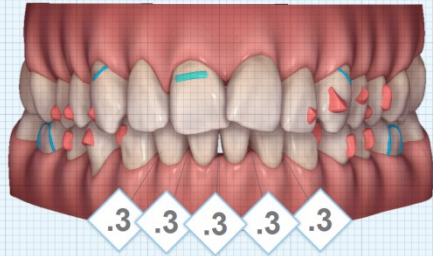




# Orthodontics brackets

## Decorative brackets



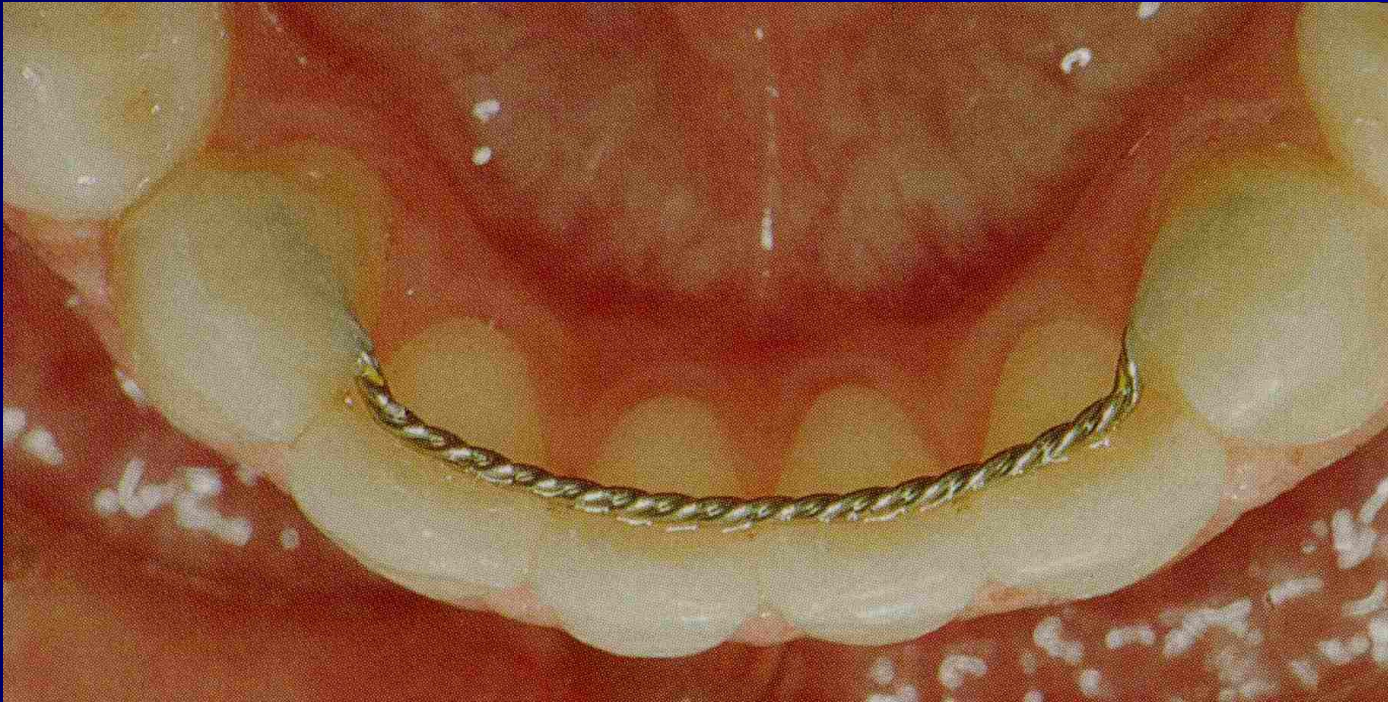


ClinCheck® Software

Simplified Tooth movements; actual treatment results may vary.  
Treatment plan are determined by your doctor.



# Fixed lingual retainer



# Direct bonding

1. cleaning



2. etching



3. rinse



4. drying



# Direct bonding

5. primer



6. bonding



7. remove excess



8. light or chemically cured



# Indirect bonding



Case 1 : vestibular eruption 11, crowding,  
supernumerary 11

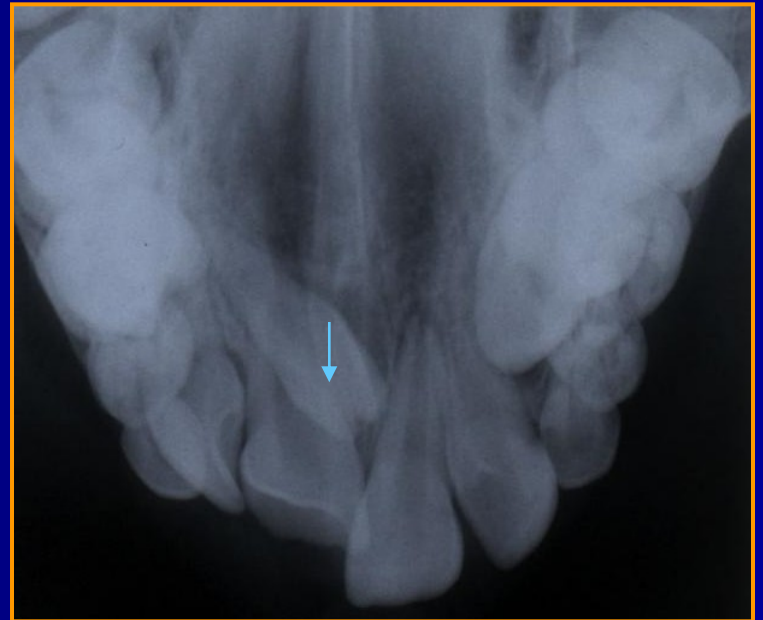




Case 1 : vestibular eruption 11, crowding,  
supernumerary 11



Case 1 : vestibular eruption 11, crowding, supernumerary 11



Case 1 : vestibular eruption 11, crowding, supernumerary 11 -  
Treatment



Case 1 : vestibular eruption 11, crowding,  
supernumerary 11 - Treatment



- Treatment time – 11 months

Case 2 : retention 11,21 , crowding, supernumerary 11, 21



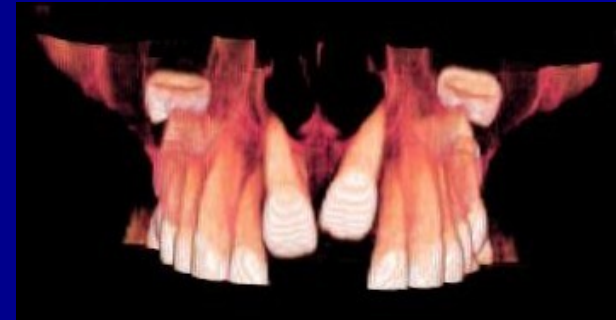
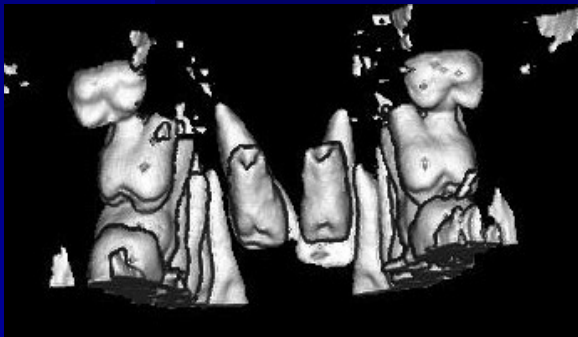
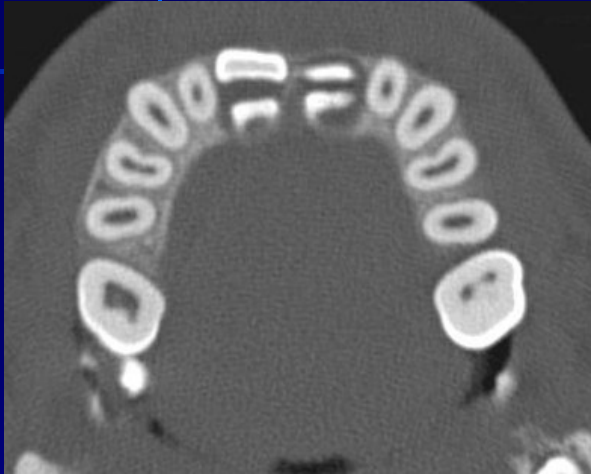
Case 2 : retention 11,21 , crowding, supernumerary 11, 21



Case 2 : retention 11,21 , crowding, supernumerary 11, 21

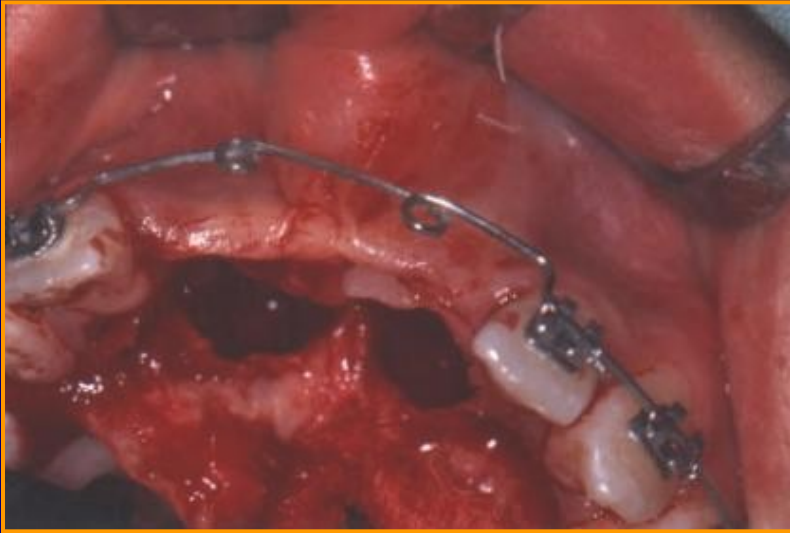


Case 2 : retention 11,21 , crowding, supernumerary 11, 21  
CBCT





Case 2 : retention 11,21 , crowding, supernumerary 11, 21  
Treatment - Extraction of the supernumerary 11,12



Case 2 : retention 11,21 , crowding, supernumerary 11, 21  
Treatment



Case 2 : retention 11,21 , crowding, supernumerary 11, 21  
Treatment



Case 2 : retention 11,21 , crowding, supernumerary 11, 21  
After Treatment



Case 2 : retention 11,21 , crowding, supernumerary 11, 21



- Treatment time 16 months

### Case 3 : Crowding, deep bite



Case 3 : Crowding, deep bite  
After Treatment with a fixed orthodontic appliance



Treatment time – 1,5 years

Case 4 : Crowding, inverted bite, vestibular eruption 13





Case 4 : Crowding, inverted bite, vestibular eruption 13  
Treatment – fixed appliance - expansion, leveling, bite correction



Treatment time – 1,8 years

Case 5 : retention 25, no space for 25 eruption  
Treatment – fixed appliance - expansion, open space for 25  
leveling



Case 5 : retention 25, no space for 25 eruption  
Treatment – fixed appliance - expansion, open space for  
25 leveling



Treatment time – 2 years

Case 6 : retention 23, no space for 23 eruption, crowding  
Treatment – fixed appliance - expansion, open space for 23, leveling



Treatment time – 2 years

Case 7 : retention 13,23, no space for 13,23 eruption, crowding  
Treatment – fixed appliance – extraction 14,24,34 44, leveling, bite  
correction



Treatment time – 2 years

# Orthodontic – surgery treatment - by skeletal Class III. case

Before treatment



After treatment



# *Lingual appliance 2D – crowding treatment*





**Thank You four Your  
attention**

